Italian Implementation Plan

Index

Introduction

This document is the Italian Implementation Plan for the requirements set in article 20 of Regulation 2019/943 of 5th June 2019 on the Internal Electricity Market (IEM).

Article 20 states that Member States with identified resource adequacy concerns identify regulatory distortions and market failures that may have caused or contributed to the adequacy concern. It further provides that member states with identified electricity resource adequacy concerns develop and publish an annual Implementation Plan containing "a timeline for adopting measures to eliminate any identified regulatory distortions or market failures as a part of the State aid process."
As regards process, the Member States are to submit the plan to the Commission for review. The Commission within four months issues an opinion on whether the planned measures are sufficient to eliminate the regulatory distortions or market failures that were identified as causing or contributing to the resource adequacy concern. The opinion from the European Commission may contain an invitation to the Member States to amend their Implementation Plans. The Article also sets out that the Member State shall monitor the application of their Implementation Plans and shall publish the results of the monitoring in an annual report to be submitted to the Commission. Member State are also requested to continue to adhere to the Implementation Plan after the identified resource adequacy concern has been resolved.

Article 21 of the Regulation 2019/943 states that where a Member State applies a capacity mechanism, it shall review that capacity mechanism and shall ensure that no new contracts are concluded under that mechanism where both the European resource adequacy assessment and the national resource adequacy assessment, or in the absence of a national resource adequacy assessment, the European resource adequacy assessment have not identified a resource adequacy concern or the implementation plan as referred to in Article 20(3) has not received an opinion by the Commission as referred to in Article 20(5). Article 22 requires Member States applying capacity mechanisms on 4 July 2019 to adapt their mechanisms to comply with Chapter 4 of the Regulation without prejudice to commitments or contracts concluded by 31 December 2019.

In 2019 in Italy a Capacity Market (CM) was introduced on the basis of identified resource adequacy concerns. The Commission's Decisions of 2018 and 2019, authorizing the measure for the period 2018-2028, found that the Italian CM was compliant with EU State Aid Rules - in particular with the conditions and requirements set by the Guidelines on State Aid for Environmental Protection and Energy 2014-2020 - and necessary, given the resource adequacy concerns and the concrete risks for the Italian electricity system identified by the Italian Authorities, also recognizing that the adequacy concerns are broadly consistent with the last findings published by the ENTSO-E Systems Adequacy Report.

In 2019 the first two auctions of the CM, concerning the target years 2022 and 2023, were held. According to the above-mentioned provisions of the EU Regulation, new auctions and then new capacity contracts as of January 2020 may not be concluded until Italy has received the Commission's opinion on this Implementation Plan.

This Implementation Plan applies to the electricity market in Italy and is structured as follows:

- **Part 1:** Overview of the resource adequacy concerns identified in Italy
- **Part 2:** Operation of the Italian electricity market, including an overview of the Italian Capacity Market mechanism
- **Part 3:** Market distortions and failures, which led to the introduction of the Italian Capacity Market
- **Part 4:** Full range of actions the Italian Institutions has pursued - and continues to pursue - to address the market failures
- **Annex A:** Market reform measures aimed at addressing market failures and related timeline for implementation
- **Annex B:** Detailed answers to the questionnaire attached to the EC guidance document

1. Overview of the resource adequacy concerns identified in Italy

1. Over the last ten years the Italian electricity system has experienced a significant reduction in installed thermal generation capacity and a significant development of generation from variable renewable energy sources. In particular, during the last 6 years, about 15 GW of traditional thermal capacity have been dismissed. In addition to that, approximately 3 GW of plants have not been decommissioned yet but are currently not available for operation. To date, about 55 GW of thermal capacity is available and usable.
2. At the same time, the variability of the electricity demand has increased: the correlation between temperature and demand has tightened, especially during the summer period (due to the wide use of air conditioning systems), reaching increases of about 2000 MW per °C after 2015. This has led, to a significant increase in summer peak demand and to an increasing frequency of summer peaks, thus straining adequacy of the power system that is already limited by a reduced thermal generation capacity as described above.
3. In other words, in the last years the risk of having insufficient resources to cover peak load and ensure system adequacy and quality of service, with consequential distributed load shedding (activation of the Emergency Plan for the Security of the Electricity System-PESSE) has increased. In particular, critical situations were registered in Italy in July 2015 for extremely high temperatures, in January 2017 due to a cold spell and simultaneous unavailability of French nuclear plants and in August 2017 for high peak consumption combined with scarce hydro contribution.

4. In the Commission' Decision of 2018 on the Italian capacity market, the Commission recognized that concerns expressed by Italy about meeting adequacy standard are justified, based on a generation adequacy assessment performed by Terna which covered several target years until 2025. The assessment concluded that the existing capacity will not be able to meet in the target years the reliability standard of 3 LOLE hours[1], while market conditions would not have been able to stimulate new investments to cope with adequacy needs.

5. The growing trend of critical events will be further exacerbated in the coming years as a result of the national and EU legislation, aimed at reaching a deep decarbonisation of the energy system to cope with the serious risks of climate change. In the National Energy and Climate Plan (NECP), Italy has committed to:
    - coal generation phase-out by 2025 (approximately 7 GW of capacity);
    - achievement of ambitious RES growth targets (+32 GW PV and +9 GW wind).

[1] The Loss of Load Expectation is one of the main indicators for measuring the adequacy (or inadequacy) of an electricity system and it describes the hours per year when load interruption is likely. This indicator has been adopted as an adequacy criterion at both European and national level. The Ministerial Decree 28 June 2019 approving the rules of capacity market functioning set the reliability standard for Italy at 3h/year.

6. More specifically, the NECP foresees a strong development of renewables reaching 95,2 GW of capacity by 2030; about 70 GW of the latter is due to wind and solar PV expansion. In such a framework, renewables will be able to cover about 55% of gross domestic consumption, therefore becoming the main source of electricity. However, electricity demand, driven by the contrasting effects of a progressive electrification of consumption and a strong push towards energy efficiency, is generally expected to grow and should reach around 340 TWh by 2030.
7. These ambitious RES targets for the electricity sector will certainly bring many benefits from different points of view. In particular, they will positively contribute to decarbonization, stimulate innovation and technology, support economic growth. Nonetheless, at the same time the progressive growth of renewables will decrease the equivalent full load hours of traditional thermal plants, thus, reducing the possibilities for them to recover fixed costs, leading to the decommissioning also of traditional thermal plants.

   The closure of traditional thermal plants and the sensitivity of electricity demand to high temperatures have led to particularly critical operating conditions of the electricity system with respect to its adequacy conditions featured by a significant reduction of the so-called adequacy margin, which is defined as the share of power available after meeting system demand and reserve. This value fell between 2014 and 2019 by around 76%, from 25 to 6 GW in one year. Adequacy analyses for the coming summer period confirm the downward trend and that in extreme conditions (high temperature) the contribution of imports is necessary to restore adequacy margins at national level and in particular for North and Central North zones. Therefore in the event of simultaneous scarcity with neighbouring Countries, the risk of having insufficient resources to cover peak load andto ensure system adequacy and quality of service, is higher. Without corrective actions this trend will continue, bringing the electricity system into increasingly critical operating conditions. Indeed, the progressive growth in renewables, as envisaged in the NECP, will decrease the equivalent full load hours of traditional thermal plants which, in the absence of capacity remuneration mechanisms, are divested by producers.
8. The analyses carried out by Terna in the Italian Adequacy Report 2019[2] show how, over the medium-long term (2025-2030), the Italian electricity system requires a thermoelectric generation capacity of at least 54 GW, and +3 GW of additional storage, to meet the adequacy standard of a maximum of 3 LOLE hours.
9. It's important to point out that by 2025 the NECP scenario shows a reduction in thermal generation capacity, mainly due to the commitment to a complete phase-out of coal (7.2 GW).
10. In the absence of new capacity, therefore with a level of thermal capacity of less than 50 GW by 2025, LOLE hours would be about 30, more than 10 times higher than the adequacy standards adopted both at national and European level. In this scenario, the energy not supplied to consumers would amount to about 11 GWh per year. In practical terms, with a load interruption of this size the

[2] https://download.terna.it/terna/Rapporto%20Adeguatezza%20Italia%202019_8d71cb7ff32ad37.pdf

Emergency Plan for the Security of the Electricity System would be transformed from an emergency measure to an ordinary tool for managing the electricity system, with the consequence of great inconveniences for citizens and businesses.

11. Even with 40 GW of new renewable capacity foreseen in the NCEP 2030 scenario, installed thermal capacity slightly lower than currently available will be required to guarantee the adequacy of the system. This capacity will need to be available at all times, in order to cope with periods of scarce production from renewable sources and ensure the safety of the electricity system, thus ensuring its contribution in Power (MW) and minimising its contribution in Energy (MWh). In fact, since dispatching priority is determined by the energy markets, renewable source plants, with almost zero variable generation costs, will always have dispatching priority over thermal plants.
12. In an electricity market based on short-term prices, which by their nature cannot fully reflect expected future conditions, a reduction in the contribution in Energy (MWh) of a thermal plant implies reduced, less predictable profits with the result that in some cases its fixed costs cannot be covered anymore. These plants are therefore in economic conditions that may lead to their definitive closure. Indeed, expected scarcity prices may theoretically provide an adequate incentive for maintaining or installing capacity. However, scarcity conditions are featured by extreme uncertainty and randomness both in frequency and intensity of occurrence. Therefore, in a context of general reduction of operating hours of thermal plants due to rising RES penetration and consequent reduced profits, investors, whose decisions by their nature have time horizons related to construction times and the financial return on the long-term, are increasingly reluctant to base their decisions on the expectation of uncertain scarcity rents.. In this market picture where conventional plants will be decreasingly used to cover the "base load" and increasingly used to manage the "peak load" spot market alone is not able to provide price signals to support investments and therefore provide the system with adequate resources and the availability of long-term price signals anchored to the availability of the resource is fundamental.
13. Therefore, the electricity system needs strategic actions to promote the development of new adequacy resources, to compensate the ongoing decommissioning (primarily coal-fired generation) and to maintain in service the existing capacity, increasingly intended to provide a "reserve" service and less to cover the fully efficient base load. For these reasons the NECP encompass, among the main objectives, the implementation of new market instruments, in order to channel investments towards new storage systems and generation capacity and to promote a progressively more active role for demand and other resources that can support adequacy, on the basis of pre-established standards. This will be achieved also through the new capacity market, launched in late 2019, by promoting the development of technologically advanced solutions having a low environmental impact, in line with the general objectives of the NECP in terms of decarbonisation, and coping with the system requirements arising from the increasing penetration of the non-programmable renewables. Market mechanisms like the capacity market, which are indispensable in terms of

security and adequacy, may even have positive effects on network services costs and wholesale prices in the mid-long term. The Italian Capacity Market has been introduced to ensure long term price signals for investment decisions, to facilitate the full integration of non-programmable RES into the electricity system, to enable the decarbonisation process of the generation fleet envisaged by the NECP and to allow the complete phase out of coal generation at 2025. In this respect, with the first two auctions of the capacity market held on late 2019 concerning the target years 2022 and 2023 the electricity system paved the way for the scheduled phase out of coal generation: the auctions have promoted the construction of new efficient and sustainable generation and storage capacity for about 5,8 GW[3]. The future auctions, covering the years from 2024, are for this reason essential to allow to procure the capacity to the extent and in the time adequate to complete the decommissioning process.

2. The Electricity Market in Italy

14. The Italian wholesale electricity market was set up as a result of Legislative Decree no. 79 dated March 16, 1999 ("Bersani Decree") as part of the implementation of the EU Directive on the creation of an Internal Energy Market (Directive 96/92/EC repealed by Directive 2003/54/EC).
15. The Day ahead and Intraday market are operated by Gestore dei Mercati Energetici (GME) - that following the approval of the EU Regulation 1222/2015 (CACM) was designated as Nominated Energy Market Operator (NEMO) in Italy - and are based on a zonal approach: the transmission network is represented in a simplified way, grouping network nodes into “bidding zones”.
16. In particular the Day Ahead Market (DAM) is operated on the basis of market splitting with the following features:
    - Unit bidding mechanism where producers and consumers submit hourly energy offers and bids by single generation/production unit;
    - Prices are settled at zonal marginal price: Italy is split in several internal bidding zones. The clearing price is set where the demand and supply curves meet, for each hour of each market zone (zonal price), taking into account cross-zonal capacity between these zones. Different zonal prices emerge as soon as a transmission constraint limits exchange. Zonal pricing therefore optimizes the dispatch of power plants considering network constraints and also provides locational signals for further investments. Sale offers are settled at the hourly zonal price and buy offers are settled at the Single Price (PUN) computed as the average of zonal prices weighted according to the consumption in each zone. In other words, most of the internal network congestions are managed through energy markets

[3] It is the derated capacity (the installed capacity adjusted to take account of the availability of plant) contracted within the Capacity Market

thanks to the bidding zones configuration, which represents one of the distinctive features of the Italian market model.

17. Italy is part of the Single Day-Ahead Market Coupling (SDAC), a coordinated electricity price setting and cross-zonal capacity allocation mechanism that allocates scarce cross-border transmission capacity in the most efficient way by coupling wholesale electricity markets from different regions through a common algorithm, simultaneously taking into account cross-border transmission constraints thereby maximizing social welfare.
18. The SDAC is applied on the borders with France, Austria and Slovenia.
19. The Intraday Market (MI) is organized in 7 sessions where bids/offers are selected under the same criterion as for the Day- Ahead Market; contrary to the Day-Ahead Market, accepted purchase bids are valued at the zonal price instead of PUN.
20. The ancillary services market (ASM), operated by Terna, is featured by a central dispatch model as described in the paragraph 4.5. In the ancillary services market Terna procures the necessary resources for managing and operating the power system (secondary reserve, tertiary reserve, relief of intra-zonal congestions, voltage regulation, real-time balancing). All programmable Production Units with a maximum power of more than 10 MVA and with the needed technical requirements to provide the ancillary services are obligated to participate. Today, the main suppliers of these services are fossil-fuel power plants. With progressive decarbonisation of production facilities, new resources will be required to guarantee the adequacy and security of an increasingly heterogenous electricity system.
21. In order to widen the amount of resources participating to ASM and increase the pool of ancillary services providers, Terna and the Italian National Regulator (ARERA) since 2017 have launched several initiatives to open the market to new kinds of participants and resources. This has led to more than 1,3 GW of demand side response (DSR), storage or small RES plants qualified to ASM as of 2020 in the form of “UVAM” (mixed virtual power plants).

Capacity Market

With the Ministerial Decree of June 28, 2019, Italy implemented a Capacity Market based on reliability options to address the growing risks of inadequacy and interruption in the supply of electricity in large areas of the country. The Italian Capacity Market has been introduced following two formal notifications (first notification on August 23, 2017[4] and second notification on March 25, 2019[5]) and two final Decisions of the European Commission of 7 February 2018 and 14 June 2019 that stated the compliance of the Italian mechanism with the Guidelines on State Aid for Environmental Protection and Energy 2014-2020 and authorized the measure for the period 2018-2028. In particular, the Commission concluded that the measure - taking into account the

[4] https://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=3_SA_42011
[5] https://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=3_SA_53821

assessment performed by Terna against a well-defined economic reliability standard - is necessary in order to ensure adequacy in a long-term perspective and that the mechanism based on zonal auctions and reliability options is appropriate with regard to the objective of the measure, also considering that the type of capacity mechanism chosen will be complementary to the market reforms undertaken by the Italian Authorities. These reforms are better described in the following paragraphs of this Implementation Plan. The EU Commission Decisions are also coherent with the results of the sector inquiry performed by the Commission itself in 2016 stating that even if a reformed market in principle has the potential to deliver secure supplies, uncertainties may persist about whether an increasingly volatile market price and rare scarcity situations can drive long-term investment decisions and that, where a Member State identifies a long-term risk that there will be insufficient investment, market-wide capacity mechanisms (like that introduced in Italy) are likely to be the most appropriate form of intervention. Finally, as stated in the Commission Decision of 2018, Italian Authorities will periodically reassess the effects of the planned market reforms on adequacy and security of supply and has committed to monitoring annually the functioning of the capacity mechanism with a view, inter alia, to reassess its necessity. This is coherent with the provisions of the Regulation 2019/943.

22. The Italian Capacity Market is a centralised, auction-based mechanism, in which reliability options are traded between capacity providers and a central buyer (Terna). Before every yearly auction, Terna performs and updates a national adequacy assessment. Auctions are held according to a zonal approach so that the mechanism entails a coordination between the capacity procurement and the planned network investments, avoiding over procurement risks. Participation is voluntary and technology neutral (storage, non-programmable RES and DSR are also allowed to participate). The mechanism is open also to foreign resources. The thermal capacity is subject to compliance with binding CO2 emission limits, by implementing in advance the requirements provided by the "Regulation 2019/943 on the Internal Market for Electricity"[6]. Capacity providers are entitled to perceive a premium in return to their capacity obligation. The premium (in €/MW/year) is defined as the clearing price of the Capacity Market auction on the basis of the marginal price rule, in the different capacity market Areas. Successful bidders in the auction are awarded with a one-year contract (15 years for new capacity, provided that a minimum investment threshold is respected).
23. The product traded in the Capacity Market is a reliability option: this means that, in order to respect their capacity obligation, contracted capacity providers must be available to submit offers in the day-ahead, intra-day, ancillary services and balancing markets. Moreover, the design of reliability options puts an obligation on the capacity market participants to pay back the positive difference between a market reference price resulting from their bids in DA, ID and ASM and a strike price (that correspond to the hourly variable cost of the marginal technology (OCGT).

[6] Unitary emissions must be lower than 550 gCO_2/kWh and total emissions lower than 350 $kgCO_2/kW\text{-}year$

24. The Capacity Market, therefore, allows for a certain remuneration to capacity providers in exchange for the uncertain remuneration that they would have earned from spot markets (the so-called scarcity rent). The underlying contractual structure provides for a more efficient allocation of risks between producers and consumers and ensures that the amount of capacity necessary to secure supplies will be available. At the same time, the reliability options avoid windfall profits for capacity providers and costs for consumers related to the capacity mechanism without limiting electricity prices, which remain free to rise up to scarcity levels providing the right incentives for short-term dispatch. Furthermore, the pay back obligation on capacity providers is load following, meaning that it will be calculated ex post by the TSO on the basis of the actual demand for any given hour, so that it does not implies any restrictions or distortive effects on the bidding decisions and, finally, on the market price formation.
25. Terna held the first two auctions with delivery period in 2022 and 2023 in November 2019. The price signals coming from the results of the auctions are consistent with the critical issues in terms of adequacy that the national electrical system is experiencing and that it will face even more in the coming years. The scarcity of available capacity highlighted by the auctions 2022 and 2023 is also consistent - in terms of need for new generation capacity - with the information indicated in the NECP and in the Italian Adequacy Report 2019[7]. Moreover, the introduction of emission limits, in compliance with the provisions of the Regulation UE 2019/943, has excluded the most polluting generators from the capacity remuneration (no coal-fired power plant participated to the 2022 and 2023 main auctions) enabling a decarbonization of the generation fleet. Indeed, these auctions allowed the procurement of about 5,8 GW of more efficient and sustainable new capacity, including storage and renewable resources, that represent an essential step for the phase out of coal while ensuring adequacy of the system.

3. Relevant market failures

26. An efficient electricity wholesale market has to provide reliable electricity at the least cost to consumers. This means making the best use of existing resources (short-run efficiency) and promoting efficient investment in new resources (long-run efficiency).
27. The energy transition process is highlighting the difficulties of energy only markets in achieving these goals due to the existence of several market failures. As described in the Commission' Decision of 2018, Italy underlined the existence of several market failures that were leading to a decrease in the adequacy levels of the electricity system which required regulatory intervention.
28. The main market failures identified are the following:
    - Adequacy has public good characteristics

[7] https://download.terna.it/terna/Rapporto%20Adeguatezza%20Italia%202019_8d71cb7ff32ad37.pdf

The first failure stems from the fact that adequacy has public good characteristics. Without public intervention, the market alone is not capable of pursuing the optimal level of capacity. In general, in the current context of technological development, consumers do not respond in real time to price changes and cannot be disconnected from the network on the basis of their willingness to pay to ensure adequacy in critical events.

- Coordination failures between generation and transmission investments

  The "energy only market" is unable to promote a coordinated development of generation capacity and transmission capacity (network developments) due to the fact that information is unequally distributed among different "players" in the electricity sector (TSOs and existing and potential capacity suppliers). This failure exacerbates the cycle of expansion and contraction that affects investments in the electricity sector and is caused by the time gap between the moment when the market experiences scarcity or oversupply prices and the reaction of operators in terms of investments in new generation capacity. Moreover, the difficulty in coordinating investments in generation capacity rather than in network investments, leads to the risk of directing capacity investments where they are not actually needed (in terms of critical transmission constraints).

- "Missing money" problem

  When certain aspects of the market architecture – reactions of the industry to possible public or regulatory interventions – lead to scarce/lack of electricity prices increases, capacity investments are not encouraged appropriately, hence triggering the so-called '*missing money problem'*.

  In fact, the current national regulatory framework does not set any limit to the dynamics of price growth, which is therefore free to reach the Value of Lost Load (VOLL) in case of approaching scarcity events. However, investment decisions are conditioned by unpredictability of price spikes and concerns that public/regulatory interventions or other external factors may block prices from reaching sufficiently high levels to cover generators' costs and ensure adequate remuneration to attract new investments. As the academic literature related to power system economics highlights, such interventions can be affected by the difficulty faced by regulatory or antitrust authorities in distinguishing situations where prices are high because of scarcity from circumstances where high prices are due to the exercise of market power.

29. The increasing penetration of generation from intermittent renewable sources in the market together with the contraction of demand due to energy efficiency policies and the economic crisis in the last years have increased the risk borne by investors in conventional thermoelectric capacity of not being able to cover fixed costs, with the result of further exacerbating the "boom and bust" cycle of investments in the sector. While demand has started again to grow and it is expected to increase in

the next decade due to electrification of energy end uses, decommissioning is going on and new investments are lagging behind with a serious risk for adequacy in the next years.

30. As a result of these market failures, the electric power market is unable to reflect through prices the growing inadequacy of the electric power system in a medium/long-term perspective. Even if the prices were to rise, this would only happen for a few hours, concentrated in specific years characterized by particular conditions. This could lead to a situation in which new investments are not implemented due to their high risks and the most modern and efficient plants are decommissioned, with a consequent risk of re-concentration of supply and a negative impact on the different adequacy conditions existing at a zonal level.
31. Finally, even if investors would be willing to take such high risks, there may still not be enough time for these price signals to translate into capacity investments (both new generation capacity and demand response capacity) in the time and to the extent necessary to counteract to scarcity and its lasting effects on prices. Adequacy would therefore be far from being restored and this could also lead to blackouts in the coming years.
32. Moreover, investors are increasingly reluctant to make investments in a framework where operating hours and prices are expected to decrease due to higher RES penetration and profitability strongly depends on few uncertain scarcity events. New investors would enter the market only when the number and the frequency of scarcity hours are high enough - above the efficient level - to ensure a capital remuneration coherent with high risks taken.
33. In summary, in the last few years, the Italian electricity system has witnessed a decrease in adequacy levels. Since the beginning of the last decade, no significant investment in new thermal power plants has been made (the last was commissioned in 2012) while the system has dismissed more than 15 GW of capacity. This has increased the risk of having insufficient resources to cover peak load, ensure system adequacy and quality of service, and, consequently, having to activate distributed load shedding (PESSE activation). Critical situations have been registered in Italy in July 2015, January 2017 and August 2017. Up to now critical situations have been managed adopting short term measures (e.g. demothballing of unavailable plants, denial of authorizations to dismantling). As mentioned above, in the NECP, Italy has committed to phase-out coal generation by 2025 (approx. 7 GW of installed capacity) and reach ambitious targets in terms of RES growth (+32 GW PV and +9 GW wind).
34. The uncertainty related to expected scarcity spot prices is not capable of providing an adequate price signal to investments in new flexible and more efficient capacity. In this market context it becomes extremely difficult for market operators to plan investments in new and efficient generation capacity despite the fact that the system needs them to maintain the necessary levels of adequacy and quality of service.

35. The challenging NECP targets combined with the abovementioned market failures will make ensuring security of supply more difficult in the coming years unless long-term measures, like a capacity market, are applied.

4. Implementation plan of the market reforms concerning Article 20(3) of Regulation 2019/943

36. For several years now, the Italian electricity system has been facing the challenges posed by the energy transition process and, while doing so, it has become increasingly complex to operate. The exponential growth of intermittent renewable sources and the generation fleet decarbonisation process has serious technical and economic impacts on the operational performance of the system, that will tend to exacerbate in the future for the further development of renewables expected towards 2030, based on the targets set in the NECP.
37. Increasing shares of intermittent renewable energy sources associated with decreasing shares of conventional ones result in a greater volatility of power flows, network congestions and wholesale electricity market prices as well as a lower control capability in terms of frequency regulation, voltage regulation, short-circuit power and system inertia.
38. The electricity system needs reforms to address the issues listed above and the already identified problems of resource adequacy caused by regulatory distortions or market failures. This paragraph describes in detail the full range of measures Italy is implementing or planning to implement – also in light of Article 20.3 of Regulation (EU) 2019/943 - which will contribute to reducing adequacy issues in the medium to long term and to integrating renewable energy sources into the system. The aforementioned measures are listed below:
    - Removing price caps (4.1);
    - Increasing interconnection and internal grid capacity (4.3);
    - Enabling self-generation, energy storage, demand side measures (also with a massive smart meter replacement and development) and energy efficiency (4.4);
    - Ensuring cost-efficient and market-based procurement of balancing and ancillary services (4.5);
    - Promote European market integration (4.6);
    - Removing regulated prices (4.7).
39. In addition to the measures listed above, it's worth mentioning:
    - the increasing investments in digitalization for the management of an increasingly complex, integrated and distributed electricity system, characterized by a soaring number of active, grid-connected resources and exchanges between each other. In light of the exponential

increase in the number of production (especially small-scale intermittent RES) and consumption plants, as well as the growing intermittent RES contribution to total production, we are already observing how the complexity of system operation is growing and how forecasts are becoming more challenging and subject to greater uncertainty. These trends will only continue. In order to mitigate the effects of these phenomena, it is essential to guarantee timely and reliable information to grid operators about the increasing number of resources that can actively be managed and are connected to the electricity system, primarily to the national transmission grid operator who is responsible for the security of the electricity system. It should be noted that today Terna manages the electricity system without having real-time monitoring of over 28 GW of distribution generation plants. In order to tackle this issue and to implement the European regulation (Requirements for generators and System Operation Guideline-SO GL) ARERA has initiated through resolution 628/2018 (December 2018) the procedure for the definition of the data exchange model based on the System Operation Guidelines. More recently with resolution 36/2020 ARERA has gone into details regarding the real time observability of the distributed generation plants. In particular ARERA has foreseen the development and management by Terna of an estimation algorithm powered by: a) direct and timely measurements acquired in real time from a sample of distributed generation plants (all MV plants with power ≥1 MW and a subset of MV/LV plants with power <1 MW to be identified according to geographical-dimensional criteria); b) master data of the distributed generation systems; c) historical data; d) weather data. For the acquisition of data from the distributed generation plants, the Distribution System Operators will send the real time measurement data of the energy produced with the sampling frequency (4s for MV plants, 20s for LV plants) defined by Terna. Following the adoption of the resolution 36/2020 ARERA will start a consultation to identify: a) the technological solutions of the device to be installed for the collection and sending of data; b) the methods of covering costs; c) the methods and timing of adaptation of the existing plants (retrofit).

- The Italian commitment to fostering the development of RES. Ministerial Decree “RES 1” of 4 July 2019, introduced support mechanisms for 8 GW of energy produced by photovoltaic, wind power, hydroelectric and sewage treatment plant gas. “RES 1” lists the plants into four groups based on the type of renewable energy source and the plant developments (e.g. new plant or upgrading of exiting plant). RES plants can access to the support mechanisms participating in tendering procedures or in competitive auctions, depending on their size and on the group to which they belong. Seven tendering and auction procedures are scheduled; the first one in September 2019 and the last one in September 2021. With the first tendering and auction procedure about 587 MW were selected.

4.1 Removing price caps

40. The absence of price limits (price caps and floors or bidding restrictions) is fundamental to allow the market to provide price signals necessary for generation investments. With regard to price caps, the current market regulatory framework is consistent with the CACM implementation and on DA market the maximum limit is set at 3.000 €/MWh while as for the ID this limit is going to be set at 9.999€/MWh; as concerning price floors on DA e ID market, now set at 0€/MWh, the National Regulatory Authority, in the scope of setting the new provisions for electricity dispatching, has foreseen the removal of the bidding price floor in both day-ahead and intraday markets (thus allowing the possibility of bidding at negative prices) as of the last months of 2020. However it's important to consider that if allowing the formation of negative clearing prices could have positive effects in terms of better signals for the flexibility of the electricity system, at the same time it could impact on the volatility of prices and then increase the market risks for investors.

4.2 Introducing a shortage pricing function for balancing energy

41. An administrative shortage pricing mechanism is already operating in the Italian dispatching regulation. More specifically, when a system inadequacy condition is detected with respect to a balancing period, the TSO is required to resort to rolling disconnections of loads either in the scheduling phase of the Ancillary Services Market or, with at least 30 minutes notice, in the real-time phase of this market. In this case, the imbalance settlement price is automatically set to the Value of Lost Load (VOLL).

4.3 Increasing interconnection and internal grid capacity

42. The development of interconnections could enable an increase in the volume of energy trade at more competitive prices by increasing competition in energy markets and at the same time ensuring security of supply through additional capacity. The reduction of network congestion, between and within the bidding zones, improves the use of generation resources in order to better cover needs and to increase the use of more competitive and efficient production plants, with positive impacts on competition.
43. According to Article 4 of Regulation (EU) 2018/1999, Member States are required to implement an electricity interconnection target for 2030 of at least 15%.
44. Referring to the "*Report of the Commission Expert Group on electricity interconnection targets*", in order to make the 15% target operational, the Expert Group assessed two alternative variables that

could be used in the numerator of the new formula: the net transfer capacity[8] (NTC) and nominal (thermal) transmission capacity of interconnectors. In addition, the interconnection level of a Member State could be calculated using one of the following variables in the formula (denominator) as an alternative to the installed generation capacity:

1. "Generation capacity weighted by load factors" (Index 1): this parameter reflects the reality where different technologies cannot all be used to the same extent (wind and solar, most notably, can only be used when weather conditions permit);
2. "Peakload" (Index 2): this parameter reflects security of electricity supply concerns, in fact Interconnectors contribute to the ability of the system to cover the current demand for power;
3. "Installed renewable generation capacity" (Index 3): this parameter reflects the expected future development of the energy mix and the theoretical maximum potential of production from renewable sources.

4.3.1 Current interconnection level

45. In 2019, the interconnection capacity is primarily located at the country's northern border (4 lines with France, 12 with Switzerland, 2 with Austria, 2 with Slovenia). In total, there are 7 circuits at 380 kV, 9 circuits at 220 kV and 3 circuits at 150/132 kV on the northern border. There is also a direct current connection with Greece and one that connects Sardinia and the peninsula with Corsica (SACOI2). Sardinia is also connected to Corsica by an alternating current cable. A 220 kV cable connects Sicily with Malta. Finally, the commissioning of the HVDC cable with Montenegro contributed to interconnection level with additional 0,6 GW of NTC.
46. In the following the 2019 interconnection levels – calculated using the above-mentioned parameters and the current NTCs[9] – are shown:
    - According to the Index 1 Italy achieves the value of 14,6% (10,8/ 65,1 GW);
    - According to the Index 2 Italy achieves the value of 16,2% (9,5/ 58,8 GW);
    - According to the Index 3 Italy achieves the value of 17,5% (9,5/ 54,2 GW).

47. Below, the actions that Italy has planned in order to achieve the targets mentioned above.

4.3.2 Planned interconnection projects and Interconnection level for 2020

48. The interconnection projects expected to be up and running by 2020 are under development on the French border through the 3-P HVDC "Piossasco-Grand'Ile" intervention and the development on the Austrian border in relation to the intervention 208-P Prati di Vizze-Steinach. The commissioning

[8] The NTC is assumed as the import winter peak capacity.
[9] Including the commissioning of the Montenegro cable (400 MW public and 200 MW private).

of these projects will allow **an interconnection capacity increase of 1.3 GW over 2019 value (9.5 GW)**, that will allow the achievement of an interconnection level in 2020, of:

- According to the Index 1 Italy achieves the value of 16,6% (9,5/ 65,1[10] GW);
- According to the Index 2 Italy achieves the value of 18,4% (10,8/ 58,8[10] GW);
- According to the Index 3 Italy achieves the value of 19,9% (10,8/ 54,2[10] GW).

Interconnection projects with foreign countries planned for 2020			
Project Name	Expected commissioning year	Expected NTC[11] increase [GW]	
		by project	*Sum*
Interconnection between Prati di Vizze and Steinach *(IT-AT)*	2020	0.1	1.3
*Interconnection between Piossasco and Grand'Ile (IT-FR)**	2020	1.2	
2019 Interconnection capacity [GW]			**9,5**
Total expected 2020 interconnection capacity [GW]			**10,8**

* Project of common interest in accordance with Regulation 2016/89 of the third PCI list, not included in the IV list of 31 October 2019 as it is in an advanced phase of implementation.

4.3.3 Planned interconnection projects and Interconnection target for 2030

49. For 2030, the interconnection capacity between the national grid and that of neighbouring countries is expected to grow. The 2020 National Development Plan (NDP) includes further projects that will lead to **an additional increase in import interconnection capacity of about 4.1 GW[12] by 2030 (a total expected NTC value of 14.9 GW)**. This expected increase will enable an interconnection level of:
    - According to the Index 1 Italy achieves the value of 21,4% (14,9/ 69,6 GW);
    - According to the Index 2 Italy achieves the value of 24% (14,9/ 62 GW);
    - According to the Index 3 Italy achieves the value of 16% (14,9/ 93,3 GW).
50. These increases are related, in particular, to the implementation of the following network developments:

Interconnection projects with foreign countries planned for 2030

[10] The values of Generation capacity weighted by load factors, Peakload and Installed renewable generation capacity for 2020 was assumed equal to 2019 one's, for simplification.
[11] The NTC increases are considered approximately equal to the total transfer capacity (TTC), taking into consideration the data from the national development plan.
[12] The calculation includes the interconnection projects with Montenegro and Tunisia.

Project Name	Expected NTC increase [GW]	
	by project	***Sum***
Interconnection 220 kV between Nauders and Glorenza (IT-AT)	0.3	4.1
II half of HVDC link between Italy and Montenegro (IT-MNE)	0.6	
*SACOI 3**	0.1	
*HVDC link between Italy and Tunisia (IT-TUN)**	0.6	
*HVDC link between Divaca and Salgareda (IT-SL)**	1.0	
Interconnection 220 kV between Italy and Austria (IT-AT)	0.5	
Interconnection between Italy and Switzerland (IT-CH)	1.0	
Interconnection capacity for 2020 [GW]		**10,8**
Total expected 2030 interconnection capacity (only projects from NDP) [GW]		**14,9**

* Project of common interest in accordance with Regulation 2016/89 of the third PCI list

51. Furthermore, taking into consideration the merchant lines projects[13], it is expected to obtain a **further increase of about 3 GW (a total expected NTC value of 18,1 GW)**, achieving the following interconnection level:
    - According to the index 1 Italy achieves the value of 26% (18,1/ 69,6 GW);
    - According to the index 2 Italy achieves the value of 29,2% (18,1/ 62 GW);
    - According to the index 3 Italy achieves the value of 19,4% (18,1/ 93,3 GW).
52. The list below shows the development projects related to the merchant lines:

***Merchant lines* planned for 2030[14]**		
Project Name	Expected TTC increase [GW]	
	by project	*sum*

[13] In accordance with Regulation (EU) 943/2019

[14] The expected values have been declared by project promoters as part of the consultation carried out during the processing of development plan 2020.

*Greenconnector (IT-CH)[15] **		1,0	
Interconnection 20 kV between Ventimiglia and Menton (IT-FR)		0,04	
AC link 132 kV "Mese-Castasegna" (IT-CH)		0,1	
"Redipuglia-Vrtojiba" interconnection (IT-SL)		0,2	
"Dekani-Zaule" interconnection (IT-SL)		0,2	
*"Wurmlach-Somplago" interconnection (IT-AT)**		0,3	3,1
AC link 220 kV "Mese-Castasegna" (IT-CH)		0,3	
Interconnection 132 kV between Cesana and Briancon (IT-FR)		0,2	
I half of HVDC link between Montalto di Castro and Rejim Maatoug (IT-TUN)		1,0	
II half of HVDC link between Montalto di Castro and Rejim Maatoug (IT-TUN)		1,0	
Interconnection capacity for 2030 [GW] without merchant line			**14,9**
Total expected 2030 interconnection capacity [GW]			**18**

* Project of common interest (in accordance with Regulation EU 347/2013)

4.3.4 Planned interventions to reduce the network congestion between bidding zones

56. With reference to developments in the electrical transmission network, Terna planned some cross-zonal network developments in its NDP in order to increase transport capacity between the areas of north, central-north and central-southern Italy and to reduce the hours of congestion between these sections.

57. Above all, the new connection between the Mainland - Sicily and Sardinia will enable an increase of transport capacity among Sicily, Sardinia and Central-South areas.

58. In particular, the electricity systems of the two islands are currently affected by:

- old and inefficient generation units;
- lack of interconnection links with the mainland;
- poorly developed 380 kV networks;

[15] The "Greenconnector" merchant line between Italy and Austria was not counted for the possible synergy with the "Interconnection between Italy and Switzerland (IT-CH)", included in the previous table.

- many voltage regulation problems in specific operational conditions;
- many congestions due to high RES generation units.

59. All these problems are expected to increase considering the targets provided by the Italian NECP, that foresees:

- a significant increase of renewable generation capacity in the South area;
- the phase-out of coal fired thermoelectric capacity by 2025.

60. Referring to the above mentioned, the realization of the project will be primary for increasing adequacy, flexibility and security of the two insular electric systems and to allow further market integration.

61. Instead, the “Central North-Central South” border, is affected by many hours of congestion in a mid/long-term scenario due above all to the strong growth in renewables production plants. For this reason, the realization of the “HVDC Adriatic link” and “the removal of the restrictions of the Center South-Center North section” is necessary. In particular, the “HVDC Adriatic link” responds to the needs of adequacy, safety and flexibility of the national electricity system, which is expected to be featured by high transport levels between the South and Northern Italy.

62. In order to remove the current congestions on the South-North ridge the following developments are planned:

- the “380 kV Colunga-Calenzano electricity line” will be implemented on the “North-Central North” section;
- the “Central South-South” section, in particular:
  - 380 kV “Foggia-Villanova” electricity line;
  - 380 kV “Bisaccia-Deliceto” electricity line;
  - 380 kV “Montecorvino-Avellino-Benevento” electricity line.
- the “Rossano-Sud” section (future “Calabria–South” section), will be affected by the ''redevelopment of North Calabria network'' intervention.
- the “Sicily–Rossano” section (future “Sicily–Calabria” section) where the ''380 kV Sorgente - Rizziconi electricity line'' intervention will allow an increase of the exchange limit between the bidding zones up to the value of 1500 MW, by means of the two new submarine cables (commissioned in 2016) and the future variation of terrestrial location of some OHLs.

63. Furthermore, the implementation of the following interventions - foreseen to enhance transmission network efficiency and to guarantee a better dispatch of production units - is also planned:

- “the removal of the restrictions on the 380 kV network” (in the north area);
- “new 380 kV connection between Milan and Brescia” (in the north area);
- “the reinforcement of 380 kV network between Venice and Padua area” (in the north east area);
- “the Chiaramonte Gulfi – Ciminna 380 kV electricity line” (in the Sicilian region).

64. Finally, many interventions were planned in order to increase the voltage regulation system ability, such as the installation of synchronous compensators in specific areas of the network.

65. In 2018, ARERA introduced an incentive for Terna to create new transmission capacity between bidding zones (both internal and cross-border).

These incentives are provided to achieve an additional transmission capacity between market zones, in particular to achieve a **"***target capacity*", i.e. the interconnection capacity that is economically efficient to achieve, since the benefits outweigh the costs. The target capacities have been proposed by Terna and approved by ARERA. In particular, the interventions identified (also mentioned in paragraph 51, 61 and 62), are included in the NDP 2020.

66. As regards cross-border capacity, ARERA approved a value of 4.4 GW of additional capacity (on top of 8.9 GW import capacity, which was available in 2018) which confirms the interconnection capacity increases of the interventions included in Terna's network development plan.

67. With regard to the internal zones, ARERA approved a capacity to be implemented between the various areas equal to 3.4 GW overall.

4.4 Enabling self-generation, energy storage, demand side measures and energy efficiency

4.4.1 Enabling self-generation

68. Italy attributes great importance to the promotion of self-consumption from renewable sources, both in single and aggregate configurations. So far in Italy, there are 740.000 self-consumption units, accounting for a total installed capacity of 26 GW; these facilities generate 28 TWh per year and cover around 9% of the total electricity consumption.

69. Italy is currently engaged in the transposition in the national law of the European Directives n. 2019/944 on the internal market for electricity and n. 2018/2001 on the promotion of RES, which will give greater impetus to the development of self-consumption. Indeed, with the Law February 2020, n. 8, of conversion of the Legislative Decree 162/2019, Italy anticipated the implementation of the Directive RED II. The Law introduces two new configurations:

- Collective self-consumption composed by Renewables self-consumers located in the same building, including multi-apartment blocks
- Renewable energy communities.

According to this Law, the National Regulatory Authority is expected to define technical and economic rules about new configurations (a specific public consultation on this regard has been recently launched) and the Ministry of Economic Development is also expected to define an incentive tariff for the remuneration of renewable sources included in the experimental configurations. A further

step will be the definition of the legal and regulatory framework to promote the development of energy communities of citizens, as provided by the Directive 2019/944. The definition of the rules regarding all the above mentioned new configurations will pay attention to the need to promote the development of such configurations and to facilitate a pro-active role of final consumers both in terms of participation to all electricity markets and of contribution to the effective achievement of the energy and environment targets set in the NECP.

4.4.2 Enabling demand side response

70. Enabling active consumers and demand response means that, in the coming years, Member States of the European Union shall complete an ambitious program of deployment of advanced-metering infrastructure, allowing demand resources to receive more precise market signals and to react to them. In other words, end consumers shall receive price signals with adequate locational and time granularity in tariffs, thus allowing them to take ownership of the way they use and consume their electricity.
71. Italy shows one of the most significant smart meter roll-out programs in Europe, a pioneer country in the installation of this kind of meters, starting it since 2001. Currently, more than 98% of customers is equipped with the 1st generation smart meters (1G). Starting from 2016 the Authority is leading the implementation of a second generation of smart meters (so-called 2G) based on new specific functionalities, able to bring benefits for all customers and electricity retailers more widely.
72. Relating to metering data collection, 2G smart meters allow data reading every quarter-hour for all customers compared to 1G smart meters which limited this option only to customers with contractual power higher than 55 kW. This information will help all customers to better know their consumption, making the introduction of new commercial offers based on real time prices set in the spot market possible for retailers. Moreover, prepaid contracts can be more effective, also as an instrument to contrast the risk of payment arrears which are a market entry barrier.
73. Relating to remote data management, 2G smart meters present an additional communication channel which allow to activate new services for customers and retailers, like reporting messages (impossible to be promptly sent through the ordinary chain). Thanks to dedicated devices (“In Home Devices” - IHD), interfacing this communication channel with smart meters, in order to continuously check in real-time both the used capacity of the connection point and the injection or withdrawal of energy; moreover, if IHD is connected to an EMS (Energy management systems), on-line dialogue with EMS can be used to send price signals to customers aimed at changing their loads on the network (i.e. for unexpected outages) or at activating network ancillary services (i.e. for participation in the dispatching market).
74. With resolution n. 222/2017 the National Regulatory Authority ARERA approved the 2G smart metering roll out plan for e-distribuzione - the main distributor in Italy (85% of customers served) – which foresees the substitution of its current 1G meters fleet by 2024. As of December 2019, e-

distribuzione has already installed almost 13 million of 2G smart meters. Further distribution companies are going to start the roll-out in these years and by 2025 it's expected that LV connection points of more of 90% of customers and prosumers will be equipped with 2G smart meters. According to resolution n. 306/2019, the remaining distribution companies with more than 100.000 customers will have to complete their 2G smart meters installation plans by 2026.

75. Moreover, as envisaged in the NECP, the scrapping of the SNP (Single National Price) will be assessed. Although grid investments have already strongly reduced the price spread among Italian bidding zones and will continue to do so, exposure of consumers to zonal prices could play a role in fostering demand response providing better price signals to demand (with PUN very high zonal prices linked to local scarcity in one bidding zone are not reflected in the price paid by consumers of that bidding zone but all consumers pay the same average price).. For that purpose, specific assessments before the reform shall be performed with regard to the changes in network structures and to the need to put in place preventive measures for reducing network congestion and/or the possible economic disadvantages of specific territorial areas, taking into account the increasing market penetration of renewables.

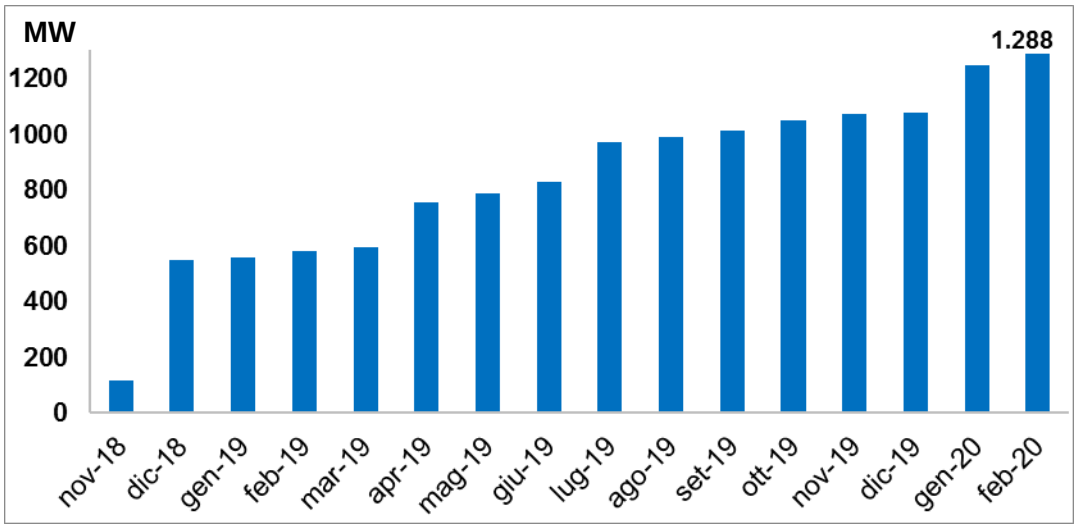

Figure 1: Evolution of aggregated DSR participating to the Italian ASM, MW (Source: Terna)

76. With regard to market participation, the current framework allows demand response participation to Energy (Day-Ahead and Intraday), Ancillary Services and Capacity Markets. In the Ancillary Services and Balancing Markets demand response participation has been allowed through pilot projects (Decision 300/2017/R/eel) aimed at collecting useful elements for an overall reform of these markets opening them to new participants (such as non-programmable renewable sources, distributed energy resources and demand side response and storage systems, including electric car batteries) also through aggregators (Mixed Enabled Virtual Units - UVAM[16]).

[16] https://www.terna.it/it/sistema-elettrico/progetti-pilota-delibera-arera-300-2017-reel/progetto-pilota-uvam

77. As of February 2020, Terna qualified almost 1.300 MW of UVAM to participate to ASM for the provision of tertiary reserve and balancing service. The majority of them is represented by large industrial consumption sites, but the number of UVAM made by an aggregation of small consumption points (e.g. domestic consumers) is increasing and is expected to increase further with the deployment of 2G smart meters.

78. The Recent Decree of the Ministry of Economic Development (MISE), approved on 30th January 2020, sets criteria and methods aimed at promoting the integration of electric vehicles (EVs) into the grid (so-called "vehicle to grid": V2G), allowing also V2G vehicles to offer dispatching services through charging stations. These services include: (i) tertiary power service and balancing (both in "upward" and "downward" modes) (ii) congestion resolution and (iii) primary/secondary power services, where technically possible. In addition, in order to promote the electric mobility, since 2010 ARERA established a specific tariff for the public charging service.

79. A further impulse to the demand side response will also derive from the implementation of the framework on self-generation introduced by the abovementioned Law 8/2020, of conversion of the Legislative Decree 162/2019 (see 4.4.3).

4.4.3 Enabling energy storage

80. In the next years, energy storage will play a pivotal role in Italy to guarantee increased security and flexibility to the power system and to minimize RES overgeneration and curtailment. This is particularly important as the expected rise of the RES generation to achieve the target at 2030 of 30% share of energy from RES (on the gross final consumption of energy) could imply huge electricity overgeneration flows, even considering all the planned network developments, estimated to be more than 10 TWh, lacking measures meant to reduce this effect. Based on scenario analyses that take into account national RES penetration targets (55% of electricity production by 2030 according to the NECP), new storage systems will be required already in the medium term, in addition to the optimal management of existing hydro storage systems[17]. For 2030 preliminary estimates indicate a need for about 6,000 MW of new storage systems (hydro and electrochemical) in addition to the expected growth of about 4,500 MW of distributed storage (e.g. domestic storage coupled with PV plants).

81. In 2015, Terna kicked-off two macro-projects called "Energy Intensive" and "Power intensive" storage labs to test and validate the use of electrochemical storage at the "utility scale" level. The projects provided for (i) the construction of three storage plants in southern Italy, (34.8 MW), with the aim of reducing RES curtailment and grid congestions during hours of excessive wind generation and (ii) the installation of storage plants in Sardinia and Sicily (40 MW) in order to assess and validate

[17] Italy has already a significant capacity of pumped hydro storage (6,5 GW in pumping mode and 7,5 GW in production mode) which is however mainly located in the northern regions while most of RES capacity is being added in the south and in the islands

the integration of the storage systems with the TSO Defence Systems. These projects gave important insights on how to use battery storage systems for ancillary services provision.

82. Italy is now committed to enabling the development of new storage systems through a comprehensive set of actions and market reforms. In particular, concerning electrochemical storage:
    - the capacity market is expected to promote investments also in new storage systems. Results of the 2023 capacity auction show that over 200 MW of battery storage capacity have been awarded a capacity contract.
    - Terna, has also launched a dedicated pilot project to allow the provision of primary frequency response by electrochemical storage systems (Project UPI, which has by now a 30 MW size and allows production units to allocate their FCR reserve band on a storage system integrated with the production units).
    - Electrochemical storage systems can already participate in the Ancillary Services Market and Balancing Market through the UVAM mechanism (also aggregated under 1 MW of size) in order to provide tertiary reserve and balancing service.
    - The provision of secondary frequency regulation (aFRR) from UVAM and stand-alone storage systems will soon be allowed (consultation expected by first half 2020).
83. Moreover, the Italian NRA has recently consulted a regulation[18] for exempting transport, dispatching and system fees to energy consumption of storage systems for the subsequent reinjection in the network. This regulation generalizes the approach currently adopted for hydro storage systems and temporarily extended to electrochemical storage too.
84. Italy deems that the reforms undertaken or expected in the next years in Ancillary Services Markets, the introduction of the Capacity Market and the measures underway to better define the permitting and regulatory framework for storage plants will support the growth of electrochemical storage systems in Italy, with a small or medium energy capacity.
85. Yet, these market reforms might still be insufficient to attract new investments in energy intensive storage with large energy capacity, especially for new pumped storage, which are featured by really long pay back times and huge financial needs, for which dedicated long-term remuneration schemes might be needed since their economic viability strongly depends on price volatility and arbitrage opportunities in the energy market. Therefore, effective ways of attracting private investment into pumped storage will be identified considering this kind of storage capacity a fundamental infrastructure asset for the energy transition towards 2030 targets. In this regard, It's under discussion a market-based mechanism for the procurement of new storage capacity that will be then allocated to operators and deployed through the electricity markets. Furthermore, attention will be focused on the need to streamline licensing and permitting procedures.

[18] https://www.arera.it/it/docs/19/345-19.htm

4.4.4 Enabling energy efficiency

86. Italy is one of the most energy efficient countries, with a primary energy intensity about 18% lower than the EU average. The national energy efficiency targets for 2020, in accordance with Article 3, paragraph 1 of Legislative Decree No. 102 of 2014 (implementing the Energy Efficiency Directive - EED), provide for an energy efficiency improvement programme aimed at saving 20 Mtoe/year of primary energy and 15.5 Mtoe/year of final energy. In 2020 the expected consumption (158 Mtoe of primary energy and 124 Mtoe final energy) will be exceeded.
87. As regards, instead, the absolute level of energy consumption in 2030, Italy pursues a target of 125.1 Mtoe primary energy and 103.8 Mtoe final energy.

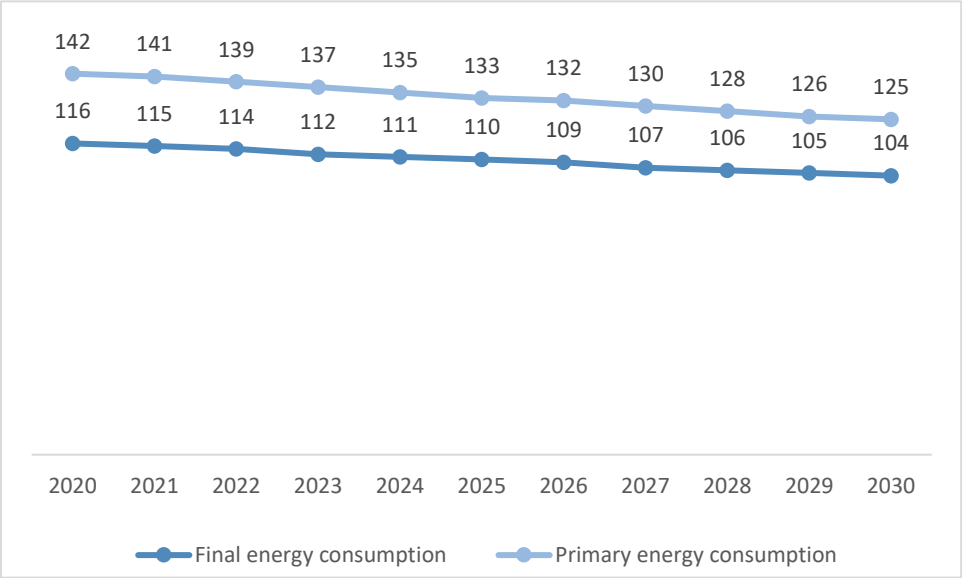

Figure 2 - Trajectory of primary and final energy consumption (Mtoe) over the period 2020-2030
Source RSE

88. For the definition of this target, a trajectory has been developed based on the achievement of the mandatory savings defined in accordance with Article 7 of the EED Directive of 11 December 2018, which provides for a target of a minimum reduction in final consumption of 0.8% per year over the period 2021-2030, calculated on the basis of the three-year period 2016-2018.
89. It is therefore estimated that 0.927 Mtoe of annual incremental final energy savings will be generated from new interventions in the period 2021-2030. In terms of total cumulative amount, the above

translates into 50.98 Mtoe of final energy savings to be achieved through active policies in the period 2021-2030.

Year	Annual savings	Annual Energy Savings										Total
2021	0,8%	0,927										**0,927**
2022	0,8%	0,927	0,927									**1,854**
2023	0,8%	0,927	0,927	0,927								**2,781**
2024	0,8%	0,927	0,927	0,927	0,927							**3,708**
2025	0,8%	0,927	0,927	0,927	0,927	0,927						**4,635**
2026	0,8%	0,927	0,927	0,927	0,927	0,927	0,927					**5,562**
2027	0,8%	0,927	0,927	0,927	0,927	0,927	0,927	0,927				**6,489**
2028	0,8%	0,927	0,927	0,927	0,927	0,927	0,927	0,927	0,927			**7,416**
2029	0,8%	0,927	0,927	0,927	0,927	0,927	0,927	0,927	0,927	0,927		**8,343**
2030	0,8%	0,927	0,927	0,927	0,927	0,927	0,927	0,927	0,927	0,927	0,927	**9,27**
Total cumulative savings over the period 2021 - 2030												**50,985**

Figure 3 - Savings to be achieved over the period 2021-2030 based on average final energy consumption over the three-year period 2016-2018 (data in Mtoe) (Source: Italian NECP)

90. Despite the calculation of annual savings declined in the previous table, based on the latest available data, this leads to a minimum reduction target of 50.98 Mtoe over the period 2021-2030 (corresponding to about 9.25 Mtoe of annual savings in 2030). Therefore, the target already communicated in the NECP of about 51.4 Mtoe (corresponding to more than 9.35 Mtoe of annual savings in 2030) is confirmed.
91. Many of the measures planned to achieve the target for reducing final consumption are already in place. These include white certificates, tax deductions for energy efficiency measures and the recovery of the existing building stock, the "*Conto Termico*[19]", the National Fund for Energy Efficiency.
92. As far as the transport sector is concerned, actions will be taken for the renewal of public and private vehicles and of passenger and goods transport; Urban Sustainable Mobility Plans (PUMS) will also be made mandatory. The Energy Redevelopment Programme of the Central Public Administration (PREPAC) and the National Enterprise Plan 4.0 will continue, in particular the hyper depreciation and Nuova Sabatini[20].
93. Consumer information and training programmes, already started, will be improved in the period 2021-2030 to promote users' awareness of energy saving and behavioural change. An energy efficiency programme is planned for the Public Administration starting with public lighting, in order to accelerate the process of replacing lighting sources and installing consumption monitoring systems.

[19] Instrument that incentivises interventions to increase energy efficiency and the production of thermal energy from renewable sources for small plants.
[20] Public facility provided by the Ministry of Economic Development which aims to simplify access to credit for companies by financing their investments for the purchase or leasing of machinery, equipment, plant, capital goods for productive use, hardware, software and digital technologies.

4.5 Ensuring cost-efficient and market-based procurement of balancing and ancillary services

94. In Italy a market-based procurement of balancing and ancillary services (including congestion management) is in place. The Italian electricity market is based on a central dispatching model to determine both the unit-commitment status and the dispatching level of dispatchable facilities within an integrated scheduling process where commercial and technical data as well as the start-up characteristics of these facilities are considered as an input to the process itself, together with the latest control area adequacy analysis and the operational security limits.
95. This approach allows an efficient selection of resources because it takes into account, at the same time, both the technical and economic constraints of the enabled units and the complex interrelation between the dispatched power of each unit and the multiple constraints that feature the Italian grid (for example, voltage constraints).
96. The central dispatching model is adopted in the Ancillary Services Market where Terna procures the dispatching resources needed for the secure operation of the Italian electric power system with the objective of minimizing the overall cost of such procurement and following a co-optimization approach between different services.
97. Particularly, during the scheduling phase of the Italian Ancillary Services Market (named MSD ex-ante), upward and downward integrated scheduling process bids submitted by the BSPs are selected based on economic merit-order with the aim of relieving congestions within bidding zones and ensuring the availability of appropriate FRR and RR margins. During the real time phase of the Italian Ancillary Services Market (or Balancing Market), upward and downward integrated scheduling process bids submitted by the BSPs are selected based on economic merit-order with the aim of maintaining the balance between electricity injections and withdrawals, relieving real-time congestions within bidding zones and ensuring or restoring FRR and, if needed, RR margins.
98. Hence, through the central dispatch model as described above, the cost-efficient and market-based procurement of balancing and ancillary services will be ensured.
99. To respond to the challenges of decarbonization, Italy has started a reform to open the Ancillary Services and Balancing Markets to new resources. For this aim, as already mentioned, Terna implemented specific projects in the last two years and further initiatives are under definition to enable new resources to provide balancing and ancillary services on the basis of criteria defined by the regulatory authority. A reform of dispatching rules (TIDE reform[21]) has been recently consulted by the Italian regulator. This reform for instance includes target solutions for the coordination between MSD ex-ante and Single Intraday Coupling (SIDC), so that the shift to the continuous trading model until real time can be implemented by ensuring efficiency and reliability of dispatching

[21] https://www.arera.it/allegati/docs/19/322-19.pdf

procedures, and for the definition of aggregation perimeters of aggregated units (UVA) for each ancillary service that will allow a broader participation of operators to the MSD.

100. Also, the provision of voltage regulation services from new resources will be explored so that this service can be provided also by RES plants (mainly wind plants) directly connected to the high voltage grid and from distributed generation connected to DSOs grids. In addition to procurement from new plants already compliant to requirement set by Regulation 2016/631 a retrofitting of older RES plants is being considered to maximize the pool of providers of voltage regulation services. This will allow to reduce the need of regulation from conventional resources, ensuring the operation of the network with higher levels of RES penetration.

4.6 European market integration

101. Since 2015, Italy participates to the Single Day Ahead Coupling (SDAC) with the DA market coupled with Slovenia, France and Austria, according to the requirements set by the Regulation 2015/1222 on Capacity Allocation and Congestion Management (CACM). Furthermore, in order to consolidate and extend the positive coupling experience gained in the northern area, in 2018 Italy started the implementation of further local projects, carrying out the preparatory activities for the expansion of the coupling mechanisms: i) on the border with Switzerland, in the intraday market, with operating start in April 2019; ii) on the border with Greece, in the day-ahead market, with operating go-live currently scheduled for the last months of 2020. In December 2019, trading with Montenegro, via explicit capacity allocation, started after the new interconnection between the two Countries entered into service. In this respect, Italy is also involved in the WB6 project (Western Balcan 6) aimed at promoting the launch of a regional coupling in the Balkan area in view of the future integration with the European Union energy markets.

102. Furthermore, Italy participates in Single Intraday Coupling (SIDC), the project for the creation of a single pan EU cross-zonal Intraday Market based on continuous trading and on implicit auctions for the efficient allocation of capacity, for which the go-live of implementation in Italy is scheduled in 2021. On this regard, specific regulatory updates in the ID market framework, with particular regard to conditions for portfolio bidding, are going to be adopted in the next months in order to facilitate the shift to the continuous trading model. As said in the previous paragraphs, specific amendments are under discussion to coordinate these changes in the ID market model with the procurement processes in the MSD-ex ante.

103. In 2017 the European Commission introduced the Electricity Balancing Guidelines (EBGLs - Regulation (EU) 2017/2195) setting detailed rules for the integration of balancing energy markets in Europe, through the definition of target models for the exchange of balancing energy and the harmonization of cross-border methodologies.

104. The EBGL foresees the implementation of the common European platforms and thereby the harmonisation of the European balancing market processes. For each of the processes (IN, aFRR, mFRR and RR) the EBGL requires the development of a European platform. In order to achieve this goal, European TSOs have established the following implementation projects in which also Terna, the Italian TSO, participates:
    - International Grid Control Cooperation (IGCC): project for the implementation of a European platform for the optimization of aFRR activations through an explicit netting of opposite sign imbalances of control areas (IN);
    - Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation (PICASSO) – project for the implementation of a European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation (aFRR);
    - Manually Activated Reserves Initiative (MARI) – project for the implementation of a European platform for the exchange of balancing energy from frequency restoration reserves with manual activation (mFRR);
    - Trans-European Restoration Reserves Exchange (TERRE) – project for the implementation of a European platform for the exchange of balancing energy from replacement reserves (RR).
105. Currently, the afore-named platforms are being developed according to the EBGLs required timeline.
106. The Italian implementation timelines for these projects are listed as follows:
    - IGCC: Go live on January 27, 2020
    - SIDC: Go live expected by the first quarter of 2021 (third wave)
    - TERRE: Go live scheduled for end of 2020.

    The Go live of the aFRR and mFRR platforms is expected within 30 months from the ACER Decision of 24 January 2020 on the relative Implementation Framework.

4.7 Removing regulated prices where required by Article 5 of Directive (EU) 2019/944.

107. Consistently with the provisions of EU Energy Policy, from 2007 regulated prices in Italy are not present anymore. However, reference prices for supplying electricity have been identified to protect domestic and small consumers which haven't chosen an electricity supplier on the free market (so called "Standard Offer" conditions). According to Decree Law no. 162/2019 (so called "Milleproroghe"), converted into Law no. 8/2020, such reference prices will not be available as of 1st January 2021 for small enterprises and as of 1st January 2022 for households and microenterprises.

108. These reference prices are determined on the basis of the procurement costs borne by the Single Buyer (so called “Acquirente Unico”) which since 2017 purchases electricity only in the spot market (i.e. the Day Ahead Market (MGP) for electricity and the Daily Products Market (MPEG) and resells it to the standard offer retailers.
109. Reference prices for the “Standard Offer” are identified coherently with wholesale market conditions, enabling retailers on the free market to compete on an equal footing with standard offer retailers.
110. The competitiveness of the Italian retail market is confirmed by data provided by the National Regulatory Authority in the “2018 Retail Markets Monitoring Report”, highlighting:
    1) The increase of customers in the free market;
    2) The growth in the number of undertakings active in the market for retail sale of electricity;
    3) The advantages of free market offers compared to reference prices.
111. Regarding the first aspect, it should be noted that in 2018 44% of household consumers was supplied on the free market. In the same year, the rate at which customers have left the standard offer regime marks a new record compared to previous years, reaching 4,9%. In addition, customers who switched back to the standard offer after having experienced the free market continue to decline, reaching a rate of 0,2%. With regards to the number of electricity retailers in the market, in 2018 the corporate groups active in the electricity sector were 426, with an increase of 35 units compared to 2017 and 207 units compared to 2012. Finally, with regard to commercial offers in the free market, there is a wide range of commercial offers applying different pricing policies (e.g. variable and fixed price formulas) compared to the standard offer regime (featured by a variable price without any additional service) with possibilities of savings.
112. Furthermore, in order to ensure transparency and guidance to consumers’ choice, since 2018 Italy has implemented an independent comparison tool operated by the Single Buyer according to criteria laid down by the National Regulatory Authority, helping household and small enterprises to assess the merit of the different electricity offers that are available on the market, thereby anticipating provisions of the Directive 2019/944.

5 Conclusions

113. The profound evolution that has affected the Italian electricity system in the last few years - in terms of significant reduction in installed thermal generation capacity together with a significant development of generation from variable renewable energy sources – has led to serious system adequacy concerns. In particular, as explained in this document, the risk of having insufficient resources to cover peak load and ensure system stability and quality of service, with consequent distributed load shedding, has increased.
114. Critical situations have already occurred, and others may occur. Unfortunately, critical situations are featured by extreme uncertainty and randomness both in frequency and intensity of occurrence. The difficulty in predicting these events means that the electricity system must always be ready to face critical situations. The absence of price signals in the spot markets doesn't help the system as it precludes the possibility of making investments in new capacity despite the fact that the system needs them to maintain the necessary levels of adequacy and quality of service.
115. In order to tackle the new challenges, Italy has put in place important measures and market reforms.
116. Italy believes that the reforms described in this document will certainly help to ensure security of supply in the long term. However, in the short and medium term the increased RES penetration with the consequent increased price volatility and reduction in average market prices will increase investment risks for producers. Indeed, in an electricity market based on short-term prices, which by their nature cannot fully reflect expected future conditions, a reduction in the contribution in Energy (MWh) of a thermal plant implies reduced, less predictable profits with the result that in some cases its fixed costs cannot be covered anymore. These plants are therefore in economic conditions that may lead to their definitive closure. Furthermore, an electricity market based on spot prices is not capable of providing an adequate price signal to investments in new production capacity, which by their nature have time horizons related to construction times and the return on long-term investments. In this market picture it becomes extremely difficult for market operators to plan investments in new and efficient generation capacity.
117. Furthermore, the NECP has scheduled the phase out of coal generation by 2025 and the consequent expected decommissioning of capacity will reduce even more the margins of adequacy and security of the system.
118. Even if wholesale market prices start to rise in reaction to the increasing capacity inadequacy, there may still not be enough time for these price signals to translate into capacity investments (both new generation capacity and demand response capacity) in the time and to the extent necessary to counteract the scarcity and its lasting effects on prices. System adequacy would therefore be far from being restored and this could also lead to blackout events in the long term. Moreover, the cost of new entry in a context of highly volatile spot prices will be significantly higher compared to an efficient benchmark due to the high risk premium asked by new investors. In such a context, new investments would occur only when the system has a structural lack of resources so that the number

of scarcity hours considered sufficient to make these new investments is higher than what would be efficient.

119. In view of the above, the Capacity Market must continue to operate in the coming years to provide the right long-term price signals necessary to guarantee security of supply. The first two auctions of the capacity market for the target years 2022 and 2023 succeeded in providing investment signals for new capacity. But, considering the challenging objective of phase out of coal generation by 2025 (about 7 GW), continuity and certainty of these long-term price signals it's important: for this reason implementation of future auctions of the capacity market, , is needed. Anyway, all parties involved (Ministry of Economic Development, National Regulatory Authority and TSO) are strongly committed to continually improving the Capacity Market design on the basis of the monitoring of its effects and of the results of the planned market reforms, to ensure it better meets its objectives.

Annex A: list and implementation timeline of proposed measures

	ID	Measure	Description	Implementation timeline
Removing price caps	1	Negative prices	Removal of price floor at 0 €/MWh in DA-ID	2021 (DA-ID)
Shortage pricing function	2	Administrative shortage imbalance prices	Administrative mechanism to apply a price equal to VOLL to imbalances when distributed load-shedding is applied	Implemented
Enabling self-generation	3	Promote Collective Self-consumption and Renewable Energy Communities	Definition of incentive scheme and technical rules for Collective Self-consumption, Renewable Energy Communities and Energy communities of citizens	2020
Enabling energy efficiency	4	Measures planned to achieve national energy efficiency targets	a) White certificates, tax deductions for energy efficiency measures and recovery of the existing building stock, "*Conto Termico*", National Fund for Energy Efficiency b) Urban Sustainable Mobility Plans (PUMS), Energy Redevelopment Programme of the Central Public Administration (PREPAC), National Enterprise Plan 4.0, consumer information and training programmes, energy efficiency programme for the Public Administration	a) Implemented b) In progress
Enabling energy storage and Demand Side Response	5	UVAM (tertiary reserve)	Enabling mixed aggregates of DSR, storage and RES to participate to balancing market and tertiary reserve provision	Implemented (pilot project phase)

	6	UVAM/storage (secondary reserve)	Enabling mixed aggregates of DSR, storage and RES and stand-alone storage systems to participate to secondary reserve provision (aFRR)	In progress
	7	UPI (primary reserve with storage)	Enabling FCR provision by storage units integrated with production units	Implemented (pilot project phase)
	8	Smart meters rollout	Rollout of first (1G) and second (2G) generation of smart meters	Implemented (1G) 2024 (2G)
	9	PUN mechanism revision	Removal of Single National Price (PUN) mechanism in order to expose consumers to zonal prices providing better price signals to demand	At study
	10	Vehicle to grid (V2G)	Promotion of the integration of electric vehicles (EVs) into the grid allowing also V2G vehicles to offer dispatching services through charging stations	In progress
Ensuring cost-efficient and market-based procurement of balancing and ancillary services	11	Opening ASM to new resources	Projects to open participation to ASM to DSR, storage and RES plants and reform of dispatching rules (TIDE reform)	In progress (see points 5-7)
	12	RES and DG (voltage regulation)	Procurement of voltage regulation service from RES and DG (distributed generation) and retrofitting of older RES plants	At study
European market integration	13	IGCC	European platform for imbalance netting	Implemented
	14	SIDC	Single EU cross-zonal Intraday Market	2021
	15	TERRE	European platform for the exchange of balancing energy from replacement reserves (RR)	2020

	16	MARI	European platform for the exchange of balancing energy from frequency restoration reserves with manual activation (mFRR)	In progress
	17	PICASSO	European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation (aFRR)	In progress
Removing regulated prices	18	Remove “Standard offer” service	Possibility to opt for reference prices based on the wholesale energy market for retail customers under “Standard Offer” service will be removed	2021/2022
Interconnection	19	Interconnection projects	Please refer to paragraphs 4.3.2 and 4.3.3	In progress
	20	Interventions to reduce the network congestion between bidding zones	Please refer to paragraph 4.3.4	In progress

Annex B: Answers to questions annexed to the DG Energy's Guidance for Member States on implementation plans

Section 1 – General wholesale market conditions

1. With regards to day-ahead and intraday electricity prices, are there any formal or informal price limits other than those currently applied within European single day-ahead and intraday coupling as set out in Article 41(1) and 54(1) of Regulation 2015/1225 (CACM)?

In Italy the unit prices specified in the demand bids and supply offers must be:

- greater than 0 €/MWh and less than or equal to 3,000 €/MWh for purchase offers.
- greater than or equal to zero and less than or equal to 3,000 €/MWh for sale offers.

With the entering into force of the Regulation on the internal market for electricity (Regulation EU 2019/943), the Italian National Regulatory Authority has foreseen the removal of the bidding price floor (0 €/MWh) in both day-ahead and intraday market as of 2021. In view of the go live of the participation of Italy to the SIDC in 2021, price caps on the ID timeframe are going to be amended (9.999 €/MWh)

2. Are there any formal or informal rules or requirements that limit generators' ability to freely price their offers in wholesale markets?

There are no general limitations to generators' ability to freely price their offers in wholesale markets According to the Law n. 2/2009, there are arrangements in place which provide for the application of certain obligations in the market (also in terms of price) for the so called 'must run units'. These units belong to specific power plant or a group of power plants characterized by the structural ability of exercise market power in the provision of one or more ancillary services.

3. Are there any rules or provisions which require the TSO to release generation reserves to the market when market prices rise above certain thresholds?

No, there are not.

4. Are there currently any capacity mechanisms (i.e. in the form of reserves)? If yes, please elaborate on how they work?

Since 2004 Italy applies a targeted capacity payment, which remunerates dispatchable units available during system critical hours defined by Terna. The Law 379/2003[22] establishing the framework for capacity remuneration in Italy, defined the targeted capacity payment as a temporary solution pending the implementation of a market wide capacity remuneration mechanism, identified as the target solution to solve adequacy issues and boom and bust cycles related to generation investments. Implementation of the capacity market regulation started in 2011 with the ARERA Decision 98/11[23] and went through several consultations and State-Aid assessment in 2017 and 2019.

With the Ministerial Decree of June 28, 2019, Italy finalized the introduction of a market wide Capacity Market based on reliability options to address the growing risks of inadequacy and interruption in the supply of electricity in large areas of the country, linked to the structural inability of the electricity system to meet domestic demand in compliance with target levels of adequacy.

Terna held the first two main auctions with delivery period 2022 and 2023 in November 2019.

The Italian Capacity Market is a centralised, auction-based mechanism, in which reliability options are traded between capacity providers and a central buyer (Terna). Participation is voluntary, portfolio-based and technology neutral and subject to presentation of appropriate guarantees to Terna. All the following types of participants are allowed:

- programmable and intermittent resources (thermal, hydro, PHS); the thermal capacity is subject to compliance with binding CO2 emission limits;
- storage resources;
- foreign resources.

The TSO will carry out descending clock auctions.

The supply curve is obtained by the auction offers presented in an ascending order. In order to avoid capacity withholding, eligible capacity not offered in the auction and ineligible capacity (for instance RES already receiving incentives) are implicitly considered as offered at 0 EUR/MW/year and do not receive any remuneration.

The demand curve, defined for each area, represents the price (premium) that the system is willing to pay for each level of contracted capacity. Each level of contracted capacity corresponds to a reliability level, measured through the loss of load probability expressed in terms of hours with energy not served/year (Loss of load expectation - LOLE).

[22] https://www.gazzettaufficiale.it/eli/id/2004/01/19/004G0018/sg
[23] https://www.arera.it/it/docs/11/098-11arg.htm

The premium (in €/MW-year) is defined as the clearing price of the Capacity Market auction on the basis of the marginal price rule, in the different capacity market Areas. Successful bidders in the auction are awarded with one-year contract (15 years for new capacity, provided that a minimum investment threshold is respected).

The main auction is followed by adjustment auctions and the secondary market. Adjustment auctions enable capacity owners to renegotiate capacity obligations, the TSO to adjust the amount of capacity to be procured as the delivery period approaches and facilitate participation of capacity providers willing to commit in a time horizon closer to delivery (e.g. demand response). Additional flexibility is introduced by trading on the secondary market, where capacity providers are allowed to adjust their position on a monthly basis.

The product traded in the Capacity Market is a reliability option: it means that, in order to respect their capacity obligation, contracted capacity providers must fulfil the following obligations:

- **Availability obligation**: be available to submit offers in the day-ahead, intra-day, ancillary services markets;
- **pay-back obligation**: the design of reliability options puts an obligation on capacity market participants to pay back the positive difference between a market reference price resulting from their bids and market prices in DA, ID and ASM and a strike price (that corresponds to the hourly variable cost of the marginal technology (OCGT).

Figure 1: simplified scheme of capacity providers rights and obligations

There is a penalty mechanism for capacity providers that do not meet the availability and/or pay back obligations.

The Capacity Market, therefore, offers a complementary remuneration to capacity providers, in order to guarantee that the amount of capacity necessary to secure supplies will be available. At the same time, the reliability options limit windfall profits for capacity providers and costs for consumers related to the capacity mechanism without limiting electricity prices, which remain free to rise up to scarcity levels providing the right incentives for short-term dispatch.

Section 2 – Balancing markets

Sub-section 2.1: Imbalance settlement

5. What incentives do balancing responsible parties have to reduce their imbalances (or help the overall system to be in balance)?

In Italy, balancing responsible parties are required to define electricity injection and withdrawal schedules, of physical production and consumption units whose imbalances they are responsible for, by using the best estimates of the electricity volumes actually produced and consumed, in accordance with principles of diligence, prudence, expertise and foresight.
Furthermore, imbalance settlement rules economically incentivize balancing responsible parties defining unbalance prices based on costs incurred by TSO in the balancing market to keep the system balanced.

6. Are all market participants exposed to the TSO's imbalance settlement rules? Are the terms/rules of the imbalance settlement the same for all balance responsible parties?

Yes, all market participants are exposed to imbalance settlement rules, which are defined based on the type of unit involved.
A dual imbalance pricing rule is applied for units participating in the Italian Ancillary Services Market (as well as to import and export dispatching points). The imbalance price depends on the imbalance of the relevant unit and on the net position of the imbalance price area where the unit is located. Particularly:

- when the unit is long in a short area, the imbalance energy is settled at a price equal to the minimum between the Day-Ahead Market price and the minimum price of downward bids accepted on Balancing Market in the area where the unit is located (excluding bids accepted for secondary reserve);
- when the unit is short in a long area, the imbalance energy is settled at a price equal to the maximum between the Day-Ahead Market price and the maximum price of upward bids accepted on Balancing Market in the area where the unit is located (excluding bids accepted for secondary reserve);
- the energy is settled at the zonal Day-Ahead market price, in all remaining cases.

A single imbalance pricing rule is applied to programmable production units which do not have the needed technical requirements to provide ancillary services and to consumption units. The imbalance price depends only on the net position of the imbalance price area where the unit is located. Particularly:

- if the area is long, the imbalance energy is settled at a price equal to the minimum between the Day-Ahead Market price and the weighted average price (for the corresponding quantities) of the downward bids accepted on Balancing Market in the area where the unit is located (excluding bids accepted for secondary reserve);
- if the area is short, the imbalance energy is settled at a price equal to the maximum between the Day-Ahead Market price and the weighted average price (for the corresponding quantities) of the upward bids accepted on Balancing Market in the area where the unit is located (excluding bids accepted for secondary reserve);
- As regards intermittent Renewable Energy Sources, operators can choose between two imbalance settlement regimes:
  - standard regime, based on a single imbalance pricing rule with technology-specific thresholds and zonal compensation;
  - alternative regime based on the single imbalance pricing rule described above with reference to programmable production units which do not have the needed technical requirements to provide ancillary services.

Particularly, with the standard regime different thresholds on the scheduling resulting from the intraday market are applied to settle the imbalances, depending on the technology:

- ± 49% for relevant[24] wind turbines
- ± 31% for relevant solar panels
- ± 8% for relevant hydro fluent
- ± 1,5% for other relevant intermittent RES
- ± 8% for non relevant intermittent RES

A pure single imbalance pricing rule is applied to imbalances above thresholds. To imbalances within threshold, instead, a zonal equalization fee is applied in combination with the zonal Day-Ahead Market price in order to socializes the unallocated cost of imbalances within thresholds among production units subject to this regime.

7. How are the costs for procuring balancing services translated in imbalance settlement prices?

The costs for procuring balancing services are translated in imbalance settlement prices, by determining imbalance settlement prices based on maximum/minimum prices or weighted average prices, for the corresponding quantities, of bids accepted in the real-time phase of the Ancillary Services Market (or Balancing Market).

[24] Production units with maximum power at least equal to 10 MVA

8. Are the full costs of balancing actions attributed to the balance responsible parties though the imbalance settlement price?

The imbalance settlement rules aim at attributing to balance responsible parties the full costs of balancing actions as much as possible. When a net balance emerges, this is charged to final customers pursuant to Resolution 111/06 of the Italian National Regulatory Authority.

9. Has the Member State considered introducing an administrative scarcity pricing mechanism as referred to in Article 44(3) of EBGL?

An administrative scarcity pricing mechanism is already present in the Italian dispatching regulation, see answer to question 10.

10. How is the imbalance settlement price calculated for a balancing period in which the TSO has to disconnect one or more consumers involuntarily?

In Italy, when a system inadequacy condition is detected with respect to a balancing period:

- the TSO is required to resort to rolling load shedding either in the scheduling phase of the Ancillary Services Market or, with at least 30 minutes notice, in the real-time phase of this market;
- the imbalance settlement price is automatically set to the Value of Lost Load (VOLL).

11. What is the estimated value of lost load in the Member State? Please provide a copy of any study providing a basis for this estimate.

In Italy, the current VOLL is 3,000 €/MWh and it is the same for the whole national system.

This value will be reviewed on the basis of the new methodology indicated by art. 11 of Regulation 2019/943 on the Internal Market for Electricity.

Sub-section 2.1: Procurement of ancillary services

12. Are balancing reserves procured through a competitive process? Does the TSO procure (a portion of) its balancing reserves close to real time (day-ahead)?

Yes, reserve margins are procured through a competitive process executed on a daily basis, in D-1. Particularly, during the scheduling phase of the Italian Ancillary Services Market (named MSD ex-ante) which is executed in D-1, upward and downward integrated scheduling process bids submitted by BSPs are selected by Terna based on economic merit order with the aim of ensuring the

availability of appropriate reserve margins, relieving congestions within bidding zones as well as balancing electricity injections and withdrawals, compatibly with all system constraints.

13. Can demand side participants provide balancing services?

Participation of the demand side in the Italian Ancillary Services Market was introduced in 2017, pursuant to Resolution 300/2017/R/EEL of the Italian National Regulatory Authority, by means of pilot projects. The participation is described in question 16.

14. Are there any formal or informal rules or requirements that limit generators' ability to freely price their offers in balancing markets?

See the answer to question n.2.

Section 3 – Demand-side response

15. Are all types of demand-side response eligible to participate in the wholesale electricity markets (including day-ahead and intraday) as well as the balancing/ancillary services markets?

Demand-side response is eligible to participate in the Italian wholesale electricity markets (including day-ahead and intraday). Regarding the Ancillary Services Market please see question 13.

16. Can demand-side response participate in markets both via individual players and via aggregators?

Yes, demand-side response can participate in markets both via individual players and via aggregators and is fully integrated in Italian markets. It can participate in the Ancillary Services Market as any other resource, providing tertiary reserve and balancing services. In order to participate in the Ancillary Services Market qualified virtual units must have a minimum size of 1 MW. This value (which is the lowest in Europe) can be achieved by aggregating flexible loads of multiple companies located in the same territory. Italian National Regulatory Authority with the 300/2017/R/eel and 372/2017/R/eel Resolutions set out the criteria to enable the aggregation.

17. Are there any exemptions from network or energy-related costs as well as surcharges (RES, CHP, capacity mechanisms, etc) for specific classes of consumers which might affect demand response incentives?

In Italy, end users who provide instantaneous or emergency interruptible load services are exempted - with respect to withdrawals of electricity at sites that have contracted an interruptible power of not less than 40 MW - from the application of the fees referred to in articles 44, 45, 48 and 73 of annex A of the resolution of the Authority for electricity and gas no. 111/06 of June 9, 2006 (i.e.: fee for the procurement of resources in the Ancillary Services Market, fee to cover the costs of the must run units, capacity payment and fee to cover the costs for the remuneration of the interruptible load service).

Self-consumption is not charged of the variable part (i.e. on the €/kWh part) of both the general system charges and the network tariffs as they are not due on the amount of electricity self-consumption (but only on the amount of electricity procured from the grid).

Electricity intensive users can benefit from a reduction of the tariff component covering the costs for the incentivization of renewables, the so-called “Asos component” (which is a sub-component of the general system charges); the amount of such a reduction depends on the intensity of use of electricity.

18. What percentage of customers is provided with smart meters (please specify it separately for the following groups of customers: a) households, b) business customers, c) industrial users)

- 90%+
- 70-90%
- 40-70%
- 20-40%
- Less than 20%

90%+ of customers overall (actually 99,4%), including about 20-40% provided with 2G smart meters (i.e. second generation smart meters).

Installation process of the first-generation (so-called 1G) smart meters was launched in 2001 and completed in 2006 by *e-distribuzione* (ie.: the main distributor in Italy, covering about 85% of end users) and in 2011 for the remaining distributors.

At the end of 2016 *e-distribuzione* submitted to the Italian National Regulatory Authority its plan to install second-generation (2G) smart metering systems, which was followed, in 2017, by a public consultation and the final approval of the plan through the Authority Resolution n. 222/17. The *e-distribuzione* roll-out plan foresees the installation of 13 million 2G smart meters by 2019 with a target of almost 34 million by 2024.

According to the Authority Resolution 306/2019, the remaining distribution companies with more than 100.000 customers will have to complete their 2G smart meters installation plans by 2026.

So far 3 more distribution companies have submitted their plans to install 2G meters. These plans take the coverage to an additional 10% of the national users base.

19. Are all the smart meters capable of metering and transmitting at least hourly metering values and do data management systems enable suppliers to settle customers on the basis of at least hourly metering values (i.e. against at least hourly spot market prices, for the purpose of dynamic pricing)?

With Resolution n. 87/2016 the Italian National Regulatory Authority set the functional specifications and performance levels expected from 2G smart metering systems. The main goal of new systems is to improve services for customers, ensuring, in line with roll out of 2G smart meters, availability to DSO/TSO of reading content based on 96 quarte-hours per day for all low voltage customers (option in the past years limited only to business consumers above 55 kW). Furthermore, 2G smart meters foresee a functionality which allows customers to directly access to metering data (so called chain chain2) in order to enhance their ability to improve electricity consumption management.

20. Do customers in the retail market have access to a dynamic price contract linked to wholesale spot market prices?

Suppliers in the retail market currently offer contracts with prices set according to predefined time bands (“F1 band” from 8 am to 7 pm during weekdays, and “F2 and F3 band” from 7 pm to 8 am during weekdays and at any time on Saturdays, Sundays and holidays). The 2G smart meters could allow to design and implement new commercial offers, including offers linked to hourly prices. Furthermore, the law n. 124/2017 has introduced the obligation on retail suppliers to provide at least one commercial offer linked to wholesale spot market prices in addition to flat rate offers.
Hourly metering data also allows the introduction of pre-payed offers, which could be a useful instrument for reducing the risk of payment arrears which are a market entry barrier.

Section 4 – Retail Markets: Regulated prices

Does the Member State have a system of regulated electricity prices for final customers? If yes, please detail the following.

According to Law no. 125/07 households and small enterprises (with less than 50 employees and less than 10 mln euro revenue) connected at low voltage level who do not choose a supplier in the free market are supplied by a default supplier (that is the local DSO or an undertaking belonging to the same group) which provides electricity according to a standard offer. In this case, the default supplier purchases electricity from the Single Buyer at wholesale market price.

The reference prices are updated quarterly by the Authority, on the basis of the procurement costs borne by the Single Buyer (so-called “Acquirente Unico”) to source electricity in the spot market.

These prices reflect exclusively the costs formed on the electricity spot market (the Day-Ahead Market (MGP) and the Daily Products Market (MPEG)), allowing retailers to offer competitive offers on the free-market.

As above mentioned, the standard offer will be phased out as of 1st January 2021 for small enterprises and as of 1st January 2022 for microenterprises and household consumers.

In addition to the above, pursuant to Law 125/07 customers who cannot find a supplier in the free market and are not entitled to the standard offer regime, are supplied by a Last Resort Supplier (so-called “ esercente la Salvaguardia”) which is selected through an open auction that establishes also the price at which the customers are supplied.

21. What is the percentage of total demand supplied under regulated prices?

In 2018 45,3 TWh were sold under “Standard Offer” market which represent 18% of total demand. Instead, volumes supplied under “provider of last resort service” was about 1,7% of total demand.

22. Which customer groups are eligible for regulated prices?

“The “Standard Offer” market includes all households and small enterprises connected at a low voltage level (with less than 50 employees and with a yearly turnover not above 10 million euro) which have not chosen a supplier in the free market.

23. What is the percentage of demand per customer group supplied under regulated prices?

In 2018, the 67,7% of volumes sold in the “Standard Offer” market was purchased by domestic customers.

24. Are there market-based energy offers which are more attractive than the regulated prices available to all customers, including regulated customers?
    a. Are regulated prices set at a level where effective price competition among suppliers can occur?
    b. What were the regulated prices for the different customer groups in 2018 in c/kWh?
    c. Please provide examples of available competitive market prices that compete with the regulated prices and their comparable price level in c/kWh?

Several offers available in the free market include additional services not available under the “Standard Offer” (such as loyalty programs, energy services, etc). This difference doesn’t allow a proper comparison between regulated and free market prices. Despite this, there are savings opportunities for customers in the free market as shown by the widespread pricing strategy of several electricity suppliers to offer discounts on the “Standard Offer” price.

For example, taking into account data provided by National regulatory Authority in the “Retail Markets Monitoring Report”, during May 2018 in free market there were possibilities of savings (compared to the “Standard Offer”) up to 7% for domestic customers and 9,7% for non-domestic customers.
In the second quarter of 2018, the reference price of electricity charged for the “Standard Offer” is 189,8 €/MWh.
Furthermore, Italy has already implemented an independent comparison tool which will ease the detection of the most competitive offers available in the market.

25. What is the methodology for calculating each of the regulated retail prices currently in place? Who sets the methodology? Who approves the prices?

Reference prices are based on costs incurred by the Single Buyer (so-called “Acquirente Unico”), which supplies electricity to retailers serving "Standard Offer" market. These costs will refer exclusively to the electricity prices on the spot market (the Day-Ahead Market (MGP) and the Daily Products Market (MPEG)). The methodology is defined by the National Regulator that sets the reference price on a quarterly basis.

26. Has there been any significant switching of regulated customers to alternative suppliers?
    a. Please provide the share of customers under regulated prices in each customer category for the last five years consecutively.

The mobility of customers in the free-market, looking for better offers, is confirmed by the increase of free-market shares in terms of numbers of supplied points. The share of customers under “reference prices” and “free-market prices” are shown in the following table, whose data is based on the information provided by the Italian NRA in its “*Retail Market Monitoring survey*”:

	2014	2015	2016	2017	2018
Domestic	**100%**	**100%**	**100%**	**100%**	**100%**
Reference prices	71%	68%	65%	61%	56%
Free market prices	29%	32%	35%	39%	44%
Non domestic low voltage	**100%**	**101%**	**100%**	**100%**	**100%**
Reference prices	56%	55%	51%	48%	43%
Free market prices	43%	45%	48%	51%	56%
Safeguard market	1%	1%	1%	1%	1%

27. How are the suppliers supplying regulated customers selected? How is non-discrimination in the selection process ensured?

The “Standard Offer” is provided by the local DSO or a supplying company belonging to the same group of the DSO.

With regard to the “last resort service”, since 2008, the service has been assigned to retailers selected through open auctions for a period of two consecutive years. For the period 2019-2020 the service has been awarded to three different operators (Enel Energia, Hera Comm and A2A Energia) which are required to provide electricity to customers located in each geographical area assigned.

28. What are the measures planned to fully effective market-based pricing of electricity for all final customers, and what is the timeline?
29. What is the timeline for price deregulation? Is it due to happen before the planned introduction of the capacity mechanism?

Provided that the “standard offer” based on the central energy procurement by the Single Buyer has always been a fully effective market-based pricing mechanism, pursuant to the Law 124/2017, as emended by the Law-Decree n. 162/2019 (so-called “Milleproroghe”), definitely approved on 28.02.2020, reference prices for the “Standard Offer” market will be phased out as of 1st January 2021 for small enterprises and 1st January 2022 for households and microenterprises.

Section 5 – Interconnection

30. Has the Member State developed interconnection with the view to reaching at least its interconnection targets as referred in point (d) of Article 4 of Regulation (EU) 2018/1999?

Interconnection capacity is primarily located at the country’s northern border (4 lines with France, 12 with Switzerland, 2 with Austria, 2 with Slovenia). In total, there are 7 380 kV circuits, 9 220 kV circuits and 3 150/132 kV circuits on the northern border. There is also a direct current connection with Greece and one that connects Sardinia and the peninsula with Corsica (SACOI2). Sardinia is also connected to Corsica by an alternating current cable. A 220 kV double circuit cable connects Sicily with Malta. Finally, the commissioning of the HVDC cable with Montenegro contributed to interconnection levels with additional 0,6 GW of NTC.
The list below shows the development projects planned for overseas interconnection, in accordance with the National Development Plan (TERNA):

- Projects expected to be up and running by 2020:
  - the development on the French border through the 3-P HVDC "Piossasco-Grand’Ile" intervention;
  - the development on the Austrian border through the intervention 208-P Prati di Vizze-Steinach.
- Projects with commissioning expected by 2030:

- Planned by Terna:
  - new power line of interconnection between Italy and Austria;
  - II half of HVDC connection between Italy and Montenegro;
  - connection between Italy and France (SACOI 3 ‘Sardinia-Corsica-Mainland Italy’: replacement of the existing SACOI 2);
  - connection between Italy and Tunisia, which will provide an additional tool to optimise the use of energy resources between Europe and north Africa;
  - New interconnection between Italy and Switzerland;
  - 220 kV interconnection between Nauders (AT) and Glorenza (IT);
  - HVDC interconnection between Salgareda (IT) and Divaca/Bericevo (SI);
- Merchant lines (reg. 943/2019):
  - Interconnection 20 kV between Ventimiglia and Menton (IT-FR);
  - AC link 132 kV "Mese-Castasegna" (IT-CH);
  - "Redipuglia-Vrtojiba" interconnection (IT-SL);
  - "Dekani-Zaule" interconnection (IT-SL);
  - "Wurmlach-Somplago" interconnection (IT-AT);
  - AC link 220 kV "Mese-Castasegna" (IT-CH);
  - Interconnection 132 kV between Cesana and Briancon (IT-FR);

HVDC link between Montalto di Castro and Rejim Maatoug (IT-TUN);The expected additional capacity related to the above projects will be about 7. GW, referring to the current interconnection capacity, which will contribute to the EU interconnection targets, as shown in the paragraph 4.3.

31. Please describe the amount of interconnection capacities available for trading from and to the Member State and their current utilization

The total values of the exchange capacity on the Italian border (Net Transfer Capacity - NTC) - that is the maximum total exchange program in a given direction on an electrical border compatible with security standards and taking into account the technical uncertainties on the network conditions - for the year 2020 are:

- on the northern borders (France, Switzerland, Austria, Slovenia) between 6300 MW and 8400 MW in import and between 3000 MW and 3900 MW in export;
- on the Greek border 500 MW;
- on the Montenegrin border 600 MW;

(more details are available at the following link: https://www.terna.it/en/electric-system/electricity-market/capacity-interconnection-abroad).

In accordance with Regulation (EU) 2015/1222 Terna is part of two capacity calculation regions (CCRs): Greece- Italy CCR (the Italian internal bidding zone border and the interconnection with Greece) and Italy- North CCR (all northern border). In the Italy- North CCR a voluntary coordinated capacity calculation process is in operation in order to determine the amount of cross-zonal capacity made available to the market for the long-term period, for the day-ahead market time-frame and intraday market time-frame (covering XBID2 auction (16h-24h)).

The allocation of capacity on the Italian interconnections takes place through explicit and implicit auctions according to the border and the period of the allocation. In particular:

- in the long-term timeframe (yearly and monthly), capacity is allocated through explicit auctions on all borders (Austria, France, Greece, Montenegro, Slovenia, Switzerland)
- in the day- ahead timeframe, capacity is allocated through:
  - explicit auctions on the Greek, Swiss and Montenegrin borders
  - implicit auctions on the borders where Market Coupling is in operation (Slovenia, Austria and France)
- in the Intraday timeframe, capacity is allocated through:
  - explicit auctions on the French and Austrian border
  - implicit auctions on the Slovenian and Swiss borders

The JAO (Joint Allocation Office S.A.) is the entity allocating capacity through explicit auctions for the borders Italy - France, Italy - Switzerland, Italy - Austria, Italy - Slovenia and Italy-Greece. For the Italy – Montenegro border, SEE CAO (South East Europe Coordinated Auction Office) is the allocating capacity entity.

Furthermore, Terna has put in place the cooperation needed for the implementation of the single intraday market coupling on a regional level (LIP 14). The correlated launch of this project is foreseen by the end of 2021 within the so-called 'Third Wave'. Terna is also working on the implementation of complementary regional intraday auctions in relation to the Greek-Italy and Slovenia-Italy borders.

32. Are there currently administrative import and/or export restrictions on interconnectors limiting trade with neighbouring countries? If yes, please explain what is the impact of such restrictions on the market.

There are no administrative restrictions on export or import of electricity.

33. Are there any internal network congestions? What is the annual cost of redispatching/ countertrading in the Member State? Are there planned or ongoing network reinforcement measures?

In Italy energy markets are based on a zonal approach: the transmission network is represented in a simplified way, grouping network nodes into “bidding zones”. Thanks to the Bidding Zones configuration the most part of internal network congestions are managed through Day-ahead and Intraday markets, and only residually through the Ancillary Services market. With reference to the redispatching costs it should be noted that in Italy a central dispatching model is adopted in ASM to determine both the unit-commitment status and the dispatching level of dispatchable facilities within an integrated scheduling process. In this process commercial and technical data as well as the start-up characteristics of these facilities are considered as an input to the process itself, together with the latest control area adequacy analysis and the operational security limits. Since only integrated scheduling process bids are used in order to procure different ancillary services in a co-optimized way (e.g. congestion relief within bidding zones and balancing) it is not possible to identify separately all the different actions made by Terna to satisfy all network constraints at the same time.

The exchange capacity between different zones depends on the availability of the network elements, as well as on the loading and generation conditions. Terna takes into account the signals coming from the electricity market in the planning process of the grid in order to solve the problems related to the network congestions. In this respect, the planning objectives consist mainly in reducing congestions between market zones and intrazonal congestions, in order to allow better use of the national generation park and greater market integration and competitiveness.

Furthermore, the most significant development measures in terms of reduction of inter-zonal congestion are shown below:

- the new HVDC interconnection between Mainland, Sicily and Sardinia that will allow further markets exchange and integration of the increasing renewable generation capacity in the South;
- The 380 kV reclassification of Colunga-Calenzano will allow to increase the exchange limits on the market section North-Center North;
- Repowering interventions planned along the Adriatic backbone interconnection and the construction of the HVDC Fano-Villanova connection will allow an increase in the exchange limit on the Center North-Center South section;
- The construction of the 380 kV Deliceto-Bisaccia, Foggia-Villanova and Montecorvino-Avellino Nord-Benevento II power lines will allow to increase the exchange limit on the South-Central South section;
- The reorganization of the northern Calabria network will allow to increase the Calabria-South exchange limit and therefore the transit of energy produced by the plants located in Calabria towards the consumption centers located in Central Italy, Campania;
- The increase of transport capacity in the Rossano-Sicilia section, due to the further reinforcements related to the “380 kV Sorgente-Rizziconi electricity line”.