Italian Electricity Market Scenario

March 2024 Update

REF4E SCENARI

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1 Frame of Reference

REF-E scenarios over the time horizon 2024-2050 (with projections up to 2060) are elaborated by MBS Consulting experts on the base of proprietary suites and market knowledge. Econometric and structural models, as well as our expert sensitiveness, detailed knowledge of regulation, and accurate monitoring of market outcomes underlie our elaborations.

Gas and electricity forecasts consider the diverse geopolitical and economic hypothesis deriving from the regulatory, financial and fundamentals adjustments to the disruption generated both from the pandemic and the Ukrainian war, which are seen as key determinants of the future equilibrium of the energy markets.

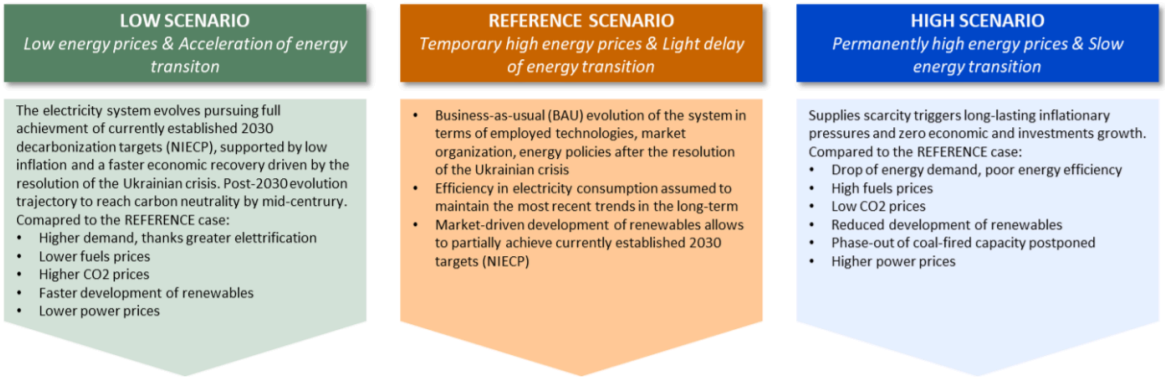
Current scenario update incorporates an evolution of climate variables in line with the historical average trend. In this perspective, we defined three scenarios:

- The **High Case scenario** is characterized by permanently high prices amid import-export tensions, supply scarcity and possible logistic locks. Negative or zero economic growth and the energy transition process failure would follow because of investments disruption.

- In the **Reference scenario**, prices remain high in the short-term since still low supplies combines with demand growth. However, the energy transition process continues leading to a progressive diversification of energy sources. This, combined with efficiency and high prices induced savings leads the energy market towards a normalization path. The economic growth suffers a contraction over the next two years, followed by recovery.

- The **Low Case scenario** would materialize in the event of favourable weather conditions and a fast energy transition, supported by low inflation and a faster economic recovery, reducing demand over the next few years.

This would limit prices upside potential and then fuel a downward acceleration.



1.1 Scenario highlights

Short-term perspectives for Italy have relaxed compared to the recent past, although tensions on energy markets are still possible given the fragile equilibrium on gas market: intensified competitive dynamics between Europe and Asia could drive prices up on the electricity market as well.

Relaxation in market fundamentals, a significant slowdown in economic growth and still subdued power demand are the key determinant for the electricity prices easing expected for the 2024-2025 period. Ongoing consumption trends appear to confirm a positive impact of the energy crisis on the acceleration of energy-saving investments and more flexible behaviours on the energy demand side. Whether the overall decrease in power demand dealt with short-term electricity savings or structural efficiency measures is still under observation, but effects are accounted for in near-term demand projections.

Contraction in electricity demand (-10 TWh y/y), recovery in hydro generation after the severe drought during the first months of 2023, an higher than historical level installation rate in renewable guarantied an increase in RES quota (30% of demand, +22% y/y) in the energy mix affecting the competitiveness for gas generation units. Furthermore, electricity demand contraction also in the other European countries, rebound in hydro generation together with an improved availability of French nuclear fleet increase the potential export flows from interconnected countries, resulting in an increased net import from the northern border (+10 TWh y/y). In the coming years the expectation of a slow recovery in

electricity demand, below 2019 level until 2026, and a sustained pace of renewable installations (+3.5 GW per year in Reference scenario and +6 GW in the Low scenario) may intensify market competition for gas-fired power plants.

In 2023, a notable increase in renewable installation rate (+5.7 GW compared to 1.5 GW/y during the last 5 years), driven by solar technologies, marks a further step towards the net zero path in the long run, despite a still uncertain economy recovery; permitting process simplifications, attractive market signals and investment costs reduction, driven by supply chain recovery may further accentuate the trend.

The Italian 2024 GDP growth is expected to remain almost close to zero in the Reference scenario, since inflation and restrictive monetary policies weigh on economic growth, while a recovery of demand and investments should sustain GDP growth in 2025 and for all the scenario years. In the High case the pessimistic macroeconomic view (-0.5% y/y) for the GDP in 2024 and the overall deceleration in growth in the ensuing years, undermines the system's potential.

The inflation trajectory will play a crucial role in defining the economic outlook performance. Private consumptions and industry investments persist in subdued, curbing growth projections in the short term. However, a possible faster normalization in inflation may speeds-up monetary policy normalization, supporting investments leading to our LOW Case scenario, with the GDP growth moving back to just below 1% (y/y) already in 2024.

Continuous relaxation in gas market dynamics over 2023 have favoured the easing in global prices. Favourable weather conditions, with subdued demand, abundant storage facilities, and stable supplies have guaranteed market stability in the short-term. The European market equilibrium remains delicate though, depending on LNG imports, strongly affected by competition with Northeast Asia. A faster recovery in Chinese industrial and transport sector pushed LNG demand in 2023, +10% y/y. Additionally, intensified competition driven by pricesensitive buyers in Asia could amplify market volatility, influencing price trends until 2025. By then, the availability of new liquefaction capacity should expand the global LNG demand-supply margin, mitigating potential tightness risks.

The gas price forecasts were revised in the short-term following the relaxation in market fundamentals and the significant slowdown in economic growth in Europe. TTF and PSV yearly price projections in the REFERENCE scenario average around 50 €/MWh for 2024 and decline towards 35 €/MWh in 2025 when liquefaction and regasification capacity should rebalance the supply-demand dynamics. If the global economic recovery stall and no competition arise on gas supplies, the gas prices decline may continue, with the PSV averaging below 30 €/MWh in 2024 as in the Low case, while in the High scenario an escalation of geopolitical tensions and increased competition on LNG supplies may emphasize the market upward potential with the yearly PSV averaging 80 €/MWh.

In 2024, the average CO2 price is should to approach €90/ton, driven by the gradual implementation of reforms within the ETS system, supporting the CO2 prices. The gradual integration of the maritime transport sector into the ETS scheme, as outlined in EU Directive 2023/959, is expected to unfold incrementally, potentially lacking a substantial impact on allowances demand in the short run. However, a notable divergence between supply and demand is projected to emerge around 2027 as the maritime sector fully integrates into the ETS system, leading to a tight market, with CO2 prices forecasted to surge towards an average of €110/ton by 2030. In 2023 electricity consumption curbs to 306 TWh but it is expected to eventually resume in 2024 reaching 311 TWh driven by recover in consumption and electrification. A moderate economic growth, driven by supportive measures, and quicker, but yet limited electrification allows the demand to reach 340 TWh in 2030. Acceleration of end-use electrification and full unfolding of efficiency potential driven by a more positive economic outlook in the LOW Case scenario should overcome the 2023 drop, and reach 313 TWh in 2024 (still below 2022 result) and head to the 360 TWh in 2030. On the contrary, in the HIGH case scenario, halted efficiency investments and slow economy recovery should keep power demand below 2022 level during 2024-2025 period, potentially growing up to 328 TWh in 2030.

The enhanced availability of France's nuclear fleet, coupled with a full recovery in hydroelectric generation across Europe, should ensure a stable energy net import flow of around 40 TWh towards Italy. In perspective, the gradual phase-out of coal-fired and nuclear capacity in the continental Europe could drive the sharp reduction of imported energy in the post-2030 horizon1. French nuclear fleet availability remains a central variable for the power exchange dynamics in Italy and phase-out decisions should drive the potential decline of net import form Northern borders after 2030 if not replaced by investments in new nuclear generation capacity.

Renewables gain share rapidly as the 2023 momentum is expected to enhance over the coming years, with a yearly increase up to 6 GW (4.5 GW of solar and 1.5 GW of wind) in the Low scenario and 3 GW (2 GW of solar and 1 GW of wind) in the Reference case, still below the NIECP average annual target of 8 GW necessary to reach the 2030 targets. Improved regulation, decreasing investment costs and ETS price signals should support the market parity conditions in the long run. The share of demand covered by renewables in 2030 reach almost 50 % and 60% mark in the REFERENCE and the LOW case respectively, while remains close to 40% in the HIGH case. Zonal distribution of the new capacity additions follows the patterns revealed by Terna's connection request database, and new utility scale projects are expected to concentrate mostly in the Southern macrozone and the two islands. Growth of small-scale distributed renewables for self-consumption is more concentrated in the Norther area following the historical path with 6% annual increase. Grid expansion reflect Terna's 2023 Development Plan indications. In the REFERENCE case reinforcements are assumed operational already in the 2020s but the main improvements to resolve zonal congestions are expected to be completed in the 2030s – Tyrrhenian link and Adriatic link as well as first portions of the Hypergrid. Faster penetration of renewable energy in the LOW case

would require the realization of the main projects even before 2030, while the slower system transition in the HIGH case postpone the key investments to the middle of the 2030s.

The need to boost energy independence in the decarbonization process at European level has already put hydrogen at the central stage of the future European energy strategy (REPowerEU) and could result in the allocation of significant financings – way more than the amount currently earmarked – to accelerate the development of a European hydrogen supply chain, improving current cost perspectives of green solutions. But accelerating renewables development materializes the risk of structural overgeneration if the development of BESS does not progress concurrently, especially in areas that are less interconnected with the rest of the system and have a high intensity of renewables relative to demand, such as Sardinia and La Sicilia in Sardinia and Sicily where economically viable opportunities for competitive green hydrogen consolidate starting from 2035.

By 2030, significant overgeneration and curtailment risks are expected to arise in the Southern zone and the Islands, which will prompt a surge in new electrochemical storage projects. Depending on the alternative scenarios of RES and grid development trajectories, these dynamics may be accelerated or delayed. Long-term development of batteries should follow the opportunities for time-shifting applications on the day-ahead market.

Investments in power intensive electrochemical batteries can be in-the-money in the medium-term, with revenue streams deriving mainly from the participation in the balancing phase of the Ancillary Services Market and a long-term capacity remuneration through specific projects. Investments in merchant energy intensive storage batteries are likely to be attractive only in the long-term when time-shifting applications on the DAM could become economically sustainable thanks to increasing price spread volatility and the presence of overgeneration. In 2040, up to 22 GW of energy intensive batteries are expected to be developed in our REFERENCE scenario.

In the REFERENCE scenario gas-fired generation is expected to remain at the backbone of the national energy mix even after renewables become the first production source through the next decades, until 2031 when RES become the main resource in the mix. Its share in the generation mix should decrease progressively but stay close to 30% of the national electricity needs until 2040.
However, mutated market conditions, triggered by the geopolitical tensions and contingent factors witnessed during the last year and a half, combined with implications of market design and regulation evolution (XBID, Terna's Incentive scheme, TIDE reform) unveil a changed market landscape context that is expected to permanently change the structure of revenue flows for gas-fired power plants.

Presence of coal units in the generation mix combined with the power demand slowdown are expected to partially limit the day-ahead market operativity of gas power plants and to reduce their margins in the 20242025 period, further worsened by the structural and permanent reduction in ASM volumes. In the longer run, after 2026, despite the entrance of less new generation CCGTs through the capacity market, competition for existing units should increase, further exacerbated by continuous acceleration in renewables development, but to be also partially compensated by coal phase-out of generation units in the Italian peninsula2 and by import reduction after 2030. The clean spark spread, which is strictly related to the evolution of existing CCGTs market share that remain the technology fixing the prices in most hours, remains negative on baseload basis, but the flexible operation of gas fired assets allows to optimise the actual captured value. Even though volatility and competitiveness increase, the day-ahead market remains the primary source of revenues for CCGTs. Missing money issues could arise for part of the existing CCGT fleet and the extension of a Capacity Remuneration Mechanism only for existing capacity could mitigate the risk of a non-adequate system.

Market prices in the short-term will mainly be guided by commodities prices dynamics. A gradual normalization of gas prices can be reflected in the power prices in the mid-term. In the long-term, power prices will be mainly driven by CO2 movements, while the impact of other commodities are expected to reach a stable equilibrium. Renewables penetration, mainly led by solar energy, is expected to strongly affect peak/off-peak dynamics after 2030, when the inversion of price spreads between time slots is expected to occur. Zonal spreads reflect the disruptive variations of the generation mix and grid in the three alternative views. In the short term, the REFERENCE case predicts that zonal prices will diverge due to the cost-effectiveness of coal production in specific areas. However, over the long term, the significant development of renewable energy sources in the southern macro-zone is expected to drive prices down through the cannibalization of solar technologies. Despite anticipated grid improvements, bottlenecks are still expected between the northern and southern zones, resulting in differing price levels in the 2030s. From 2035 onwards, further grid reinforcements are assumed to occur, resulting in a reduction of inter-zonal congestion issues on the mainland. However, criticalities are likely to remain evident in the islands.

Systematic and significant contraction of volumes exchanged on the ancillary services market has been observed since mid-2021 for both upward and downward operations. At the basis of the new trend there are multiple drivers that are expected to change the role and the perspective of the ancillary services market. The origin of the new trends is actually a combination of factors with less or more contingent nature such as: available running reserve due to reversed switching conditions, evidence for changes in the network management criteria adopted by Terna potentially connected to the incentives for ASM cost reduction, feasibility intervals imposed to power plants in the new Intra-Day Market continuous structure. The traditional market phase for regulation services is expected to become riskier and tighter, and to offer only a marginal integration to the spot market profits. Limited room is expected to remain a permanent trend in the long run, further supported by the commissioning of additional flexible thermal and storage capacity. Delay of grid investments with respect to the renewable growth could impact on the security condition with a wide heterogeneity at nodal level: local

criticalities and limited renewable hosting capacity could be mitigated by storage waiting for structural network reinforcements.

The new long-term scenario analysis of MBS takes into consideration the latest trends of the Italian system evolution, it peers itself with the Fit-for-55 targets in 2030 and discusses the possible paths towards 2050. Market simulations are extended beyond 2040 by explicitly modelling the market fundamentals through deterministic techniques and by assuming an inertial evolution, in line with the average 2030 – 2040 trajectory, for renewables installation sustained by BESS technologies, reduction in gas generation quota in the energy mix, electrification of consumptions and a proportional gird development on top of Terna development plan. All the elaborations are done considering the market structure and rules as known of today.

The resulting trajectory lacks behind the Net Zero targets: by 2050, only 85% of Italian electricity demand is expected to be met by renewable generation, while the residual demand would be covered by flexible and efficient gas generation, still needed by the system for adequacy reasons. Further contraction in operating hours (morning and evening peaks) impose the need of an explicit remuneration mechanism to support their economic viability. Renewables are expected to become the predominant marginal technology and market prices are expected to become less dependent on gas generation costs and more related to LCOE of renewable technologies as their marginal quota reach 40% of the yearly hours.

For evaluating price dynamics beyond 2050 (2050-2060 horizon),we assume an extension of 2050 results taking into account the uncertainty of available information for an explicit evaluation of the very long-term. 2040 -2060 scenarios will be carefully evaluated in future updates in order to discuss the economic sustainability of policy scenarios implementing the net zero target.

Key market trends in Italy

		mid-2021 - 2022	2024 - 2025	2026 - 2030	2030 - 2040	2040 - 2050
Main market drivers	Demand	↑	↓	↑	↑	↑
	Coal share	↑	↑	↓	↓	↓
	Import	⇆	⇆	↓	↓ ↓	⇆
	RES-E	↑	↑	↑	↑ ↑	↑ ↑
	New CCGT	↑	↑	⇆	⇆	⇆
Main market trends	DAM	High price volatility and low hydro availability supported the DAM results despite coal/oil competition	Competitive conditions persist driven by market tensions and demand reduction	Load factors improve slightly with coal phase-out	Despite the RES-E acceleration, operation of gas-fired plants maintains its share supported by reduction of import from the Northern border	RES quota in the energy mix overcome 80%, only the most efficient CCGTs remain active, with operativity condensed during peak demand hours
	ASM	Reduced ex-ante volumes caused a drop of profits from ancillary services sales and energy shifted to the day-ahead session	Opportunities for gas-fired capacity remain limited as overall volumes remain low and new flexible assets (new CCGTs and BESS) join the market			
	CRM	2022 as the first year of operation for the CRM	2023-2024 CRM premium should partially compensate limited revenues on the spot market	Missing money issues could arise for part of the existing fleet, extension of CRM only for existing capacity could mitigate the risk		Reduced participation in the energy market drastically affect plants marginality, CRM is needed to maintain the units active

2 Key Figures

NET POWER (GW)	Reference				Low				High			
	2025	2030	2040	2050	2025	2030	2040	2050	2025	2030	2040	2050
CCGTs	28,2	28,0	23,8	17,7	28,2	28,0	23,8	17,7	28,2	28,0	23,8	17,7
Coal	1,5	0,0	0,0	0,0	1,5	0,0	0,0	0,0	1,7	0,3	0,0	0,0
New CCGTs	7,3	7,3	7,3	7,3	7,3	7,3	7,3	7,3	7,3	7,3	7,3	7,3
Electrochemical BESS - Power Intensive	1,7	2,0	0,0	0,0	7,0	3,4	0,0	0,0	0,8	1,0	0,0	0,0
Electrochemical BESS - Energy Intensive	2,7	13,1	28,5	39,9	3,4	17,0	30,4	43,3	2,0	6,5	10,8	22,2
Hydro	19,0	19,3	20,0	20,6	19,0	19,3	20,0	20,6	19,0	19,3	20,0	20,6
Wind	13,3	16,3	30,1	46,4	14,5	21,6	35,4	46,4	12,5	14,0	19,3	30,1
Geothermal	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8
Biomass	3,9	3,9	3,9	3,9	3,9	3,9	3,9	3,9	3,9	3,9	3,9	3,9
Solar	35,2	49,0	77,7	112,3	39,9	63,0	87,0	112,3	31,6	37,1	47,6	77,7

BALANCE (TWh)	Reference				Low				High			
	2025	2030	2040	2050	2025	2030	2040	2050	2025	2030	2040	2050
Demand	315,8	339,3	364,2	390,2	320,9	358,0	377,0	396,0	311,9	327,4	340,2	353,1
Net import	47,4	32,6	13,2	13,3	47,4	32,6	13,2	13,3	47,4	36,4	37,7	37,6
Hydro	45,7	46,7	49,6	52,2	45,8	47,1	49,8	52,2	45,7	46,5	48,9	51,6
Renewables	87,0	114,0	194,6	285,8	105,3	110,8	86,9	60,6	81,4	88,7	111,2	174,9
Natural Gas	109,2	126,3	106,8	66,0	1,2	0,0	0,0	0,0	106,4	131,8	130,1	94,6
Coal	1,8	0,0	0,0	0,0	0,0	0,0	0,0	0,0	4,9	2,3	0,0	0,0
Overgeneration	-0,2	-0,3	-4,4	-8,3	-0,5	-3,8	-3,9	-8,4	-0,1	0,0	-0,2	-2,5

COMMODITIES	Reference				Low				High			
	2025	2030	2040	2050	2025	2030	2040	2050	2025	2030	2040	2050
PSV (€/MWh)	34,3	30,6	25,1	25,1	21,6	11,1	10,4	10,4	54,8	55,7	44,6	44,6
Coal (€/MWh)	15,6	18,0	8,0	8,0	9,5	9,0	4,0	4,0	18,7	21,9	10,6	10,6
CO2 (€/ton)	86,3	107,3	123,0	139,7	131,1	133,1	147,2	160,5	49,3	72,3	93,8	119,2

ELECTRICITY PRICES (€/MWh)	Reference				Low				High			
	2025	2030	2040	2050	2025	2030	2040	2050	2025	2030	2040	2050
Fuel variable cost - CCGT 53%	71,6	63,8	52,2	52,2	45,0	23,2	21,7	21,7	114,2	116,0	92,9	92,9
Logistic variable cost - CCGT 53%	9,6	3,4	3,4	3,4	9,6	3,4	3,4	3,4	9,6	3,4	3,4	3,4
ETS impact - CCGT 53%	32,5	40,4	46,3	52,6	49,3	50,1	55,4	55,4	18,6	27,2	35,0	35,3
Clean Spark Spread - CCGT 53%	-0,8	-0,6	-1,4	-21,2	-3,2	-2,7	-1,7	-17,2	-2,5	0,4	3,3	-19,8

ZONAL PRICES (€/MWh)	Reference				Low				High			
	2025	2030	2040	2050	2025	2030	2040	2050	2025	2030	2040	2050
PUN	112,8	107,0	100,5	87,0	100,7	74,0	78,8	63,3	139,8	147,1	134,6	111,8
North	112,8	107,8	105,4	91,7	101,7	76,6	84,1	67,3	139,7	146,5	136,2	114,1
Centre-North	112,7	106,0	98,3	87,9	101,7	75,2	74,3	62,9	139,7	146,4	136,0	113,3
Centre-South	112,7	105,8	95,0	79,9	98,5	75,2	71,7	56,9	140,0	148,1	131,7	107,7
South	112,1	105,0	94,5	79,7	98,4	61,8	70,5	56,7	139,9	148,1	131,7	107,7
Sicily	112,6	106,9	87,1	77,2	98,5	62,0	70,2	55,0	140,1	148,2	131,6	107,7
Sardinia	112,7	105,8	83,3	70,0	98,4	72,5	68,2	55,4	134,9	147,2	129,0	105,1
Calabria	112,1	105,0	94,5	79,7	98,5	62,0	70,5	56,7	140,1	148,1	131,7	107,7

CAPTURED PRICES PV FIXED TILT (€/MWh)	Reference				Low				High			
	2025	2030	2040	2050	2025	2030	2040	2050	2025	2030	2040	2050
North	100,2	91,3	83,2	59,6	89,0	61,5	66,2	46,6	125,4	133,0	119,3	86,4
Centre-North	100,6	85,9	64,0	53,6	89,3	58,5	48,0	40,6	126,1	133,9	119,3	85,0
Centre-South	96,8	83,8	55,8	38,7	77,0	58,7	43,5	28,9	122,7	132,1	110,1	71,5
South	94,8	81,2	54,2	37,9	76,8	38,2	40,8	28,6	122,7	132,0	109,8	70,9
Sicily	94,9	81,6	45,0	34,9	77,1	39,1	40,3	26,3	122,9	132,4	109,6	71,3
Sardinia	96,1	82,9	28,8	20,5	76,3	51,8	32,2	25,6	117,6	130,3	100,4	63,0
Calabria	94,7	80,8	53,5	37,4	76,4	38,4	40,4	28,1	122,6	131,5	109,3	70,2

CAPTURED PRICES PV TRACKER (€/MWh)	Reference				Low				High			
	2025	2030	2040	2050	2025	2030	2040	2050	2025	2030	2040	2050
North	101,7	92,9	85,1	61,4	90,3	62,5	67,5	47,8	0	0	0	88,0
Centre-North	102,1	88,0	66,5	55,4	90,7	59,9	49,9	42,0	0	0	0	87,0
Centre-South	99,5	87,1	59,6	41,6	80,4	60,6	46,0	31,0	0	0	0	75,4
South	97,6	84,4	58,0	40,6	80,0	41,2	43,3	30,6	0	0	0	74,6
Sicily	98,2	85,4	48,7	38,1	80,7	42,2	43,2	28,6	0	0	0	75,5
Sardinia	98,4	85,8	32,5	23,3	79,2	53,8	34,7	27,4	0	0	0	67,1
Calabria	97,3	83,7	56,9	39,5	79,3	40,9	42,5	29,6	0	0	0	73,6

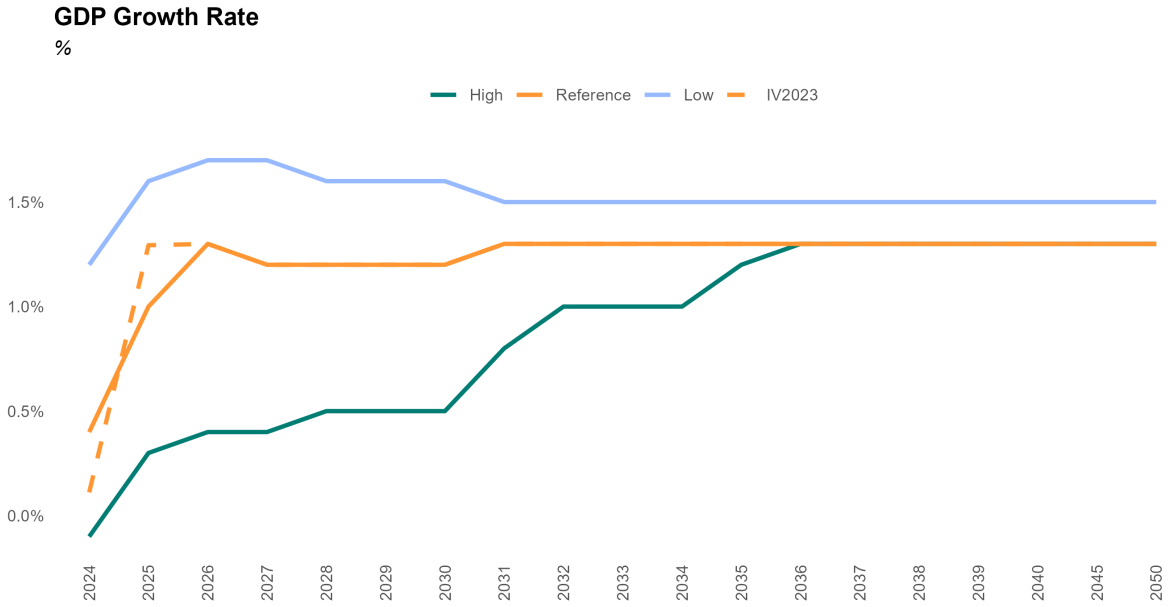
CAPTURED PRICES WIND ONSHORE (€/MWh)	Reference				Low				High			
	2025	2030	2040	2050	2025	2030	2040	2050	2025	2030	2040	2050
North	115,5	106,9	100,3	85,7	103,9	75,1	80,2	62,9	143,5	146,3	134,3	110,9
Centre-North	115,2	104,7	88,0	74,0	103,3	73,5	61,1	50,6	143,7	147,3	134,0	106,6
Centre-South	110,8	101,3	79,9	57,9	92,2	73,1	55,4	40,6	139,0	144,8	126,0	94,1
South	109,0	99,4	80,6	58,4	92,3	44,2	53,2	40,7	138,4	144,8	126,5	95,4
Sicily	107,9	98,6	64,3	52,7	92,1	44,1	51,8	37,0	137,8	144,2	125,5	94,5
Sardinia	111,0	99,7	63,5	45,0	93,5	63,7	51,6	39,6	126,6	140,2	119,1	89,7
Calabria	109,0	99,4	80,5	58,4	92,2	44,6	53,3	40,8	138,6	144,7	126,4	95,4

CAPTURED PRICES WIND OFFSHORE (€/MWh)	Reference				Low				High			
	2025	2030	2040	2050	2025	2030	2040	2050	2025	2030	2040	2050
North	0,0	107,9	100,9	86,0	0,0	75,7	80,5	62,6	0	0	0	113,0
Centre-North	0,0	107,1	89,5	75,0	0,0	74,8	60,9	50,1	0	0	0	109,1
Centre-South	0,0	104,2	86,3	65,1	0,0	74,0	59,2	45,2	0	0	0	99,7
South	109,7	102,1	84,9	62,9	94,3	47,0	56,0	43,7	0	0	0	99,8
Sicily	0,0	104,2	73,9	63,6	0,0	53,3	60,2	44,9	0	0	0	102,5
Sardinia	0,0	104,5	75,7	59,1	0,0	69,6	60,7	48,0	0	0	0	99,8
Calabria	0,0	0,0	84,9	62,9	0,0	0,0	56,0	43,7	0	0	0	99,8

3 Macroeconomic Context

3.1 GDP

GDP GROWTH IN THE SHORT TERM REMAINS SUBDUED, WITH A FORESEEN MODERATE INDUSTRIAL PRODUCTION RECOVERY SUSTAINED BY WAGE DYNAMICS AND AN EXPECTED EASING OF MONETARY POLICIES. THE DISINFLATION PATH, EASING FINANCING CONDITIONS, AND THE IMPLEMENTATION OF THE NRRP ARE THE MAIN DRIVERS BEHIND MID AND LONG TERM GROWTH PERSPECTIVES



Source: MBS Consulting elaborations

24-25

The reference scenario foresees GDP growth at 0.4% y/y in 2024 and a more robust increase in 2025 (+1%), due to an expected easing of financial conditions. A still weak industrial sector and limited investments weight in 2024. A gradual easing of the monetary policies in the second half of the year and positive wage dynamic should would contribute positively to growth in 2025. In the Worst case scenario, should inflationary pressure persist, GDP would fall by 0.1% y/y in 2024 and slightly grow in 2025 (+ 0.3%), while an acceleration of disinflation and investments recovery would lead to the Best-case scenario (GDP growth up to 1.2% in 2024 and 1.6% in 2025).

26-30

In our Reference and Best scenarios, economic growth would gradually realign to the previously projected path, sustained by the effective implementation of the NRRP measures, the recovery of the global economy, and an acceleration of the green transition reforms. In the Worst scenario, fiscal policies pressures and the failure of the NRRP implementation would keep economic growth near zero and lead to a failure of the green transition.

31-50

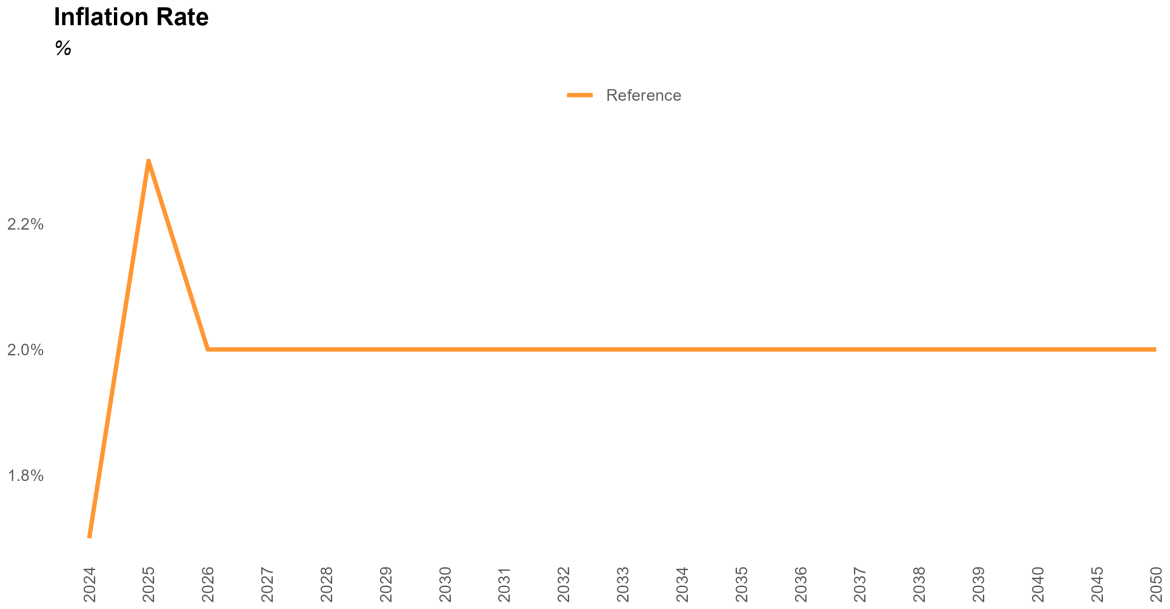
In the long-term, our Reference and Best-case scenarios remain anchored to the assumption of a stabilization of the yearly GDP growth rate in the 1-2% interval, while in the Worst scenario, GDP growth continues to discount the effects of the failure of key investments and reforms in the previous period and only gradually realigns with the Reference scenario.

Main updates

Short-term GDP projections were revised upward, as a faster than expected disinflation and the probable easing of monetary policies combined with positive wage dynamics contribute to GDP growth.

3.2 Inflation rate

THE PERSISTENCE OF THE ENERGY PRICES NORMALIZATION IS DRIVING THE GENERAL PRICE INDEX DECLINE, WITH ITS REDUCTION BEGINNING TRANSMIT ALSO TO THE CORE INDEX. MONETARY POLICY TIGHTENING PROVED TO BE EFFECTIVE IN LIMITING INFLATIONARY PRESSURES AND KEEPING MEDIUM AND LONG TERM EXPECTATIONS UNDER CONTROL



Source: MBS Consulting elaborations

24-25	Inflation is expected to increase by 1.7% y/y in 2024 and by 2.3% in 2025, with a downward revision incorporating the recent disinflation path. In the second half of 2024 monetary policy may revert to easing supporting investments growth.
26-30	After 10 consecutive reference rates increases, the actual interest rates level is proving effective in guiding inflation back to the 2% in the short term. Our scenario foresees a stabilization to 2% in the second part of the decade, even with a gradual monetary policy easing.
31-50	Long-term assumptions envisage the inflation rate to stabilize at around 2%, in line with the BCE's medium term inflation target.
Main updates	GDP projections are in line with the previous market update.

4 Commodities

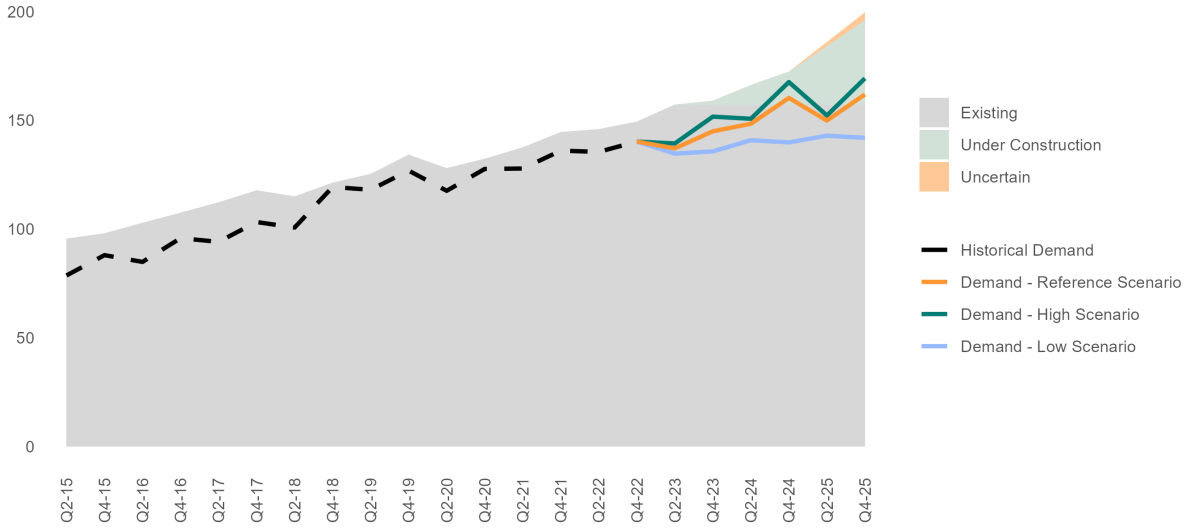
4.1 Natural Gas

4.1.1 LNG

2023 GLOBAL LNG DEMAND ROSE BY 2% Y/Y IN 2023 COMPARED TO 2022; A NOTABLE DISPARITY IN GROWTH RATE WAS SHOWCASED BETWEEN THE ASIAN AND EUROPEAN BLOCS. DELAYS IN THE CONSTRUCTION OF LIQUEFACTION AND REGASIFICATION CAPACITY, INDUCED BY LOW PRICES, COULD TRANSLATE IN RENEWED DEMAND-SUPPLY TENSIONS IN 2025-2026. THERE IS AN ANTICIPATION OF POTENTIAL OVERSUPPLY IN THE LNG MARKET POST-2026, LAYING THE GROUNDWORK FOR PRICE NORMALIZATION IN THE LONG-TERM

World LNG Demand-Supply Balance

Bcm NG/quarter



Source: MBS Consulting elaborations

24-25

In 2023, global LNG demand increased by 2% year-on-year, and it's predicted to rise by close to 5% annually in both 2024 and 2025, driven by an increased demand from Europe and China. Despite limited global LNG supply growth in 2024, competition between Europe and Asia will decrease, and new capacity coming online in 2024 and 2025 should meet demand. The balance of LNG demand between Europe and Asia, influenced by economic activity and weather conditions, along with the progress of new capacity, will be crucial in determining the global equilibrium in 2025 and 2026, with a growth rate potentially exceeding 7% in the high scenario.

26-50

After 2026, LNG demand growth is expected to slow down to just below 5% per year due to increased renewable energy production and improved energy efficiency. By 2026, new liquefaction capacity from the US and Qatar is expected to enter the market, reducing the risk of market tightness. In the long term, the pressure on the LNG market is expected to ease further due to the growth in new capacity and the implementation of green energy commitments.

Main updates

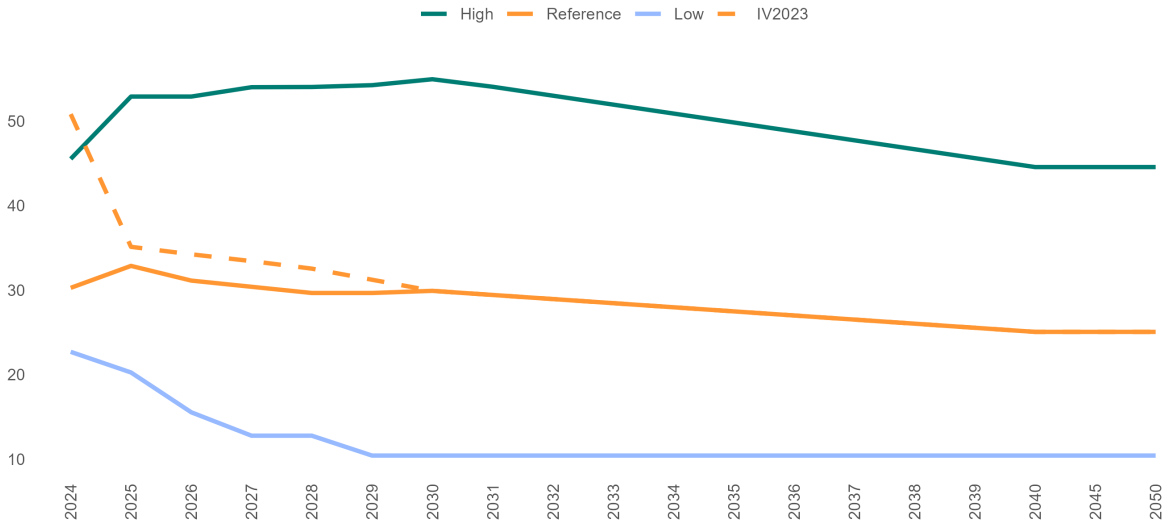
Global LNG demand growth in the short term remained in line with our previous update. 2024 European LNG demand growth was revised slightly lower since record high gas storages should slowdown demand recovery over the next few months, while the Asian one was revised higher to account for a faster than expected recovery of price-sensitive importers.

4.1.2 TTF Price

MILDER WINTER TEMPERATURES AND SUBDUED THERMOELECTRIC DEMAND DROVE A RECORD DECLINE IN EUROPEAN GAS PRICES IN 2023. STRUCTURAL MARKET CHANGES INDICATE THAT DEMAND IS UNLIKELY TO RETURN TO PRE-CRISIS LEVELS OVER THE NEXT THREE YEARS. IN THE LONG TERM, WE ANTICIPATE FURTHER DEMAND REDUCTION DUE TO EUROPE'S DECARBONIZATION EFFORTS, LEADING TO A LOWER TTF PRICE TRAJECTORY NEARING €25/MWH. PRICE TENSION AND VOLATILITY SPIKES, PARTICULARLY DURING WINTERS, MAY OCCUR OVER THE NEXT FEW YEARS. NORMALIZATION OF PRICES IS EXPECTED FROM 2026 ONWARDS, CONTINGENT UPON INCREASED EUROPEAN LNG SUPPLY

TTF Price

€/MWh GCV



Source: MBS Consulting elaborations

24-25

The TTF 2023 average price settled just above 40 €/MWh, and based on our reference scenario, expectations for the 2024 yearly average are projected to establish close to 30 €/MWh. The persistence of subdued demand, not anticipated to rebound in the short-term, driven by structural changes in the energy markets and the recovery of RES production, induce price expectations to remain low. Europe LNG import capacity is poised to expand by further 30 Bcm in 2024, following the delay of under construction regasification facilities to that year or later. The development of European regasification capacity will increasingly enable additional LNG arrivals, crucial to maintain market equilibrium in the short-term and to structurally adapt to the absence of Russian piped gas.

26-50

Starting from 2025, there will be a gradual return to normalcy in the global LNG market due to the deployment of new liquefaction capacity. This normalization, combined with an accelerated energy transition, is expected to lead to a steady decrease in European gas prices, reaching around €30/MWh by 2028. The ongoing decarbonization process in Europe will continue to reduce gas demand, which will further push prices down towards the long-term equilibrium of €25/MWh. However, in a scenario of persisting geopolitical and commercial tensions (High scenario), prices may remain just below €45/MWh in the long term. Conversely, effective green policies coupled with economic growth (Low scenario) could drive prices significantly lower, with the TTF averaging around €10/MWh in the long term.

Main updates

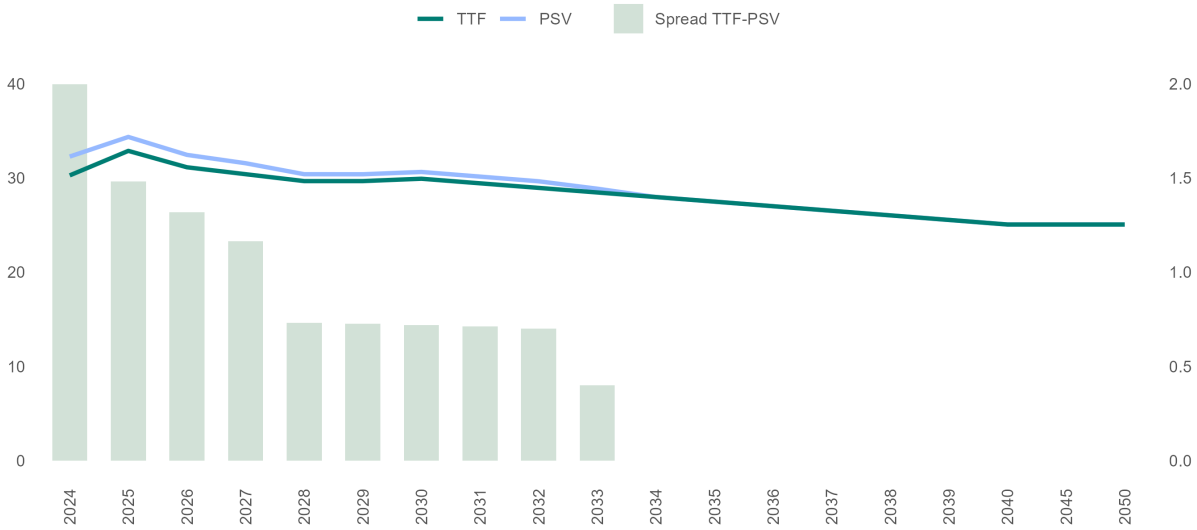
We adjusted our short-term forecasts for European gas hub prices downward, particularly for 2024-25 winter season target, in response to the stalling recovery of European gas demand.

4.1.3 Spread TTF-PSV

IN THE SHORT-TO-MEDIUM TERM THE PSV GAS PRICE IS ANTICIPATED TO MAINTAIN A PREMIUM COMPARED TO THE TTF. THIS IS DUE TO THE NEED FOR INCREASED GAS FLOWS FROM NORTHERN EUROPE TO COMPENSATE FOR BOTH THE INTERRUPTION OF RUSSIAN PIPED GAS SUPPLIES AND FOR THE TEMPORARY CLOSURE OF THE OLT LNG REGASIFICATION FACILITY IN ITALY. HOWEVER, OVER THE LONG TERM, THE PRICE DIFFERENTIAL IS EXPECTED TO PROGRESSIVELY NARROW TOWARDS ZERO

Spread TTF-PSV

€/MWh GCV



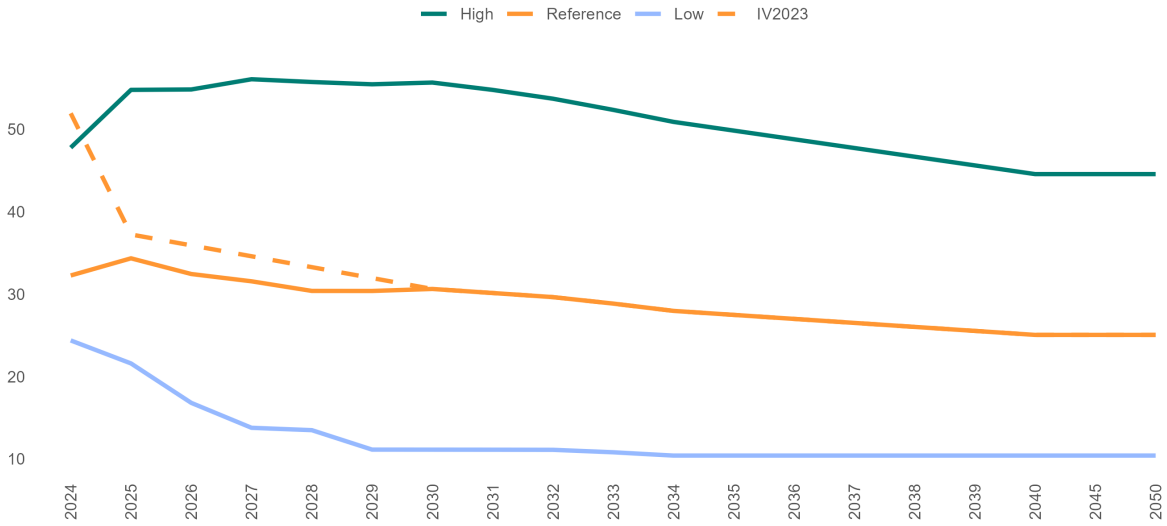
Source: MBS Consulting elaborations

24-25	The PSV-TTF spread is expected to widen in 2024 following the closure of the OLT LNG regasification facility, averaging at 2 €/MWh. This is due to the increased reliance on flows from Norway via Passo Gries to compensate for the reduced availability of LNG. Fluctuations throughout the year are anticipated, driven by seasonal factors.
26-30	Flows from the TAP and Algeria, and LNG arrivals are seen as balancing imports in the medium-term, leading to a progressive spread closure to below 1 €/MWh by 2030.
31-50	The PSV-TTF spread is foreseen to reabsorb towards zero in the long-term, since a gradual flows rebalancing is expected to combine with the underlying decarbonization-induced demand reduction.
Main updates	PSV-TTF spread is still expected to remain positive in short and medium term and to reduce progressively towards null in the long-run. A slight increase in the short-term average PSV-TTF spread followed the aforementioned dynamics affecting Italian gas supply.

4.1.4 PSV Price

THE ITALIAN GAS PRICE CONTINUES TO BE CLOSELY TIED TO THE EUROPEAN HUB ONE, WITH THE TTF SIGNIFICANTLY AFFECTING PSV TRENDS. HOWEVER, THE TEMPORARY CLOSURE OF OLT FACILITY HAS IMPACTED ITALIAN IMPORTS, LEADING TO SHORT-TERM PROJECTIONS SUGGESTING WIDER DEVIATIONS FROM THE TTF. MOREOVER, THE PSV IS EXPECTED TO FOLLOW A TRAJECTORY LOWER THAN PREVIOUSLY ANTICIPATED, REFLECTING STAGNATING DEMAND AND ECONOMIC RECOVERY. IN THE LONG RUN, WE FORESEE THE PSV TO ALIGN WITH THE EUROPEAN PRICES NORMALIZATION PATH, TARGETING 30 €/MWH BY 2030 AMIDST A REBALANCING OF GLOBAL GAS DEMAND AND SUPPLY DRIVEN BY THE ACCELERATION OF THE ENERGY TRANSITION

PSV Price
€/MWh GCV



Source: MBS Consulting elaborations

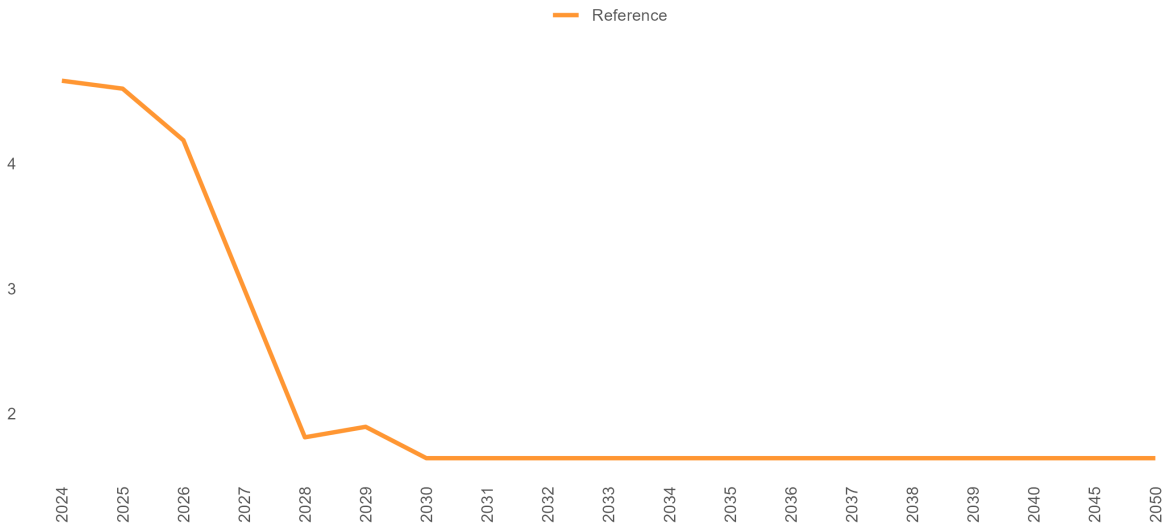
24-25	The 2023 PSV average price settled just below 45 €/MWh in 2023. In 2024, we anticipate a decrease in the PSV yearly average, with prices hovering around 30 €/MWh. This downward revision in PSV forecasts for 2024-2026 can be attributed to constrained gas demand recovery, which, in turn, stems from various factors. Firstly, gas consumption of the distribution network is anticipated to remain subdued amid a shift towards savings and efficiency. Limited growth in the energy-intensive sector and lower-than-average thermoelectric gas demand driven by sustained electricity imports and renewable electricity production on the rebound, will further limit national gas consumption. Delays in the commissioning of the Ravenna FSRU have also hampered gas demand recovery, falling short of initial expectations.
26-50	The PSV is expected to follow the European gas prices mid-term normalization towards 30 €/MWh by year 2030, as a gradual rebalancing of the global gas demand-supply dynamics should follow the expected acceleration of energy transition. PSV Reference price is expected to stabilize, aligning to TTF prices at around 25 €/MWh in the long-term.
Main updates	Our short-term expectations on the European gas hubs prices were revised lower, mainly across 2023-24 and 2024-25 winter seasons targets, following the recent relaxation of short-term market fundamentals and a significant slowdown in economic growth in Europe.

4.1.5 Logistics Costs for Italian Gas-Fired Units

GAS LOGISTIC COSTS ARE EXPECTED TO REMAIN HIGH IN THE SHORT-TERM DUE TO THE INCREASE RELATED TO THE COVERAGE OF STORAGE INJECTIONS ACTIVITY IN PARTICULAR. VARIABLE LOGISTIC GAS COSTS SHOULD START GRADUALLY DECREASING FROM 2027 ONWARDS, FOLLOWING THE EXPECTED GAS PRICES NORMALIZATION

Logistic Costs for Italian Gas-fired Units

€/MWh GCV



Source: MBS Consulting elaborations

24-26	The 2023 logistic cost for Italian gas-fired units averaged 4 €/MWh amid the increase of the CRVOS (which pays storage injections incentives), CRVBL (which covers the charges associated with the gas system balancing activity) and the CVU (which covers variable charges and it's linked to the gas price trend) components. With the Consultation Document 588/2023/R/gas ARERA is evaluating the introduction of a Neutrality Charge of 2.2 €MWh from April 2024 (and for at least 3 years) to recover almost 4 Bln€ derived from the summer 2022 last resort buying activity put in place to refill the Italian storages. The overall gas transport cost should therefore remain above 4 €/MWh at least until 2026. The CRVOS component should reduce close to pre-crisis levels starting from October-2024 instead.
27-50	A gradual normalization of the average variable logistic costs is expected from 2027 on wards, following the normalization of gas prices, nearing 1.6 €/MWh on average by 2030.
Main updates	The variable transport charges forecast incorporates the regulator interventions to mitigate the recent commodities surge on bills, compensated by an increase in storages and balancing cost.

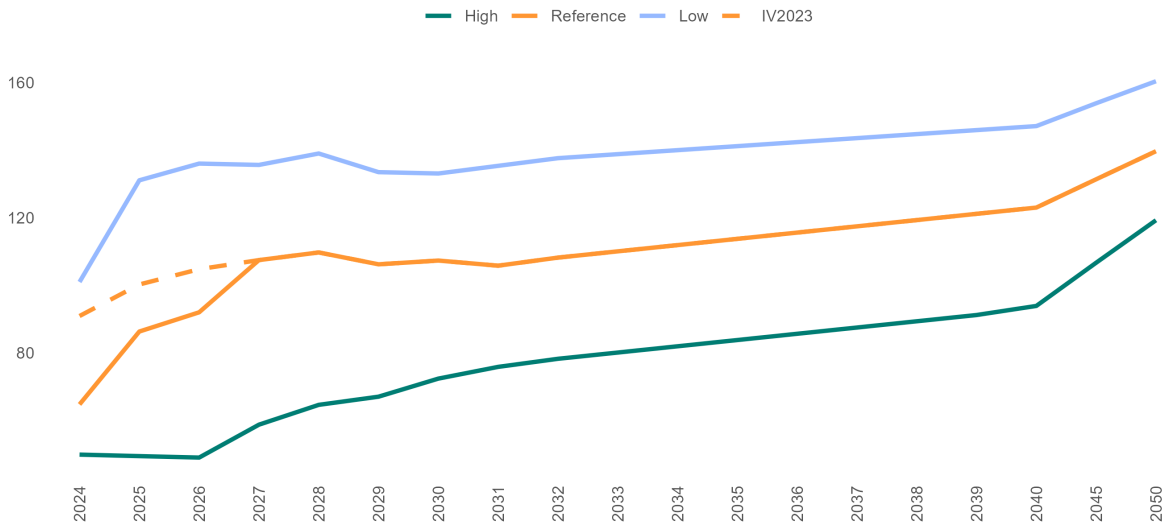
4.2 EU ETS

4.2.1 CO2 Allowances Price

THE NEW ETS REFORM, TO BE INCORPORATED INTO NATIONAL LEGISTLATION OF EU MEMBER STATES BY THE END OF 2024, AIMS TO PROGRESSIVELY RAISE THE CO2 PRICE. THE INCLUSION OF NEW SECTORS, SUCH AS THE MARITIME ONE, WILL CONTRIBUTE TO SUSTAINING THE ENVISIONED PRICE INCREASES

CO2 Price, EU ETS Mechanism

€/tCO2eq



Source: MBS Consulting elaborations

24-25

In the Reference scenario, the average CO2 price in 2024 is expected to reach around €65/ton. The aviation sector will see a reduction in free allowances, reaching 50% of the total by 2025, and 90 million permits will be removed from the market in 2024, both of which will limit supply and push prices upward. Additionally, starting from 2025, the inclusion of the maritime transport sector will further increase demand. However, concerns persist about effective demand recovery due to anticipated slow economic growth over the next few years.

26-30

A notable widening of the supply-demand gap should manifest starting from 2026, as the maritime sector integrates into the ETS system and the phasing out of free allowances for aviation reaches full implementation. By 2030, the reinforcement of the Market Stability Reserve and the increase of the Linear Reduction Factor up to 4.4% will contribute to further tightening the market. CO2 prices are expected to accelerate, nearing just below 110 €/ton by 2030.

31-50

By 2034 the removal of free allowances for sectors covered by the CBAM will reach full implementation, inducing a further increase in allowances demand. The long-term targets would hinge upon the effective efficiency of the ETS System, with the CO2 price expected to exceed 120 €/ton in the Reference scenario by 2040, and potentially accelerate to just below 150 €/ton in the Low scenario, under the assumption of stricter decarbonization efforts in Europe to accelerate the prices increase.

Main updates

CO2 price targets downward in the very short term, following the sharp decline observed in the first quarter of 2024. After 2024, a rebound in allowances demand and prices is expected.

5 Energy Mix

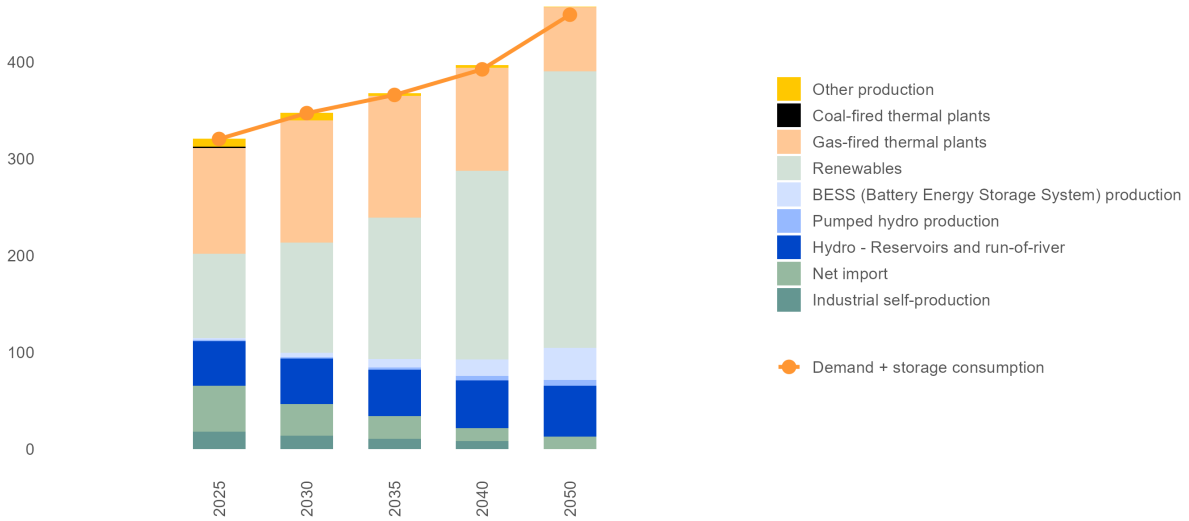
5.1 Day-Ahead Market Energy Balance

5.1.1 Reference Scenario

IN THE SHORT-TERM, A REDUCTION IN COAL PRODUCTION IS SUSTAINED BY AN INCRESE IN ELECTRICITY IMPORT. IN THE MID-TERM, GAS-FIRED GENERATION BECOMES THE PRIMARY SOURCE OF ELECTRICITY AS COAL PLANTS ARE PHASED OUT. IN THE LONG-TERM, RENEWABLES TAKE THE LEAD AS THE PRIMARY SOURCE OF ELECTRICITY PRODUCTION, SUPPORTED BY GAS-FIRED PRODUCTION

DAM Energy Balance, Reference Scenario

TWh



Source: MBS Consulting elaborations

24-25	The reduction of the electricity demand at European level, the recovery of nuclear plants capacity from the O&M maintenance of the last two years, and a surge in hydro production in Switzerland lead to an increase in the electricity import from the Northern borders. The positive trend of new RES installed capacity evidenced in 2023 will recur also in the two following years. Gas power thermal plants remain the marginal source.
26-30	Coal-fired units are going to phase-out within 2025, with the exception of the Sardinian ones, which remian operative until the completion of the Tyrrhenian Link in 2030. Electricity production from renewables will cover almost 50% by 2030.
31-50	Renewables will become the main source in the electricity mix, with a share of 70% by 2040. An optimization of the electricity grid, with the Tyrrhenian Link doubling in 2043, and the realization of the Elmed cable (Tunisia-Sicily) will reduce the need of net import from the Norther borders. Convenient market conditions would favor the development of energy intensive storage.

Main updates

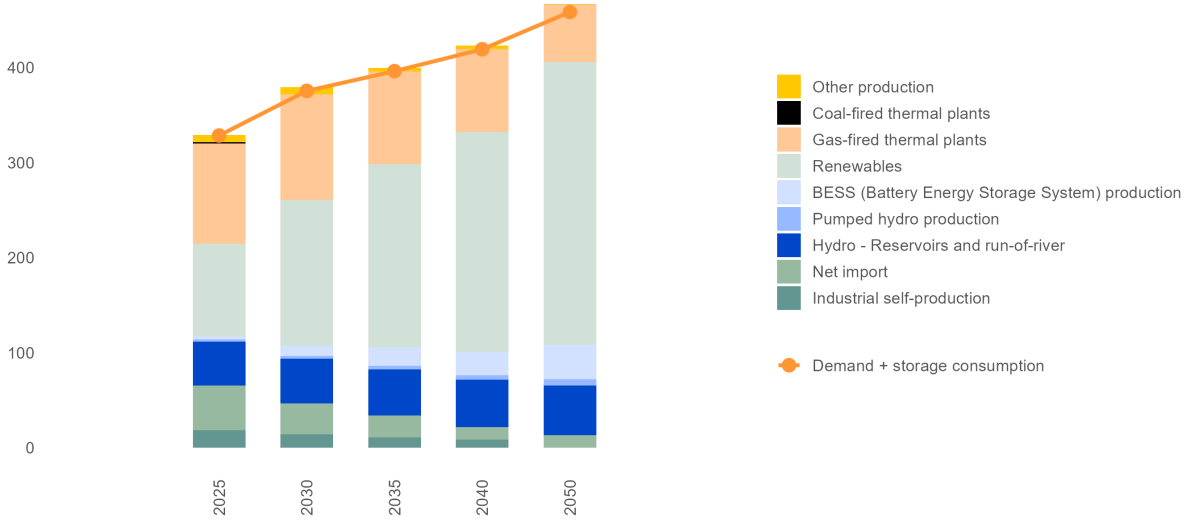
Net import increases in the short-term, supported by French nuclear capacity recovery and a general reduction in the electricity demand and European level.

5.1.2 Low Case Scenario

HIGHER COMMITMENT TO DECARBONIZE THE EUROPEAN ECONOMY LEADS TO A STRONGER DECARBONIZATION PROCESS, IN WHICH RENEWABLES COULD SORPASS THE CURRENT 2030 TARGET, REACHING 75% OF THE ELECTRICITY PRODUCTION MIX BY 2050, SUPPORTED BY AN INCREASE IN THE BATTERY STORAGE CAPACITY

DAM Energy Balance, Low Case Scenario

TWh



Source: MBS Consulting elaborations

24-25

A swift rise in decarbonization solutions is supported by an increase in commodities' prices, higher prices in the EU ETS mechanisms, and easier authorization for new renewables projects to encourage investments in the energy efficiency. Although coal units continue to operate, their share decreased due to more favorable conditions for gas-fired thermal plants, whose production will reach up to 33% of the national electricity demand by 2025.

26-30

By the end of 2028 coal-fired units in the are entirely phased-out. Falling renewables costs and a greater effort to reach decarbonizations goals support renewables development. In fact, the share of renewables production will reach 43% of the total electricity consumption. Improvements in the electricity grid will facilitate the reduction of electricity imported from neighborhood countries. Gas-fired thermal plants will continue to be the marginal source, cover 30% of the national electricity needs.

31-50

In the long-term, gas-fired thermal plants will be operative to guarantee system security and adequacy, even though the increase in storage system will down their share to 15% by 2050. Despite storage and network reinforcements the integration of renewables in the energy mix will only be partial reached as congestion and overgeneration problems are going to manifest, generating signals for electrolysis capacity.

Main updates

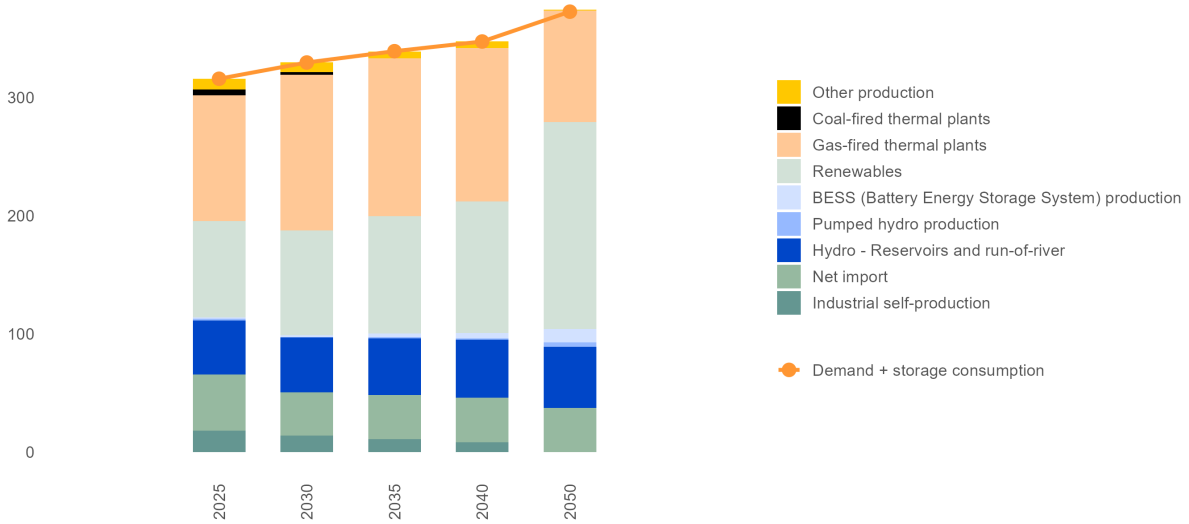
Changes in the production mix reflect updated commodities in the short-term. In the long term, new renewables installed capacity will be supported by thermoelectric and storage to maintain system adequacy.

5.1.3 High Case Scenario

SLOWER ECONOMIC RECOVERY IS REFLECTED IN A LOWER ELECTRICITY DEMAND AND LOWER AMOUNT OF INVESTMENT IN DECARBONIZATION. THE ENTRANCE OF THE MAIN GRID INFRASTRUCTURE PROJECTS ALLOWS THE PHASE-OUT OF COAL UNITS BY 2034. RENEWABLES AND BESS GRADUALLY INCREASE THEIR SHARES IN THE GENERATION MIX

DAM Energy Balance, High Case Scenario

TWh



Source: MBS Consulting elaborations

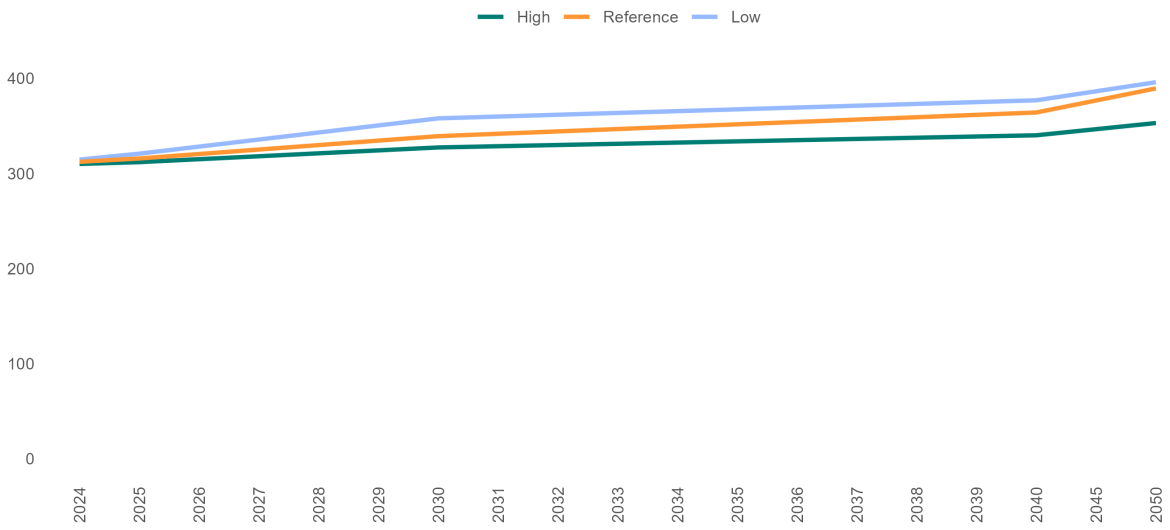
24-25	Coal-fired thermal plants are still an important source of power, even though the reduction in the gas prices will increase the share of the gas-fired thermal plant, covering 35% of the demand. The increase in net import up to 47 TWh in 2025 reduce the need of coal to 5 TWh in the same year.
26-30	CM-led investments come online but the phase-out of coal-fired capacity is postponed, so as the realization of great network investments. Net imports will reduce to 36 TWh within 2030, and gas-fired production maintains a 40% quota of total electricity needs, as hydro production normalize aroung 46.5 TWh/y and renewable energy sources gradually increase their share in the mix.
31-50	Increase in CO2 price reduce coal generation competitiveness until 2035, when the entrance of the Tyrrhenian Link determine the phase-out of all coal units. Gas-fired production increases its share in the national energy mix to around 38%. Volatile DAM dynamics and RES development sustain the entrance of 10GW of energy intensive storage in the long-term.
Main updates	Changes in the production mix reflect updated commodities in the short-term.

5.2 Electricity Demand

THE REDUCTION OF ELECTRICITY DEMAND AT EUROPEAN LEVEL IS REFLECTED IN THE ITALIAN SCENARIO, STILL TO EVALUATE WHETHER THE TREND IS GOING TO BE STRUCTURAL. IN THE LONG-TERM, ELECTRIFICATION AND EFFICIENCY IN FINAL CONSUMPTIONS ARE GOING TO BE THE MAIN DRIVERS FOR DEMAND RECOVERY

Italian Electricity Demand

TWh



Source: MBS Consulting elaborations

24-25

A slight recovery of the economy is expected in the next two years, leading to an increase in the electricity demand, which would reach almost 316 TWh in 2025 (+1.1% y/y). The positive growth is foreseen also in the alternative views: in the high case scenario, the demand would reach 312 TWh, according to a lower economic recovery, and 321 TWh in the low case scenario, where the economic growth is expected to be more sustained.

26-30

In the Reference case, moderate economic growth is driven by supportive measures and electrification allowing demand to reach 339 TWh in 2030. In the Low scenario, stronger economic outlook and system electrification push demand slightly below 360TWh, while in the High scenario the lower economic recovery and electrification bring consumption at 327 TWh.

31-50

After 2030, the progressive electrification of consumption in the transport sector and the diffusion of heating and cooling appliances could be compensated by efficiency measures in the industrial and civil sectors. This could lead electricity demand below 370 TWh in 2040. In the alternave scenarios 2040 demand totals 377 TWh in Low case and 347 TWh in High case.

Main updates

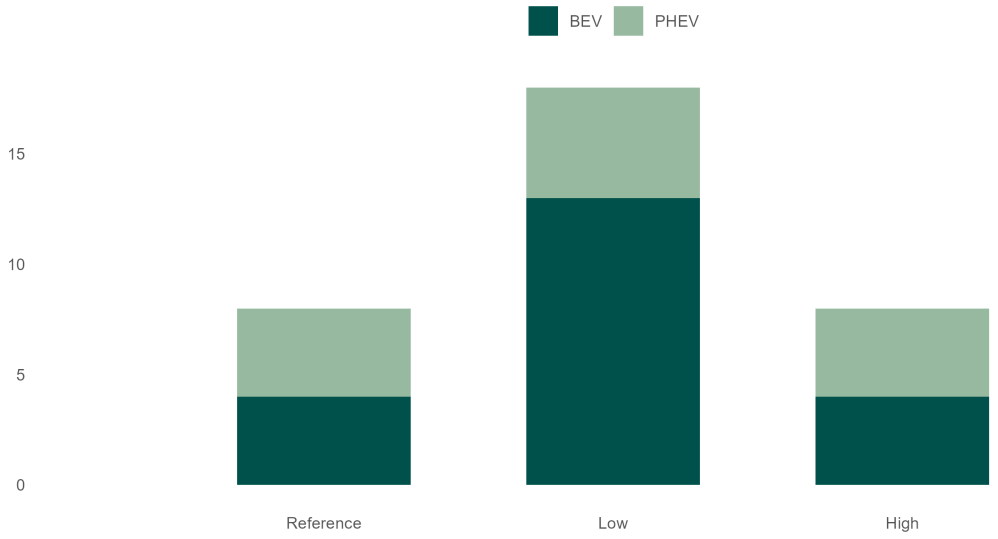
Electricity demand hypothesis are in line with the previous update, with a 1 TWh improvement in 2024.

5.2.1 E-mobility

ADDITIONAL ELECTRICITY DEMAND FROM EVs CAN SIGNIFICANTLY VARY BASED ON THE FUTURE DEPLOYMENT OF E-MOBILITY APPLICATIONS IN CITIES, EMISSION REDUCTION OBJECTIVES IN TRANSPORTS AND GENERALLY ON LONG-TERM TRANSPORT HABITS

Electricity Consumption from Electric Vehicles in 2030

TWh



Source: MBS Consulting elaborations

24-40

Electric vehicles are assumed to increase up to 1.2 million in 2025, 4.5 million in 2030 and 11 million in 2040, bringing 2 TWh, 7.6 TWh and 18.7 TWh of additional consumption, respectively. In the Low scenario, a greater diffusion of electric vehicles leads 10.5 million in 2030 and 14 million in 2040. In the High scenario, e-mobility development suffers a 5-year delay compared to the Reference case.

30

The NIECP envisages 6 million electric vehicles in Italy in 2030 - 4 million are pure EVs (BEV: Battery Electric Vehicles) – accounting for about 8 TWh of additional electricity demand. In our Reference view we estimate additional 7.5 TWh to come from BEV and PHEV (Plug-in Hybrid Electric Vehicle). This means that our hypotheses consider a greater consumption per EV compared to NIECP figures. Main differences are most likely connected to the underlying assumptions about e-mobility applications in cities or long-term transport.

31-50

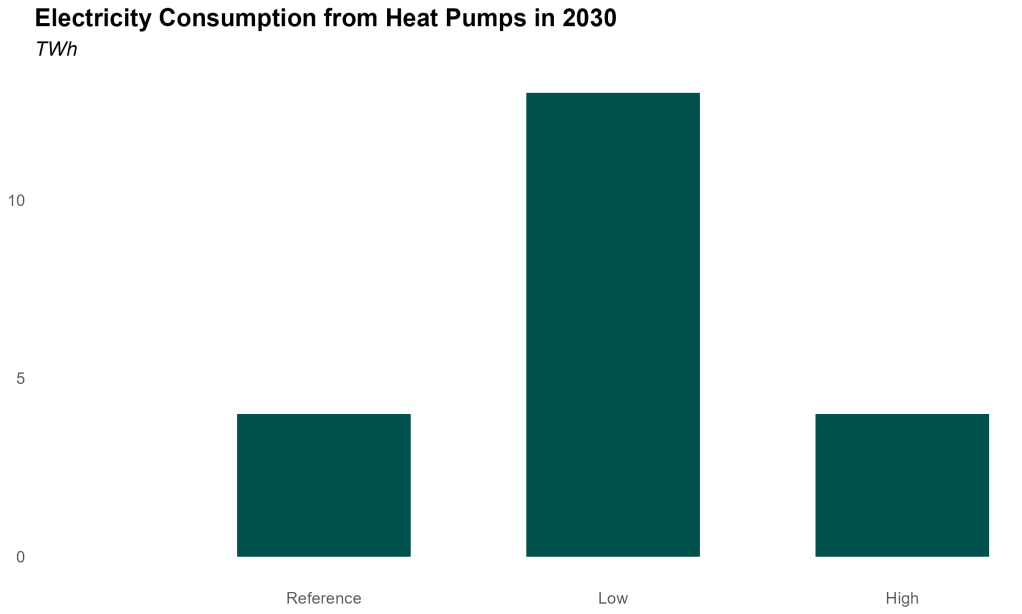
Notwithstanding the newest Green Deal proposals at EU level concerning transports, considering the uncertainty connected to the future expansion of a market which is still in a first stage of development, we assume a BAU trend in the long-term horizon, starting from the annual level of EVs addition reached in 2030.

Main updates

Development of EVs in line with previous market update, considering a potentially accentuated sensitivity towards sustainability goals in the post-pandemic recovery and especially from 2030 on with the likely strengthening of EU standards.

5.2.2 Heating and Cooling

THE ADDITIONAL ELECTRICITY DEMAND FOR HEATING AND COOLING WILL DEPEND ON THE PACE OF GROWTH OF INSTALLATIONS FOR CIVIL AND INDUSTRIAL USES, POTENTIALLY SUSTAINED BY SUPPORT MEASURES FOR DECARBONIZATION



Source: MBS Consulting elaborations

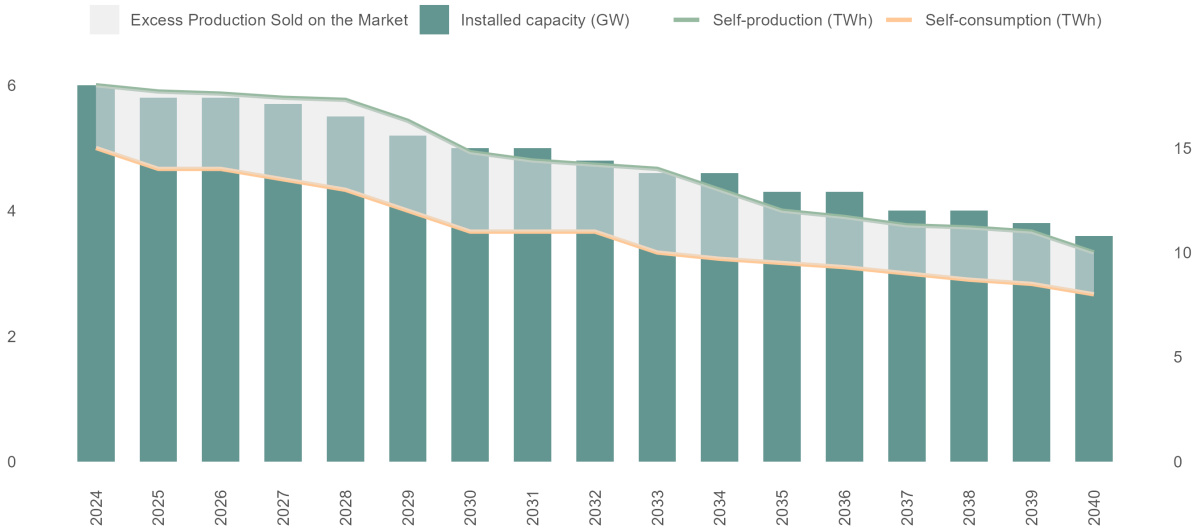
24-40	H&C is expected to account for additional electricity requirements in a range between 2.5 TWh and 8 TWh in 2025, 4 TWh and 16 TWh in 2030, 7 TWh and 18 TWh in 2040, depending on the scenario considered.
30	Our assumptions lead to estimate 6.7 TWh of H&C consumption in 2030, corresponding to around 1.8 million installations for civil uses.
31-50	We assume a BAU trend in the long-term horizon, starting from the annual level of additional installations and consumption reached in 2030.
Main updates	H&C hypotheses are in line with the previous market update, that considers the outcomes of a survey conducted in recent years by REF-E among H&C installers.

5.2.3 Industrial Self-Production and Self-Consumption

INDUSTRIAL SELF-CONSUMPTION WILL GRADUALLY DECREASE AS EXISTING ASSETS REACH END-OF-LIFE AND THE EXEMPTIONS ACCORDED TO CLOSED DISTRIBUTION SYSTEMS WL BE AT LEAST PARTIALLY REMOVED

Self-production, Self-consumption and Installed Capacity

GW, TWh



Source: MBS Consulting elaborations

24

Law 91/2014 affirms that grid and general system tariff components should be applied to the electricity consumed and not only to the electricity withdrawn from the public grid. Following this approach, the exemptions accorded to RIU (Re Interne di Utenza) and SEU (Sistemi Efficienti di Utenza) and closed distribution systems, and the benefits currently in force for existing plants related to self-consumption will be at least partially removed for new subjects/projects that apply for similar mechanisms.

25-50

The excess of self-produced electricity that is not consumed by the industrial sites (self-consumption) and is thus sold on the market (differential between self-production and self-consumption) is expected to gradually decrease, consistently with the expected end-of-life of existing power plants that serve industrial sites.

Main updates

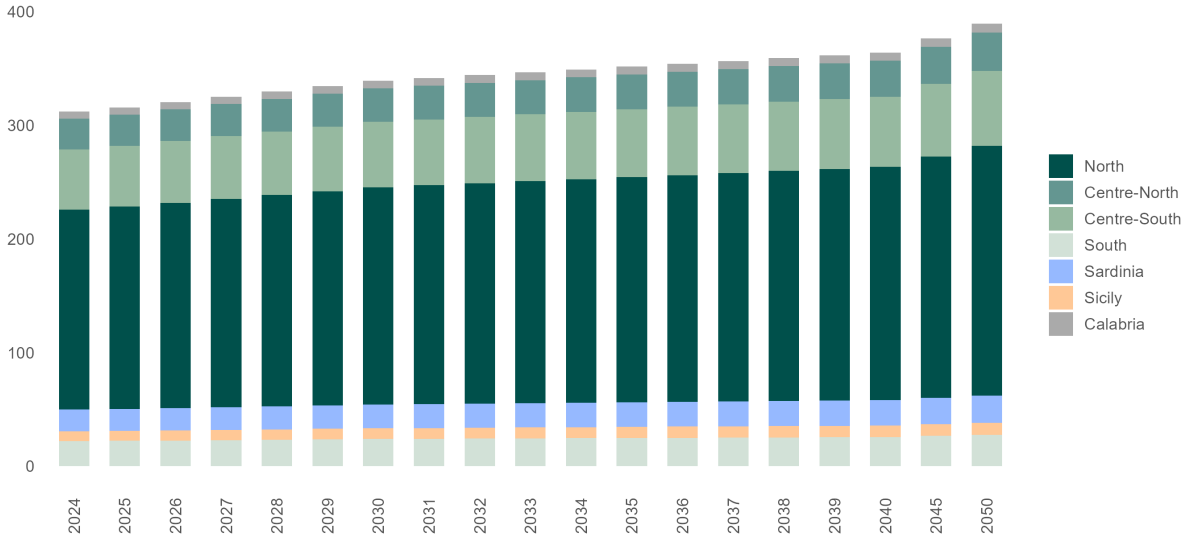
Industrial self-production and self-consumption hypotheses have been updated considering the most recent historical data but are in line with the previous update. Self-production/consumption hypotheses are the same in all the three scenarios.

5.2.4 Zonal Distribution of Electricity Demand

ZONAL DISTRIBUTION OF ELECTRICITY DEMAND IS ESTIMATED IN LINE WITH MOST RECENT REGIONAL TRENDS

Zonal Distribution of Electricity Demand, Reference Scenario

TWh



Source: MBS Consulting elaborations

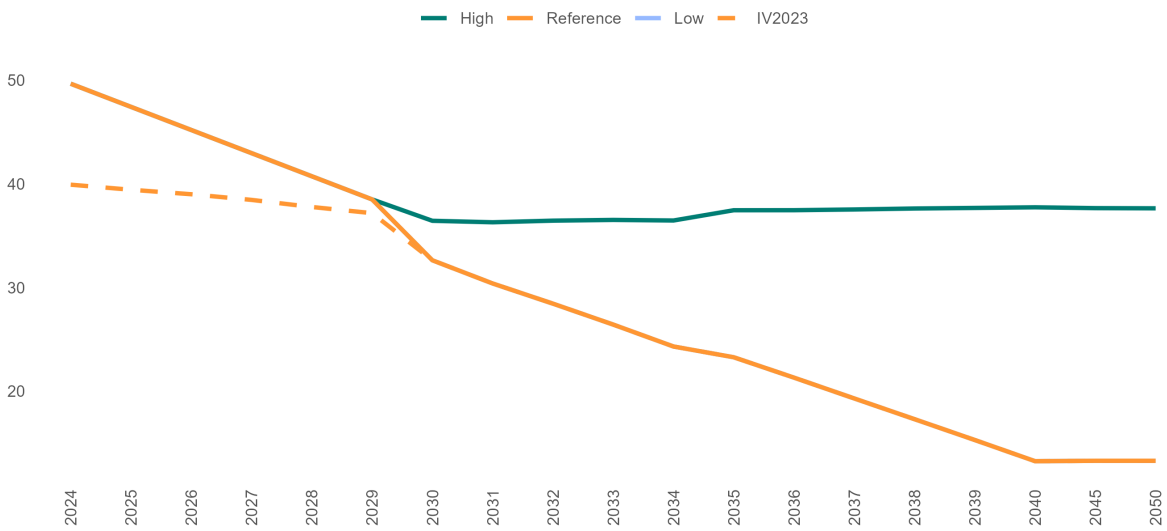
15-20	In 2015, the approval of the European guidelines on capacity allocation and congestion management (CACM) introduced new parameters to be followed in the zonal configuration review process. In 2018, Terna began a process to review the zonal configurations in compliance with such rules.
21-onwards	The current zonal configuration derives from the base case proposed by Terna in compliance with the CACM. Differences compared to the previous configuration: (i) elimination of the limited production poles, (ii) inclusion of a new bidding zone corresponding to the Calabria region, (iii) displacement of the Umbria region from the Centre-North zone to the Centre-South market zone.
24-50	The zonal distribution of electricity demand is based on historical regional data published by Terna and subsequent econometric elaborations. In the Reference case, the zonal distribution of electricity needs is as follows: North (57%), Central-North (9%), Central-South (17%), South (7%), Calabria (2%), Sicily (6%), Sardinia (3%). Slight differences in such figures between the alternative cases are the result of the econometric elaborations performed.
Main updates	The approach adopted and the distribution quotas are in line with the previous update.

5.3 Net Import

THE RECOVERY OF NUCLEAR CAPACITY FROM THE O&M OPERATION HELD SINCE 2022, AN INCREASE IN HYDRO PRODUCTION IN SWITZERALND, AND DEMAND ELECTRICITY REDUCTION AT EUROPEAN LEVEL LEAD TO AN INCREASE IN NET IMPORT FROM THE NORD NEIGHBORHOOD COUNTRIES, WHICH IS GOING TO REACH UP TO 48 TWh IN 2024. IN THE LONG-TERM, GRID OPTIMIZATION AND INVESTMENT IN STORAGE SYSTEMS DRIVE THE REDUCTION OF IMPORTED ENERGY

Net Import

TWh



Source: MBS Consulting elaborations

24-25

In 2024 and 2025, net import is going to increase, thanks to the recovery of French nuclear power production after two years operation and maintenance stops. The increase in hydro production in Switzerland registered in the last years is also contributing to net import growth. Net import is expected to reach 47.8 TWh in 2024, aligned with the value registered in 2023 of 53 TWh and with the long-term reduction goal.

26-30

Net imports flows are assumed to slowly decrease in the second half of the decade to around 32 TWh in 2030. This is due to: (i) recovering switching conditions and the partial dismission of the nuclear and coal- fired capacity in France and Germany – and considering also a BAU approach in estimang the achievement of 2030 renewable targets in other European countries; (ii) the go-live of the Tunisia-Sicily cable, that reduces the net import balance by adding more than 3.5 TWh of export flows .

31-50

The phase-out of nuclear and coal-fired units in continental Europe could lead to a further net import decrease in the 2030s, until 13 TWh ca. in 2040. The slight increase in net import seen from 2035 is due to an estimated reduction (1 TWh ca.) in the export flows towards Tunisia, following the Tunisian system development plan. In the High scenario, net imports remain sustained as switching conditions only partially improve and no significant nuclear/coal-fired dismission is supposed in continental Europe.

Main updates

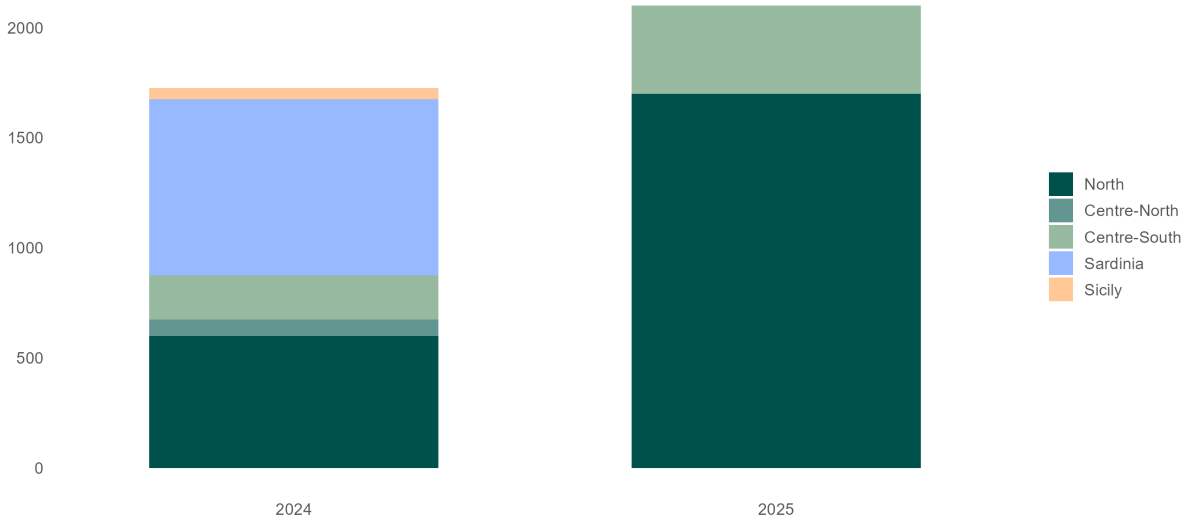
Net import is in line with the 2023 value of 53 TWh, considering the reduction that is expected to happen in the next years thanks to improvement in the electricity grid and in storage systems balancing zonal differences. In the Low scenario, long-term net import values are assumed equivalent to the Reference case under the assumption that national grid security conditions must be ensured.

5.4 Capacity from 2024 Capacity Market Auction

NEW PROJECTS CONCENTRATED IN THE NORTH ZONE AND SARDINIA, THOSE MANIFESTING THE GREATEST ADEQUACY NEEDS. ALL THE NEW GAS-FIRED PROJECTS PARTICIPATING TO THE AUCTIONS ARE SUPPOSED TO EXPLOIT THE 1-YEAR BUFFER PERMITTED BY THE RULES OF THE MECHANISM

Zone & Year of Completion of Newbuild Capacity from 2024 Capacity Market Auctions

MW



Source: MBS Consulting elaborations

NORD, CNORD	1.7 GW of new high-efficiency gas-fired capacity and almost 0.6 of new electrochemical storage capacity have been procured in the North market zone, the one which will suffer the most – under a system adequacy point of view – from the dismission of coal-fired capacity. In the Centre-North market zone, about 50 MW of new storage capacity have been procured instead.
CSUD, SUD, CALA	These zones will be interested by the phase-out planned for 2025 as they respectively host about 1.8 GW and 2.6 GW of coal-fired capacity. However, only 0.4 GW ca. between gas-fired and storage capacity have been awarded among the two – 0.3 GW in Centre-South and the remaining capacity in South – after the competitive procedure. No new projects were awarded in Calabria.
SICI, SARD	In Sardinia, coal-fired units will not be substituted by new gas-fired generation as the 0.8 GW awarded only come from new storage capacity. This could be a cornerstone for the island as the transition path embraced would hence neglect natural gas and favor fully electrified solutions. In Sicily, the competitive procedure resulted in the procurement of just 12 MW of new storage capacity.
Main updates	2024 Capacity Market auction outcomes are based on the data published by Terna and recent information regarding construction time.

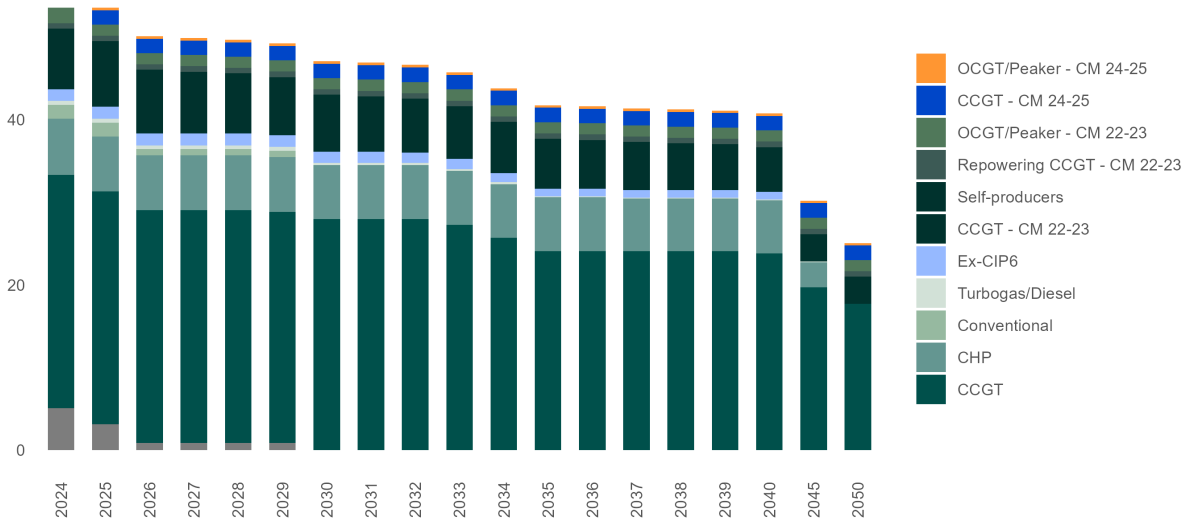
5.5 Thermoelectric Generation

5.5.1 Installed Capacity, Reference Scenario

CAPACITY MARKET AUCTIONS WILL COMPREHENSIVELY BRING 7.3 GW OF NEW GAS-FIRED CAPACITY ONLINE BETWEEN MID 2025. SARDINIAN COAL-FIRED UNITS TO BE PHASED-OUT ONLY IN 2029, CONSIDERING THE TYRRHENIAN LINK ENTERING IN 2030

Installed Thermoelectric Capacity, Reference Scenario

GW



Source: MBS Consulting elaborations

24-25	According to Terna's assumptions, almost 1.8 GW of coal-fired thermal plants capacity is going to enter the capacity market by 2025. The closures of coal plants will reduce the capacity from 2.8 GW to 1.5 GW within 2024 and 2025.
26-30	The first results of the 2024 CM auction show that around 1.8 GW of new gas-fired capacity has been procured and will enter the market between late 2024 and mid-2025. Auction results show also that Sardinian coal-fired capacity will not be substituted by gas-fired units, as only storage capacity was awarded in the island. Anyway, while coal-fired plants on the peninsula will be phase-out after 2025, Sardinian units are expected to operate until the Tyrrhenian Link infrastructure is fully completed (2030).
31-50	The amount of capacity auctioned through the CM is expected to grant full system adequacy at least through to 2030. No other thermoelectric capacity investments are envisaged after the wave of investment brought by the last CM auctions. Existing CHP power plants continue to support industrial acvities under the assumption of a BAU evolution of the industrial needs they serve. Some ageing CCGT capacity exit the market.

Main updates

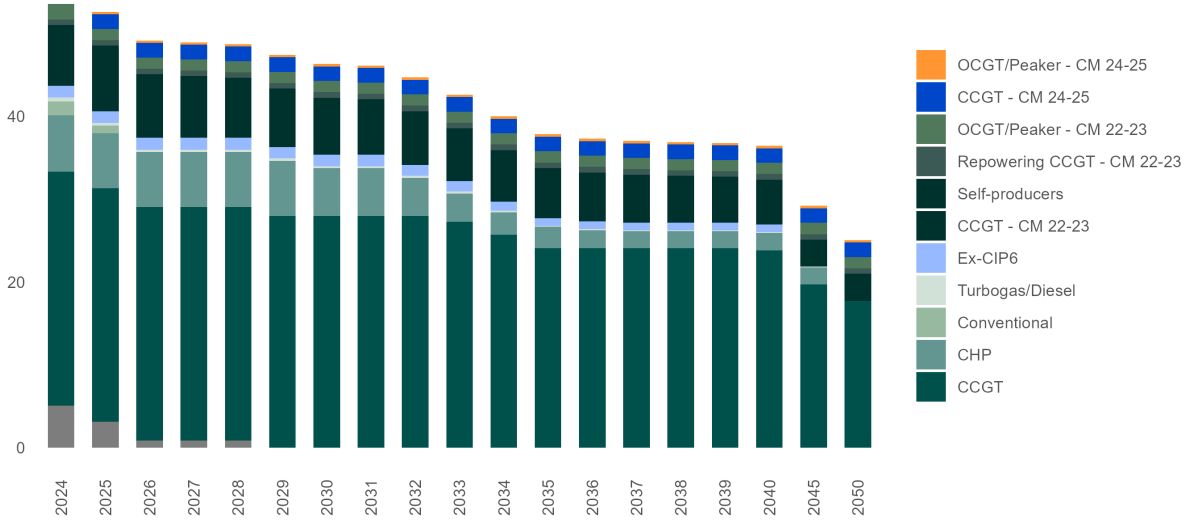
Evolution of new thermoelectric capacity reviewed consistently with latest information diffused by Terna with respect to the results of Capacity Market auctions. Hypotheses related to existing gas-fired capacity are in line with the previous market update.

5.5.2 Installed Capacity, Low Case Scenario

CAPACITY MARKET AUCTIONS WILL COMPREHENSIVELY BRING 7.3 GW OF NEW GAS-FIRED CAPACITY ONLINE BETWEEN MID 2025. SARDINIAN COAL-FIRED UNITS TO BE PHASED-OUT ONLY IN 2029, CONSIDERING THE TYRRHENIAN LINK ENTERING IN 2030

Installed Thermoelectric Capacity, Low Scenario

GW



Source: MBS Consulting elaborations

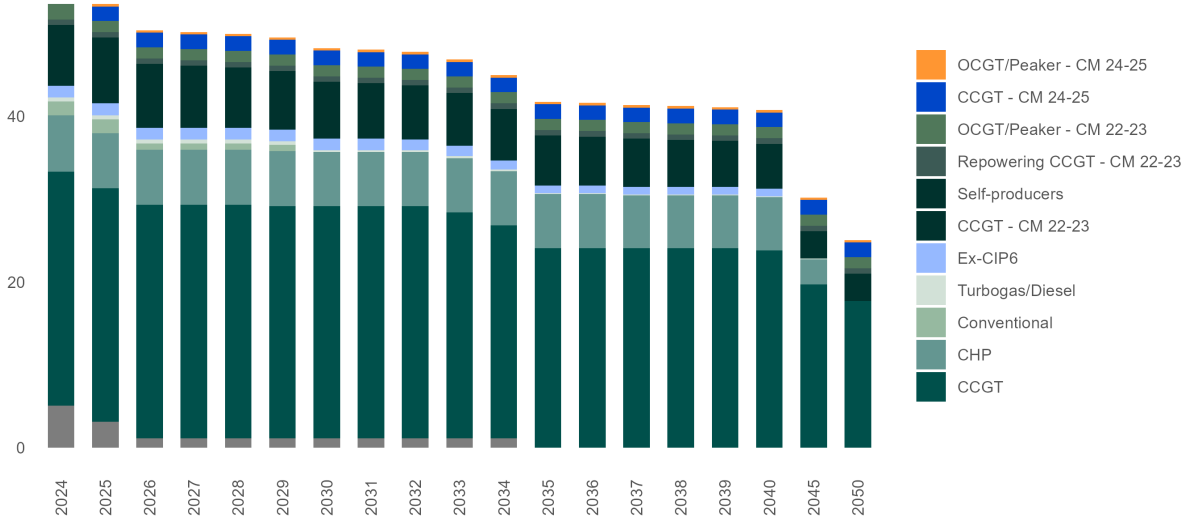
24-25	According to Terna's assumptions, almost 1.8 GW of coal-fired thermal plants capacity is going to enter the capacity market by 2025. The closures of coal plants will reduce the capacity from 2.8 GW to 1.5 GW within 2024 and 2025.
26-30	The first results of the 2024 CM auction show that around 1.8 GW of new gas-fired capacity has been procured and will enter the market between late 2024 and early 2025. Sardinian coal-fired plants are phase-out in 2025 together with power plants located in the peninsula under the hypothesis of a quick realization of the Tyrrhenian Link infrastructure.
31-50	No other thermoelectric capacity investments are envisaged a□er the wave of investment brought by the last CM auctions. Most of existing CHP power plants gradually exit the market, substituted by greener solutions. Some ageing CCGT capacity exit the market following strong competitive conditions.
Main updates	Evolution of new thermoelectric capacity reviewed consistently with latest information diffused by Terna with respect to the results of Capacity Market auctions. All coal-fired units phased-out in 2029 under the hypothesis of a realization of the Tyrrhenian Link infrastructure in line with Terna assumptions. Hypotheses related to existing gas-fired capacity are in line with the previous market update.

5.5.3 Installed Capacity, High Case Scenario

CAPACITY MARKET AUCTIONS WILL COMPREHENSIVELY BRING 7.3 GW OF NEW GAS-FIRED CAPACITY ONLINE BETWEEN 2022 AND EARLY 2025. PHASE-OUT OF COAL-FIRED POSTPONED UNTILL 2034 WHEN TYRRHENIAN LINK BECOME OPERATIVE

Installed Thermoelectric Capacity, High Scenario

GW



Source: MBS Consulting elaborations

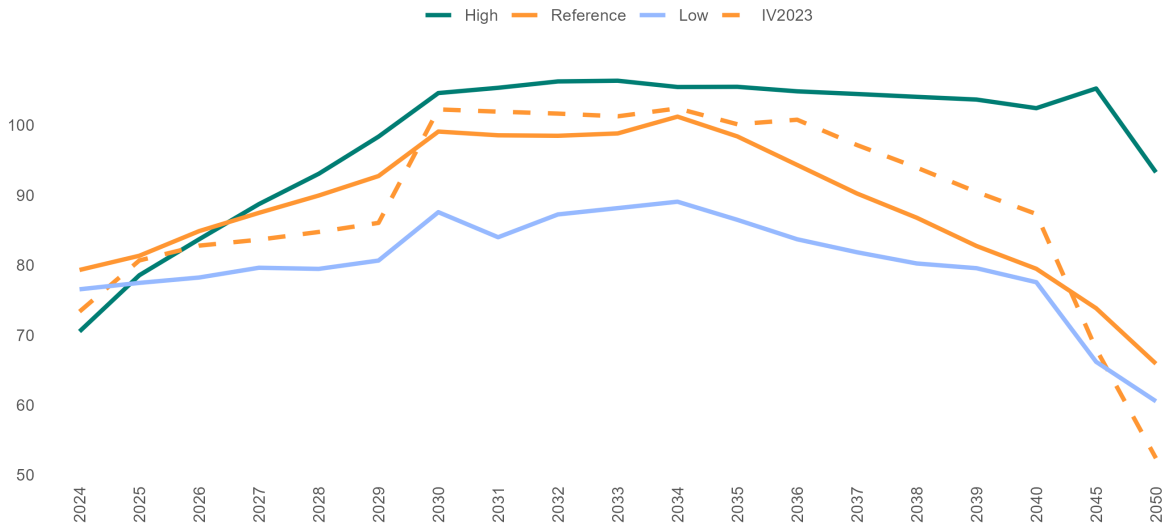
24-25	According to Terna's assumptions, almost 1.8 GW of gas-fired thermal plants capacity is going to enter the capacity market by end of 2025. The closures of coal plants will reduce the capacity from 2.8 GW to 1.5 GW within 2024 and 2025.
26-30	The first results of the 2024 CM auction show that around 1.8 GW of new gas-fired capacity has been procured and will enter the market between late 2024 and early 2025, and will continue to operate until 2030.
31-50	No other thermoelectric capacity investments are envisaged after the wave of investment brought by the last CM auctions. Existing CHP and CCGT power plants are remain operative. Realization of the Tyrrhenian Link in 2035 determine the phase-out of all coal power plants.
Main updates	Evolution of new thermoelectric capacity reviewed consistently with latest information diffused by Terna with respect to the results of Capacity Market auctions. Phase-out of coal-fired units positioned until 2035. Hypotheses related to existing gas-fired capacity are in line with the previous market update.

5.5.4 Residual Demand for CCGTs

EXISTING CCGTs COULD ACHIEVE ABOUT 3000 EOH IN THE SHORT-THERM AND RANGE BETWEEN 2000 AND 2500 EOH IN THE MID- AND LONG-TERM DUE TO THE GREATER DEGREE OF COMPETITION BROUGHT BY THE NEWBUILD CAPACITY AFTER 2024-2025 CAPACITY MARKET AUCTIONS

Residual demand for CCGTs

TWh



Source: MBS Consulting elaborations

24-25

Due to reversed coal-to-gas switching conditions, the existing CCGT fleet is supposed to average about 2200 EOH in the 2024-2025 period in the Reference case. In the alternative scenarios, the diverse results depend on the different switching conditions: in the Low scenario, the 2024-2025 average is 2200 EOH, while in the High scenario the figure drops to 2000 EOH. In the same period, min-max performances of new, high-efficiency CCGTs range between 4000 EOH and 6300 EOH (considering the three cases).

26-30

After the phase-out of coal-fired units, the residual demand rebounds but existing CCGTs suffer the competition brought by sustained import levels and new high-efficiency competitors entering with the Capacity Market support. In the Low scenario, residual demand is furtherly reduced by the energy efficiency effect on consumption and the greater renewable penetration. In the High scenario, the progressive increase of residual demand is due to improving switching conditions.

31-50

Existing CCGTs (53%-efficiency) stabilize around 2400 EOH. In the Low scenario, the great renewable penetration influences competitive dynamics and existing units remain close to 1600 EOH. In the High scenario, the improvement of switching conditions is hampered by the high level of imports from abroad, with EOH of existing units over 2000 favored by phase-out after 2035. High-efficiency units stabilize below the 4800 EOH only in the Low scenario.

Main updates

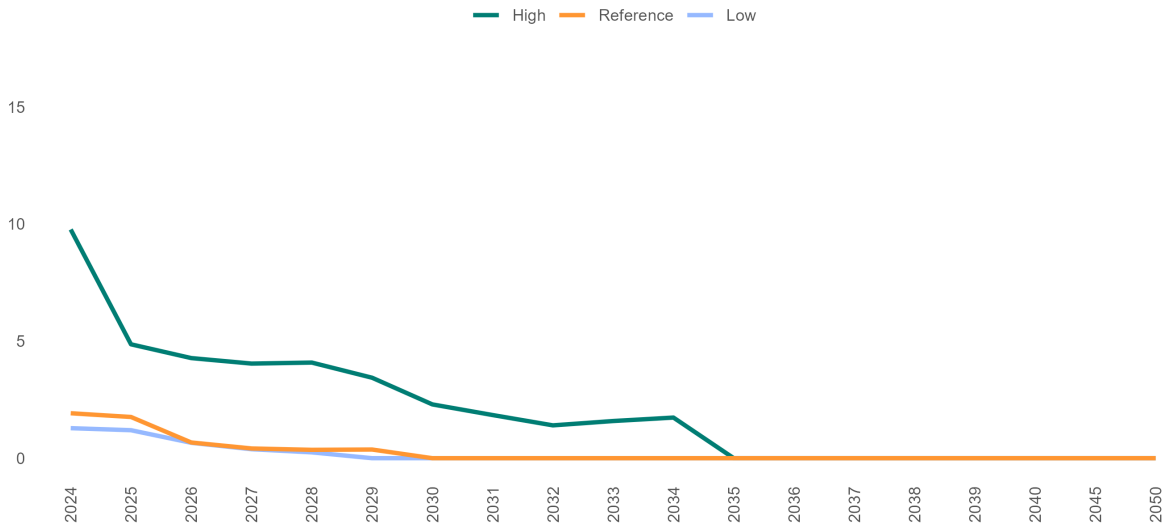
CCGTs production varies in the scenarios according to the different hypotheses made for commodities, demand growth and the evolution of the thermoelectric installed capacity.

5.5.5 Coal-fired Production

THE PHASE-OUT OF COAL-FIRED THERMAL PLANTS IS EXPECTED IN 2025, A PART FROM THE SARDINIAN PLANTS THAT ARE GOING TO CLOSE IN 2029 IN THE REFERENCE SCENARIO, AS IN 2030 THE TYRRHENIAN LINK WILL BE FULLY COMPLETED

Coal-fired Production

TWh



Source: MBS Consulting elaborations

24-25	The decrease in the electricity demand is leading to a reduction in the coal production, reaching 1.8 TWh in 2025 in the Reference Scenario. In the High Case Scenario, the share coal production will amount to 4.9 TWh in 2025.
26-30	Coal phase-out in the different scenarios depend on the functionality of the main grid infrastructure (Tyrrhenian link). In the Reference case only the units in Sardinia will conue to operate after 2025 until the Tyrrhenian Link is completed in 2030. In the Low scenario all units will be phased out by 2025. However, in the High scenario coal-powered units may continue to operate until 2035.
31-50	Coal units remain operative only in the High scenario unll phase-out in 2035, with the entrance of the Tyrrhenian Link, with favorable conditions for coal switching price most of the units are going to be in an economical phase-out, only the most efficents remains operative.
Main updates	CCGTs production varies in the scenarios according to the different hypotheses made for commodies, demand growth and the evolution of the thermoelectric installed capacity.

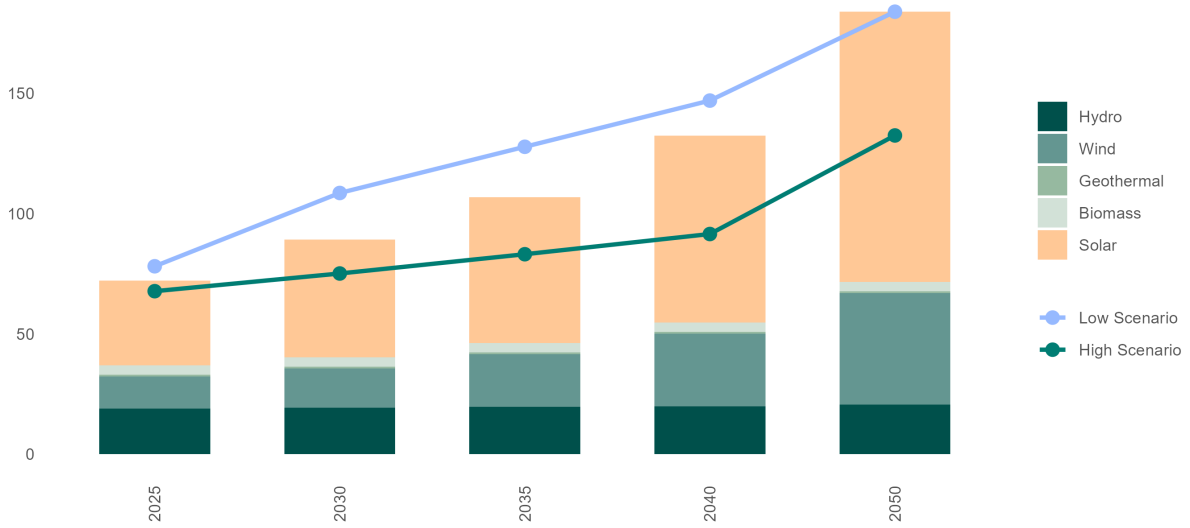
5.6 Reneweable Generation

5.6.1 Renewable Installed Capacity

THE ACCELERATION GROWTH OF RES CAPACITY OBSERVED IN THE LAST YEAR WILL CONTINUE IN THE SHORT-TERM. IN THE LONG-TERM, RES MARKET PARITY WILL CONSOLIDATE DRIVEN BY THE SURGE IN COMMODITIES PRICES AND DECARBONIZATION TARGETS

Net Renewable Installed Capacity

GW



Source: MBS Consulting elaborations

24-25

In the Reference case, the potential for renewable development is considered based on recent trends, taking into account both bureaucratic and technical obstacles. This results in an estimated increase of 7.4 GW of solar and 2 GW of wind capacity. In Low scenario, there is a greater emphasis on achieving a decarbonized economy, with 10 GW of solar and 2 GW of wind power. In High scenario, the growth of renewables is hindered by unfavorable economic conditions, resulting in an increase of just 5.4 GW and 0.6 GW of new solar and wind capacity, respectively, over the same two-year period.

26-30

Market parity conditions will accelerate long-term targets achievement. In the Reference case, there is an ambitious plan for the development of renewables with an estimated 49 GW of solar and 16 GW of wind capacity by 2030, allowing to reach almost 50% of the energy demand. This scenario assumes a market-driven evolution of the sector. Low scenario reach 63 GW of solar and 21 GW of wind capacity by 2030, achieved through a faster decrease in technology costs.

31-50

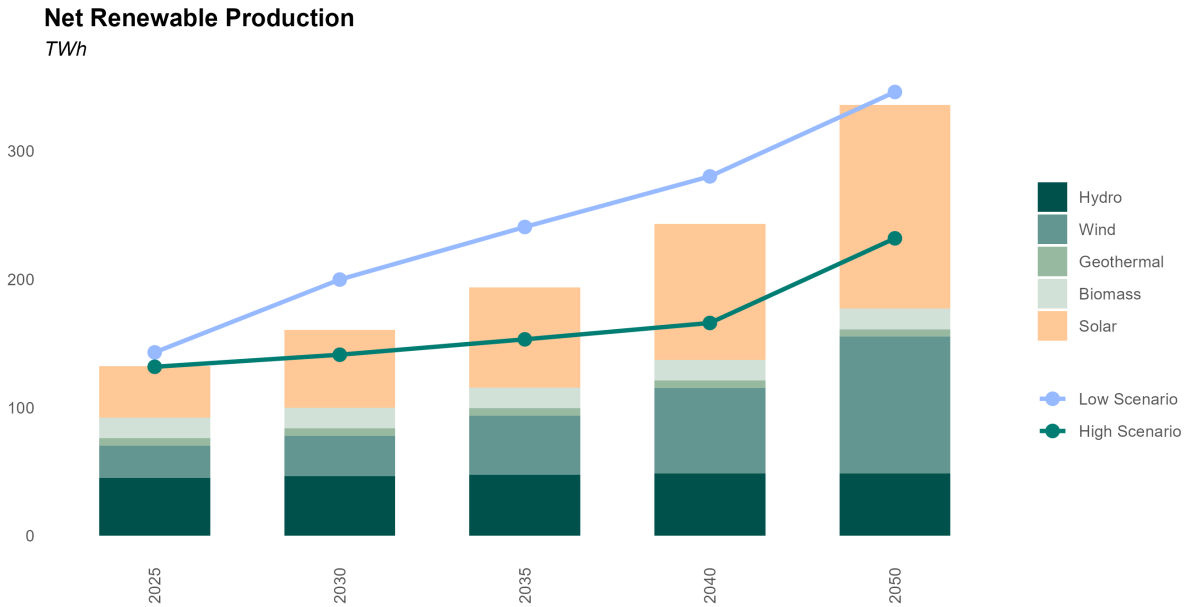
The Reference scenario predicts a continued increase in renewables penetration, with solar and wind capacity expected to reach 69 GW and 27.6 GW respectively, by 2040. A faster transition towards long-term decarbonization goals may be possible with greater-than-anticipated investments in grid infrastructure and high-capacity energy storage solutions.

Main updates

The assumptions regarding renewable capacity have been updated in line with the latest available data and consistently with the TSO connection requests.

5.6.2 Renewable Production

THE ACHIEVEMENT OF THE NIECP TARGETS RELATED TO THE ELECTRICITY SECTOR REQUIRES A GREAT EFFORT: A 2030 RES/GDC RATIO OF 65% COULD BE ACHIEVED ONLY WITH A STRONG ACCELERATION OF PROJECTS RECEIVING THE GREEN LIGHT IN THE NEXT FEW YEARS



Source: MBS Consulting elaborations

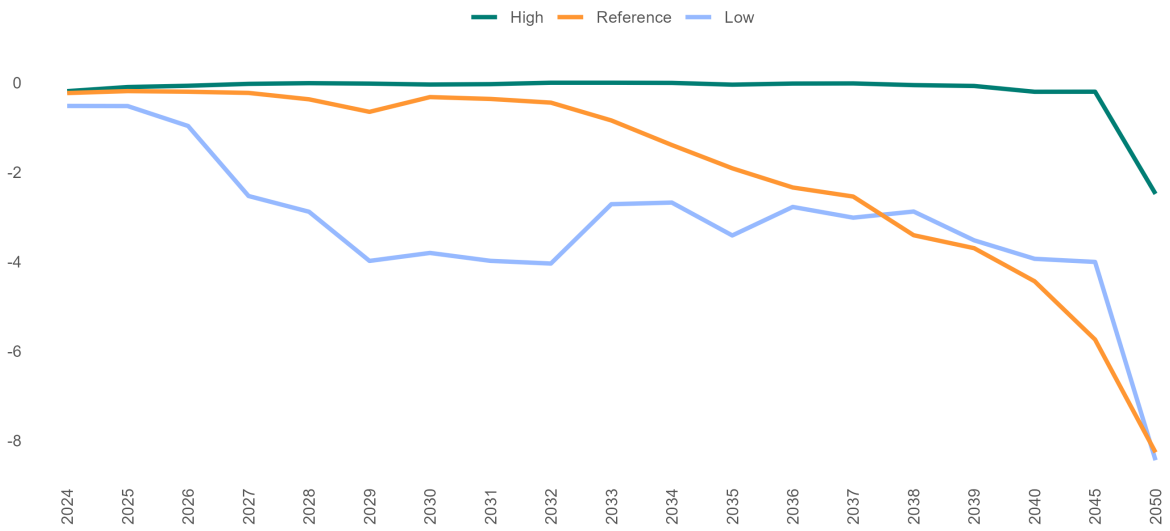
24-25	In the next two years, solar and wind production are assumed to reach past 60 TWh and 65 TWh by 2025. In the Low scenario, instead, the greater amount of investments in decarbonization projects leads to achieve 40 TWh (solar) and 27 TWh (wind) in the same period.
26-30	Assuming a BAU evolution of the market and the elimination of perming process constraints in the next future, an 90% quota of the 2030 RES/GDC ratio target is expected to be achieved. Only a greener evolution of the Italian system is expected to be able to lead to the full achievement of the target (55+ %). The achievement of Green Deal targets – possibly RES/GDC around 70%, yet to be defined – would surely require a greater effort instead.
31-50	The reduction of technology costs and consolidated market parity conditions could allow solar production to almost quadruple and wind generation to more than triple with respect to 2022 values in 2040 in the Reference scenario. Boundary condiotions of alternative scenarios lead to different degrees of renewable development and production level.
Main updates	RES production are in line with capacity installation and technology performance.

5.6.3 Day-Ahead Market Overgeneration

OVERGENERATION COULD BECOME SIGNIFICANT IN THE LONG-TERM, FOLLOWING THE HIGH RENEWABLE PENETRATION IN THE ENERGY MIX, PARTICULARLY IN THE SOUTHERN ZONES. ENERGY INTENSIVE STORAGES DEVELOPMENT AND ELECTROLYSIS CAPACITY INCREASE COULD MITIGATE THE MARKET COUNTEREFFECTS

Day-Ahead Market Overgeneration

TWh



Source: MBS Consulting elaborations

24-25

BAU market conditions and moderate renewable penetration lead to a minimum risk of overgeneration in Reference and High scenario, while a more sustained increase in capacity installation in the south macro- zone could lead to overgeneration in some hours.

26-30

Greater penetration of renewable energy sources expected after 2026, there is a possibility of overgeneration starting to increase, which could result in almost 4 TWh of excess electricity in the Low scenario by 2030. The curtailment effect may be emphasized in certain local grid conditions. Moreover, during this decade, overgeneration is likely to be exacerbated by the rapid development of renewable energy sources in the southern regions of the country and the lack of adequate grid reinforcement.

31-50

In order to effectively manage the growing penetration of renewable energy sources and the associated overgeneration phenomena, the 2030s will require significant investments in grid reinforcements and high- capacity energy storage solutions. These measures will be crucial for balancing the grid and ensuring stable energy supply, especially in regions that are particularly prone to overgeneration. This excess energy production could provide opportunities for the installation of electrolysis capacity, which would not only help to take advantage of excess energy production but also support ongoing investments in RES.

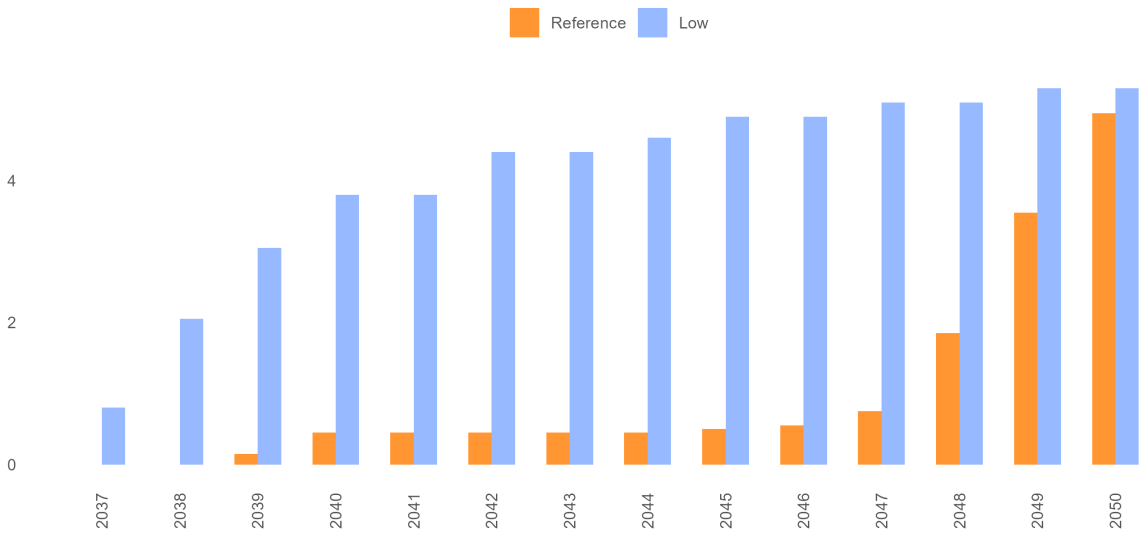
Main updates	Day-ahead market overgeneration updated according to new scenario hypothesis concerning RES installation and grid reinforcement.

5.6.4 Electrolyzer Installed Capacity

LONG-TERM RENEWABLE GROWTH IN SOUTHERN REGIONS WILL CAUSE EXCESS ENERGY, ESPECIALLY ON ISLANDS. GRID AND BESS DEVELOPMENT MAY NOT BE SUFFICIENT TO CONTAIN THE PHENOMENA, ELECTROLYSER MAY BE NEEDED. INSTALLED CAPACITY COULD REACH 0.5 GW IN REFERENCE AND 4 GW IN LOW SCENARIO, MAINLY IN SARDINIA AND SICILY

Electrolyzer Installed Capacity

GW



Source: MBS Consulting elaborations

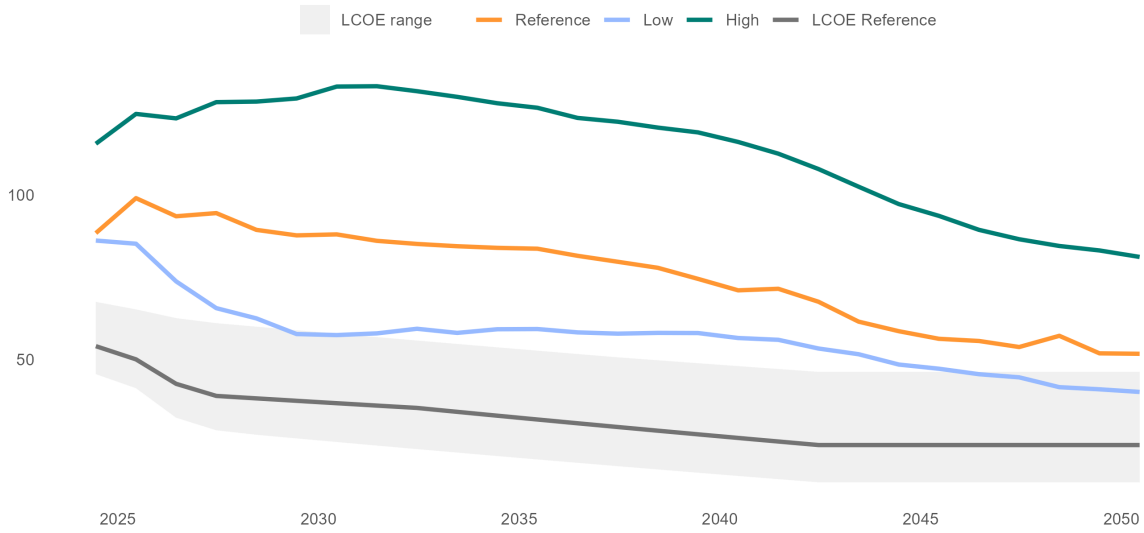
35-40	In the long-term the development of renewable capacity, in particular in the southern zones, increase the presence of systematic overgeneration in the system, mainly in the islands. Grid investments and BESS are going to be insufficient to mitigate the problem, creating favorable conditions for green hydrogen, installed electrolysis capacity could reach almost 0.5 GW in the Reference scenario, concetrated in Sardinia. In the long-term, electrolysis capacity can effectively address overgeneration by providing a means to store excess renewable energy. Additionally, by increasing demand during periods of high RES production, it can help sustain prices and mitigate the cannibalization effect, particularly during the advanced transition phase.
Main updates	Electrolysis capacity introduce in Reference and Low case scenario, considering Day-ahead market overgeneration update according to new scenario hypothesis concerning RES installation and grid reinforcement. Expected load factor at least between 1700 and 2000 equivalent hours. Commodities prices make green hydrogen competitive compared to grey.

5.6.5 Solar Market Parity

DESPITE THE REDUCTION IN COMMODITIES PRICES IS LOWERING ELECTRICITY PRICES, SOLAR PV CONTINUES TO BE COMPETITIVE, WITH CAPTURE RATES HIGHER THAN THE LIVELIZED COST OF ELECTRICITY

Fixed-tilt Solar PV LCOE Range and Captured PUN

€/MWh



Source: MBS Consulting elaborations

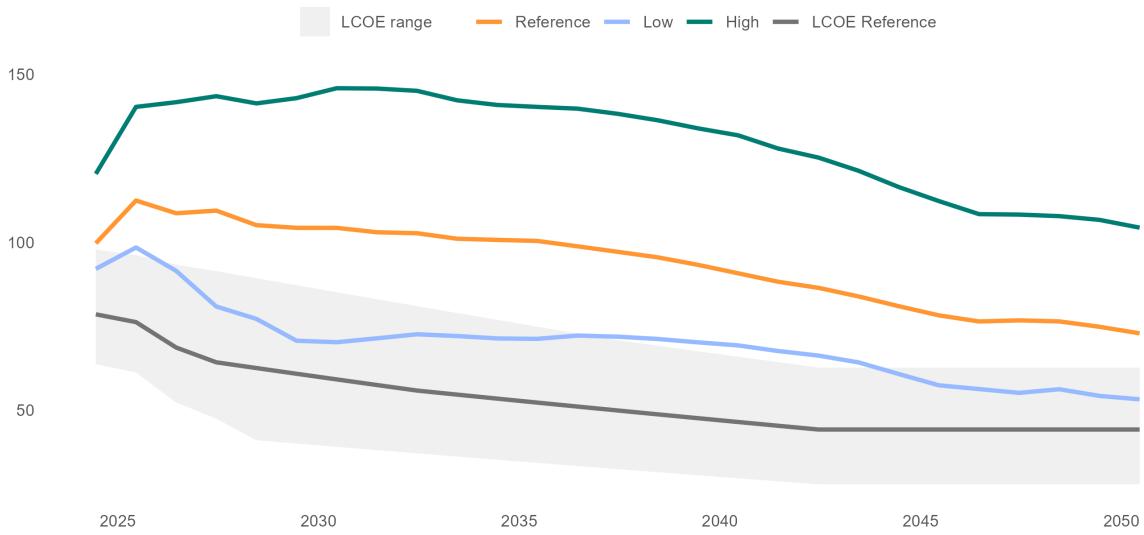
24-25	Even if some increase in technology costs has been observable in the last year, the solar energy sector continues to achieve market parity; as baseload prices are expected to settle above 100€/MWh during the 2024-2025 period, solar power plants are projected to capture rates that are significantly higher than the estimated levelized cost of electricity (LCOE) across all scenarios. This indicates a positive outlook for the solar energy industry, which is likely to remain competitive and profitable in the near future.
26-30	Despite the potential cannibalization effect on unlevered projects located in southern regions, market opportunities for merchant investments are expected to strengthen in the coming years.
31-50	The long-term outlook from 2030 on wards appears promising for the renewable energy sector, as the ongoing reduction in technology costs and the adoption of improved PPA best practices are expected to support non-incentivized investments. However, the cannibalization effect could become a significant factor in certain regions, such as Sardinia and Sicily, where the grid infrastructure may not be capable of efficiently redirecting energy flows.
Main updates	Captured prices driven by the commodities prices dynamics. No development of tracker technology assumed in the High scenario until 2040. LCOE metrics: 30-year me horizon, full equity financing, discount factor 7%.

5.6.6 Wind Market Parity

DESPITE THE REDUCTION IN COMMODITIES PRICES IS LOWERING ELECTRICITY PRICES, WIND MARKET PARITY IS GUARANTEED BY CAPTURED PRICES HIGHER THAN THE LIVELIZED COST OF ELECTRICITY

Wind LCOE Range and Captured PUN

€/MWh



Source: MBS Consulting elaborations

24-25	Wind market parity consolidates despite some increase in technology costs benefitting from the bullish trend of commodities that influence market prices. With yearly captured prices aligned to baseload prices, wind power plants are expected to achieve promising results, above the estimated levelized cost of electricity (LCOE) in all the scenarios.
26-30	Market opportunities for merchant investments are expected to consolidate, as wind assets do not suffer from cannibalization effects. Site-specific matters may however influence project economics.
31-50	Long-term perspectives from 2030 on wards are promising, following the continuous reduction of the cost of technologies and improved PPA best practices to support non-incentivized investments.
Main updates	Captured prices driven by the great surge in commodities prices. LCOE metrics: 35-year time horizon, full equity financing, discount factor 7%.

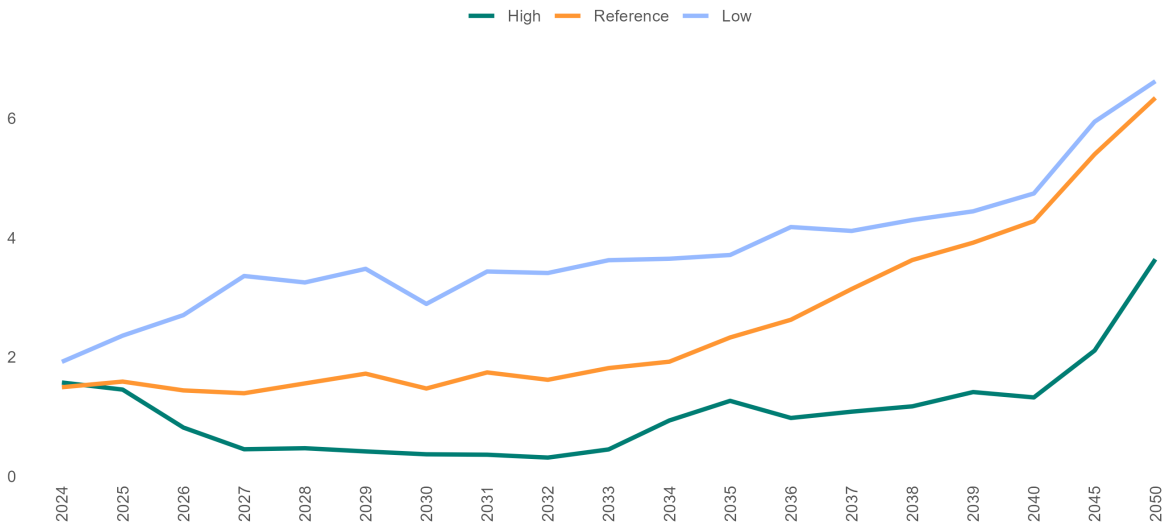
5.7 Storage

5.7.1 Pumped Hydro Production

DAY-AHEAD MARKET OPPORTUNITIES FOR PUMPED HYDRO POWER PLANTS CAN ARISE IN THE SHORT-TERM BECAUSE OF THE EFFECT OF VOLATILE PRICES, WILL MANIFEST IN THE LONG-TERM BECAUSE OF THE CONTINUOUS INCREASE OF NON-PROGRAMMABLE RENEWABLE PRODUCTION

Pumped Hydro Production

TWh



Source: MBS Consulting elaborations

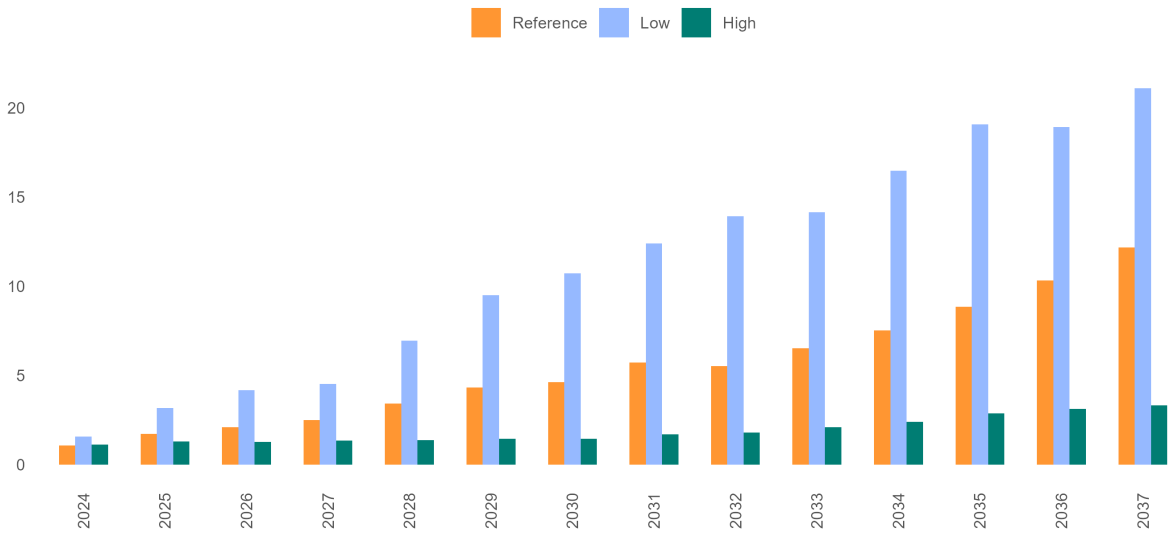
24-25	Within-day price spreads on the DAM could disclose opportunities for pumped hydro units, although the Ancillary Services Market (especially the real-me balancing phase) is expected to continue to be their main source of revenues.
26-30	Renewables development gradually increases the opportunities on the DAM. An accelerated development compared to the expected BAU trajectory could lead pumped hydro production volumes to reach 3.5 TWh in the Low scenario.
31-50	With a penetration of non-programmable renewable sources above 50% of total electricity needs, market opportunities furtherly increase: pumped hydro units help mitigate the solar cannibalization effect and help contain network congestions.
Main updates	Pure pumped hydro capacity currently amounts to about 4 GW and is not assumed to increase further in the future.

5.7.2 Power Intensive Electrochemical Storage

POWER INTENSIVE ELECTROCHEMICAL STORAGES CAN BE IN THE MONEY IN THE MID TERM: REVENUES DERIVE MAINLY FROM ANCILLARY SERVICES MARKET PARTICIPATION AND SPECIFIC SERVICES SUPPLY, AND COULD BE FURTHERLY SUSTAINED BY THE CHANGES BROUGHT BY THE FUTURE MARKET DESIGN REFORM. IN THE LONG RUN INCREASE IN RES QUOTA AND MORE VOLATILE PRICES FAVOR CONVERSION TO ENERGY INTENSIVE STORAGE

Power Intensive Electrochemical Storage

GW



Source: MBS Consulting elaborations

24-25	The first BESS (Battery Energy Storage System) projects are expected to come online in 2023 following the results of the Fast Reserve auctions held in December 2020. The pilot project proposed by Terna is based on the supply of a specific ultra-fast frequency regulation service paid with a fixed yearly capacity remuneration and is the first experience of development electrochemical storages in the italian market.
26-30	PI storages (1 hour of storage capacity) penetration is sustained by growing needs on the BM as non-programmable renewable capacity progressively increases, in the first years. After reaching the peak in the mid 20s, power intensive gradually contract, due to opportunities for converting their units in energy intensive storage to capture the increase volatile dynamics on DAM. Increased overgeneration and contractiion in ASM volumes reduce determine a gradual end in PI investments
31-50	Power intensive BESS capacity gradually disappear in the Reference and High scenario, progressively replaced by energy intensive BESS as they reach the end of the operational life, and remain available only in the Low scenario where higher RES capacity generate operativity signals on the ancillary service market.
Main updates	Power intensive storage updated taking in account ASM volumes dynamics and economic convenience.

5.7.3 Energy Intensive Electrochemical Storage

2024 CAPACITY MARKET AUCTION STARTED THE DEVELOPMENT OF ENERGY INTENSIVE STORAGES IN THE ITALIAN MARKET. LONG-TERM DEVELOPMENT OF SUCH KIND OF ASSET WILL BE KEY IN FOSTERING THE INTEGRATION OF RENEWABLES IN THE SYSTEM, WHEN THE GREAT SOLAR PENETRATION CREATES OPPORTUNITIES FOR TIME-SHIFTING APPLICATIONS ON THE DAY-AHEAD MARKET

Energy Intensive Electrochemical Storage

GW

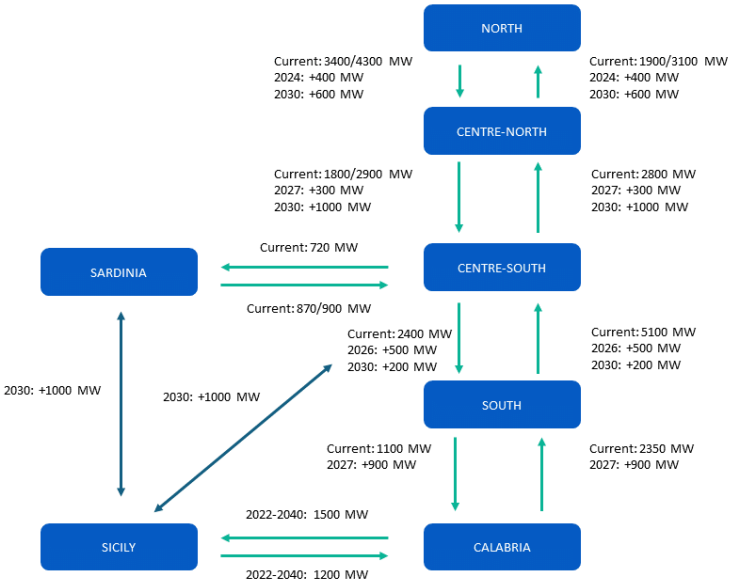
Source: MBS Consulting elaborations

24	2024 Capacity Market auction started the development of energy intensive storages in the Italian market, with more than 1.5 GW of new storage capacity – quite completely energy intensive (4 hours) – expected to hit the market by 2024 (possibly with some delays due to issue on the supply chain), with Sardinia and North to host about 0.8 GW and about 0.6 GW respectively.
25-30	The Day-Ahead Market presents promising market opportunities for merchant energy-intensive storage applications with a storage capacity of 4 hours. This is due to the increasing price spread volatility and the presence of overgeneration resulting from the development of renewable energy sources. Additionally, the gradual decrease in technology costs further enhances the attractiveness of energy-intensive investments.
31-50	Energy intensive applications reach an overall installed capacity of 22 GW in 2040. The larger installed capacity achieved in the Low scenario (near 31 GW in 2040) is consequence of greater opportunies both on the DAM and on the ASM.
Main updates	Energy intensive storage updated taking in account overgenertiaon dynamics and price volatility on the DAM.

6 Transmission Grid

6.1 Grid Reiforcements

IMPORTANT GRID REINFORCEMENTS TO BE REALIZED ALREADY IN THE MID 2020s BUT MAJOR IMPROVEMENTS ARE EXPECTED TO BE COMPLETED IN THE 2030s – TYRRHENIAN LINK AND ADRIATIC LINK. GREAT RES DEVELOPMENT GENERATE SIGNAL FOR FURTHER GRID REINFORCEMNTS AS INTER-ZONAL CONSTRAINT ARE NOT FULLY OVERCOM



24-25	In all the scenarios proposed, network constraints are aligned with the most recent indications provided by Terna.
26-30	Grid reinforcements are anticipated to enhance grid flow management and alleviate inter-zonal congestions on the mainland. By 2030, two significant HVDC infrastructures are expected to become operational: the Tyrrhenian Link, crucial for phasing out Sardinian coal-fired units, and the Adriac Link, aimed at reducing bottlenecks between southern and northern regions. However, these infrastructures are projected to be introduced with some delay compared to the proposed timeline by Terna and ARERA. In the Low scenario, they are assumed to be completed by 2028, while in the High scenario, they are expected to be operational by 2035.
31-50	Under BAU assumption, a further progressive reduction of inter-zonal constraints in the mainland is assumed to take place since 2035. In the Low scenario we assume the implementation of the infrastructure proposed by Terna for the Hypergird project to reach 30GW of exchange capacity between market zones. In the High scenario the long-term network development is much more limited instead.

Main updates

BAU grid development hypotheses based on the latest Development Plan published by Terna (2023) and on information publicly available concerning the feasibility of the various network improvements. Assumptions in the alternative scenarios are consistent with other boundary conditions.

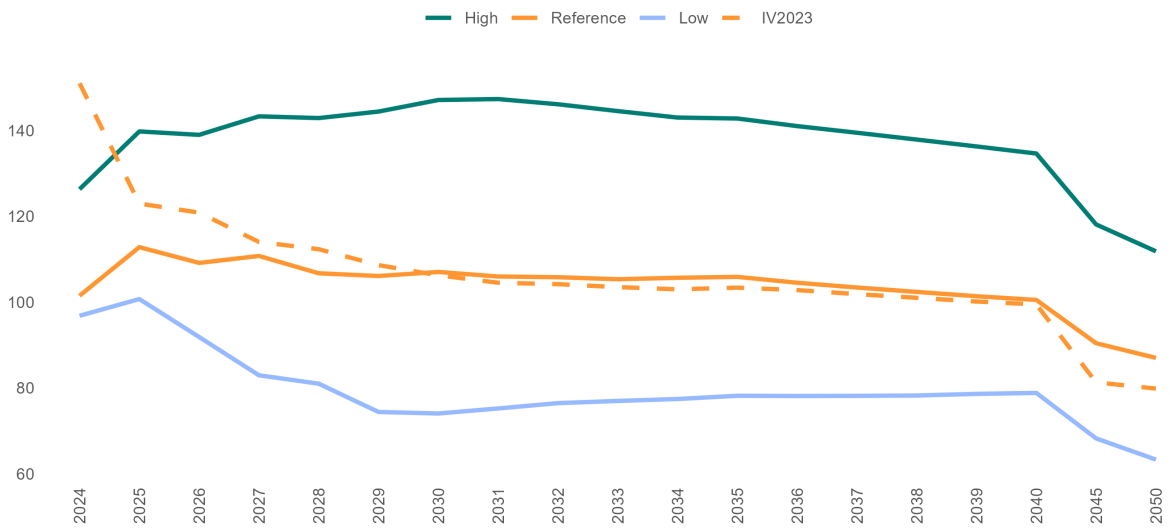
7 Power Market Prices

7.1 Baseload PUN

MORE FAVORABLE ECONOMIC CONDITIONS LEAD TO A REDUCTION OF PRICES IS EXPECTED IN THE SHORT-TERM. A GRADUAL NORMALIZATION OF PRICES IS EXPECTED IN THE MID-TERM. IN THE LONG-TERM, COMMODITIES ARE EXPECTED TO REACH AN EQUILIBRIUM AND PRICE WILL BE MAINLY DRIVEN BY CO2 VARIATION COSTS

Baseload PUN

€/MWh



Source: MBS Consulting elaborations

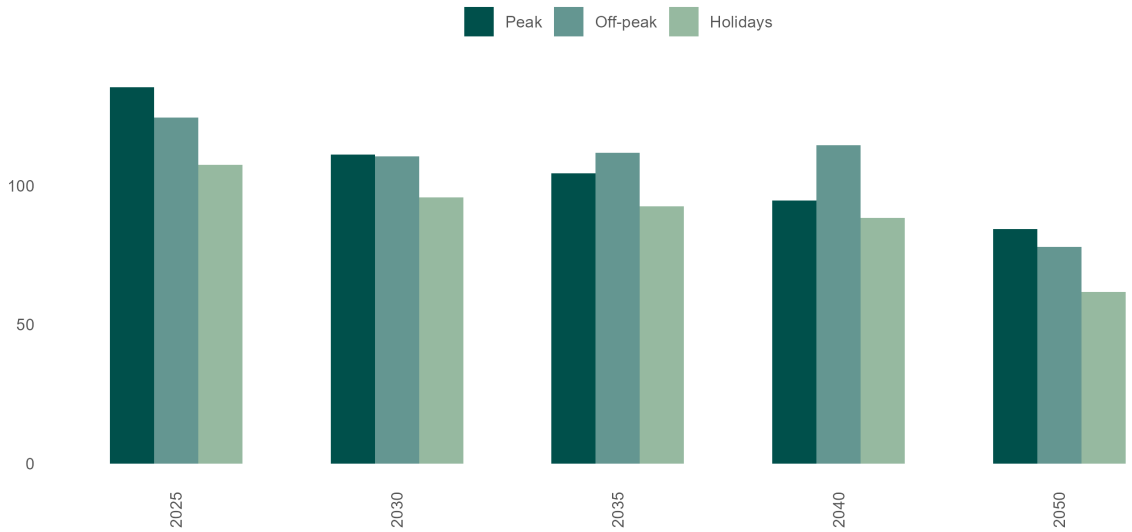
24-25	In the Reference scenario, markets dynamics are expected to relax in the next two years, with gas market continuing to stabilize. The increase in net import form the Northern zones, and the acceleration in new renewables production will bring electricity price to stabilize around 110 €/TWh.
26-30	In the later half of the 2020s, a gradual decline in commodities prices is expected due to the recovery of gas supply and economic growth. This decline, along with the increased development of RES, adoption of BESS technologies, and completion of crucial network infrastructure, is projected to bring prices below 110 €/MWh in the Reference case. A stronger focus on system decarbonization could even drive prices down to 75 €/MWh in the Low scenario.
31-50	In the long run, power prices are expected to be supported by ETS dynamics, with CCGTs being the marginal technology in the system for at least 85% of the me, causing the baseload PUN to largely reflect their average variable production costs. Depending on the level of decarbonization achieved in each scenario, the projected PUN range for 2040 is between 130-75 €/MWh.
Main updates	Compared to the previous update, the downward revision of commodities prices determines reduction in power prices during the mid 2020s. Long-term price trends are in line with previous update.

7.1.1 Peak-Load/ Off-Peak PUN

RENEWABLES PENETRATION, LED BY SOLAR ENERGY, IS EXPECTED TO STRONGLY AFFECT PEAK / OFF-PEAK DYNAMICS AFTER 2030, WHEN THE INVERSION OF PRICE SPREADS BETWEEN TIME SLOTS IS EXPECTED TO OCCUR

Average PUN per Time Slots, Reference Scenario

€/MWh



Source: MBS Consulting elaborations

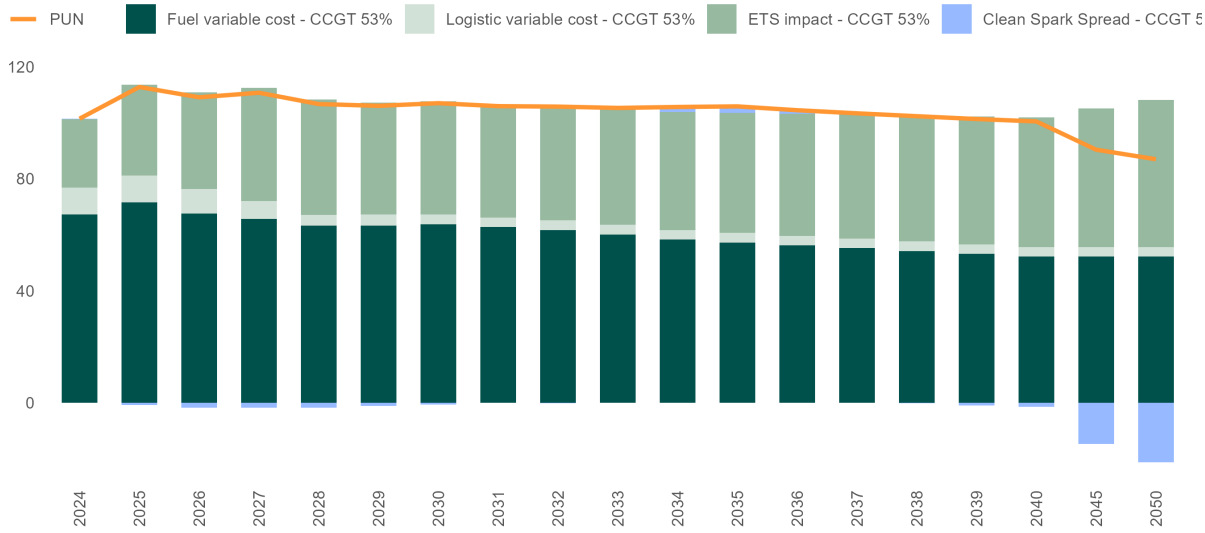
24-25	The positive price spread between evening and central hours of the day is expected to persist in the short- term, as renewables penetration remains under 40% of gross domestic consumptions.
26-30	Sustained solar development will sharpen the price decrease in the central hours of the day, especially in correspondence of large sunlight availability and low demand levels (e.g., during spring), gradually closing the gap between peak and off-peak prices.
31-50	The reverse trajectory of hourly price differentials is expected to continue in the long-term, favoring the increase of prices in off-peak hours. The growing penetration of energy intensive electrochemical BESS and the generally greater operativity of storage units could dampen the cannibalization effect produced by non- programmable solar power plants.
Main updates	The evolution of the price for the different categories of hours is in line with the previous market update.

7.1.2 Baseload PUN Components, Reference Scenario

CONTRACTION IN ELECTRICITY DEMAND AND INCREASE IN NET IMPORT REDUCE CSS FOR EXISTING CCGTs IN THE SHORT-TERM. AFTER THE PHASE-OUT OF COAL-FIRED UNITS, THE CCS IS EXPECTED TO REMAIN CLOSE TO NULL, AS THE GROWING PENETRATION OF RENEWABLES AND THE CM-SUPPORTED NEWBUILDS AFFECT COMPETITIVE DYNAMICS

Baseload PUN Components, Reference Scenario

€/MWh



Source: MBS Consulting elaborations

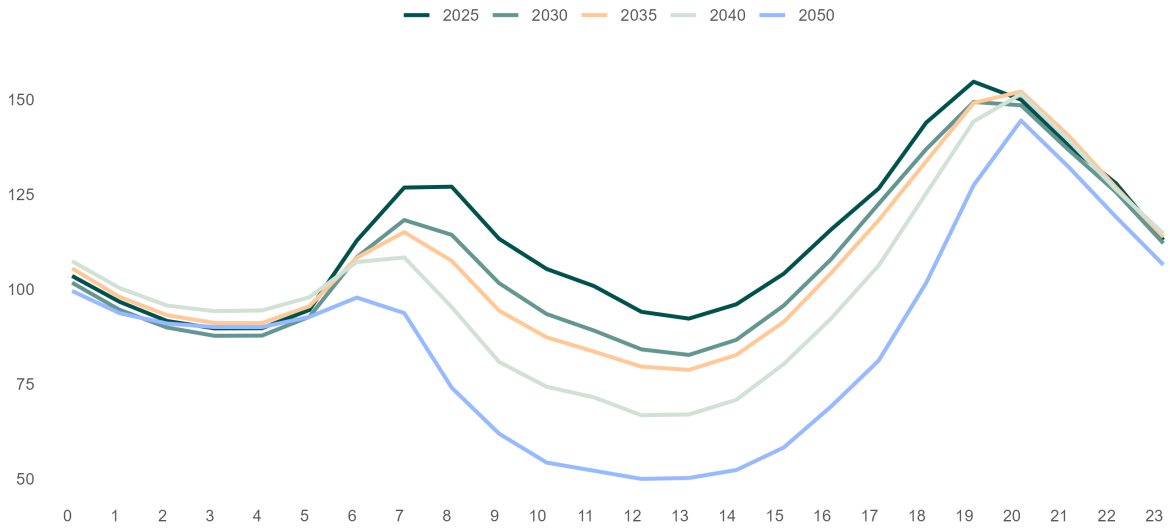
24-25	The reduction in commodities prices negatively affects the CSS of existing CCGTs, bringing it below zero. Despite that, they will continue to be the marginal technology in the Italian system, therefore setting a price lower than in the previous scenario.
26-30	In the second half of the 2020s, it is expected that existing CCGTs (Combined Cycle Gas Turbines) will benefit from the phase-out of coal-fired units in the peninsula and the growing demand, resulting in a baseload CSS (Clean Spark Spread) averaging around -1.7 €/MWh. However, this benefit will be challenged by factors such as the slowly decreasing trend of imported flows, intra-sectoral competition from CM- supported new builds, and the growing trend of renewables.
31-50	In the long-term, renewables are expected to dominate the generation mix. However, due to the decreasing trend of imported flows and increase in demand, existing CCGTs are favored and are expected to remain the marginal technology in the system for at least 85% of the hours.
Main updates	The reduction in commodies hypotheses is the main driver of downward price variations in the short- and mid- term, compared to the previous scenario. Long-term price trends are in line with previous update.

7.1.3 PUN Hourly Storage

INCREASING SOLAR PENETRATION SIGNIFICANTLY IMPACTS PRICES DURING CENTRAL HOURS OF THE DAY AND EXACERBATES DAILY PRICE DIFFERENTIALS IN THE LONG-TERM. THE EFFECT IS PARTIALLY MITIGATED BY THE DEVELOPMENT OF STORAGE UNITS

Hourly PUN Shape

€/MWh



Source: MBS Consulting elaborations

24-25	The effect of solar production during central hours of the day is still moderate as penetration remains limited. Price differentials during attain the day current average levels.
26-30	As solar penetration increases and the cannibalisation effect intensifies, the spread between central and morning/evening peak hours increase. The development of single-axis tracker installations, grid reinforcements, and power intensive storages only partially contain such effect.
31-50	As within-day price differential and the number of hours in which prices reach 0 €/MWh increase, supporting investments in electrolysis capacity, time-shifting applications on the DAM become interesting and trigger new investments in energy intensive storage units.
Main updates	The PUN hourly shape is in line with the results of the previous update. Lower short- and mid-term absolute values incorporate the effects of updated commodities assumptions.

7.2 Baseload Zonal Prices

IN THE SHORT-TERM, ZONAL PRICES ARE EXPECTED TO DIVERGE DUE TO DIFFERENCES IN THE DEMAND-OFFER BALANCE BETWEEN ZONES. IN THE LONG-TERM, THE STRONG DEVELOPMENT OF RENEWABLE ENERGY SOURCES IN THE SOUTHERN MACRO-ZONE AND IMPROVEMENTS IN THE TRANSMISSION GRID WILL AVOID ZONAL PRICES SPREAD EXPLOITATION

Baseload Zonal Prices, Reference Scenario

€/MWh

Source: MBS Consulting elaborations

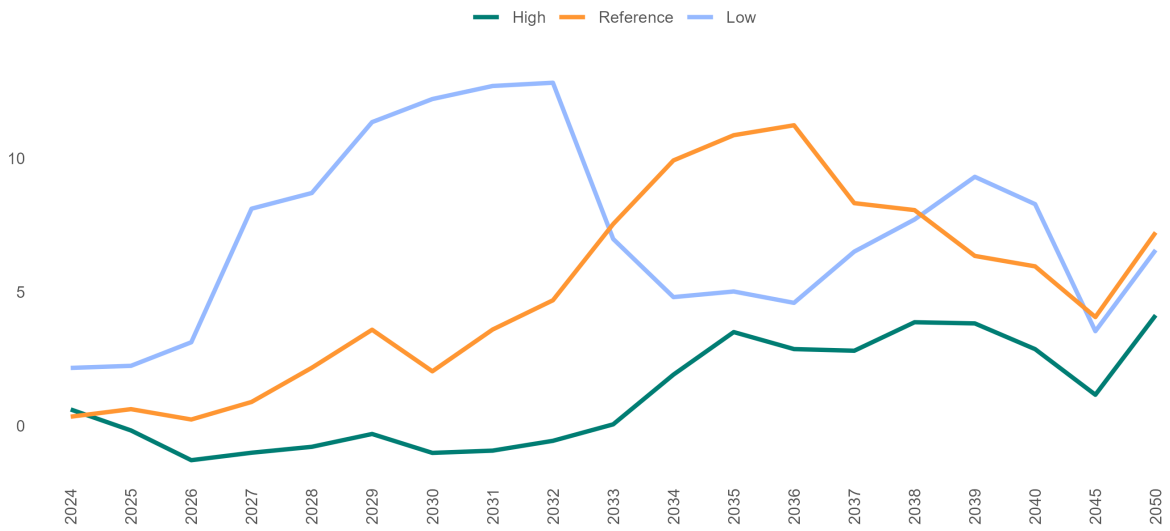
24-25	Network congestions are generally not a major issue on the mainland. Eletricity demand still below the historical level and gradual growth of renewable generation result in lower prices in the southern regions, while higher CCGT operations in the northern zones lead to higher than PUN prices, consistent with recent historical trends.
26-30	Renewable penetration will increase the number of inter-zonal congestions until 2030, when the completion of the Adriac Link is expected to partially contain the effect in the mainland and improve south-to-north energy exchanges. Nevertheless, a greater development of renewables energy sources in the southern zones is expected to gradually increase congestions occourrence, favoring price separation.
31-50	Despite the realized grid improvements, bottlenecks are expected to occur anyway between northern and southern zones, leading to different price levels between them in 2030s. Further grid reinforcements are assumed from 2035, with consequent minimization of inter-zonal congestion issues on the mainland, while criticalies remain evident in the islands.
Main updates	The dynamics of zonal prices are in line with the previous update.

7.3 Evolution of Baseload PUN-South Price Differential

THE EVOLUTION TREND OF THE SPREAD BETWEEN THE PUN PRICE – BASICALLY DRIVEN BY THE RESULTS OF THE NORTH MARKET ZONE – AND THE PRICE OF SOUTHERN MARKET ZONES STRONGLY DEPENDS ON THE ASSUMPTIONS RELATED TO RENEWABLES PENETRATION, STORAGE DEVELOPMENT, AND THE TIMING OF REALIZATION OF GRID INFRASTRUCTURES

Baseload PUN-South Price Differential

€/MWh



Source: MBS Consulting elaborations

24-25	The spread between the PUN and southern market zones (here represented by the South zone) is expected to mantain recent historical levels in the short-term, driven by operativity of coal units located in southern regions that, combined with a decreasing demand, results in CCGTs to become less determinant in establishing the zonal market price in those areas.
26-30	In the Reference case the phase-out of coal-fired units reduce the spread in the second half of the 2020s. In the Low scenario, instead, a greater renewables development contributes to further widen the spread, notwithstanding network interventions. In the High scenario, the spread is reabsorbed as switching conditions for gas-fired units gradually improve until in 2030, when coal generation become less competitive compared to gas.
31-50	In the Reference case, the great penetration of renewables in southern regions widens back the spread in the first half of the 2030s, providing the market signal for new electrochemical BESS to enter the market and for new grid investment to be realized. In the Low scenario, the anticipated and greater development of storage and network investments helps reduce the spread instead. Continuos RES development widen again the spread in the second half of the 2030s.
Main updates	The evolution of the spread between the PUN and southern zonal prices depends on the assumptions related to renewables, storage, and grid developments.

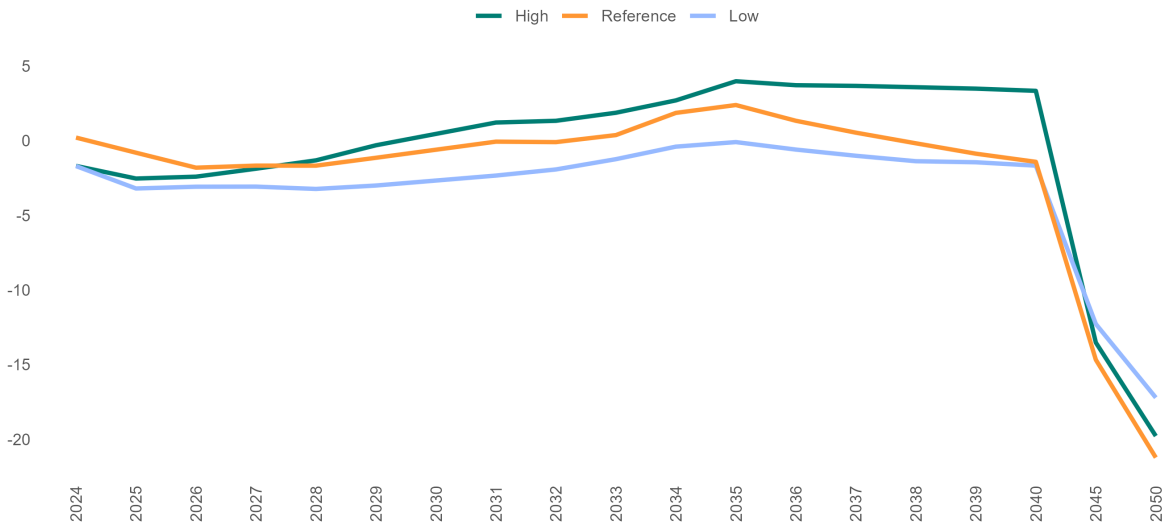
7.4 Clean Spark Spread

7.4.1 Baseload CSS for Existing CCGT Units

BASELOAD CSS EXPECTED TO DECREASE IN THE SHORT-TERM FOLLOWING REVERSE SWITCHING DYNAMICS. REFERENCE MID-TERM AND LONG-TERM VALUES EXPECTED TO STABILIZE IN THE -1/-2 €/MWh RANGE. MISSING MONEY ISSUES LIKELY TO ARISE IN THE SECOND HALF OF THE 2020s AND TO BE AMPLIFIED IN ALTERNATIVE SCENARIOS

Baseload CSS for Existing CCGTs

€/MWh



Source: MBS Consulting elaborations

24-25	CSS for existing CCGTs is expected to be slightly positive in the next year, as the power-plants will still represent the marginal technology in the Italian market scenario.
26-30	The market competition is expected to increase with the stable import flows from the northern borders, the rise in renewable capacity, and the entry of approximately 1.8 GW high-efficiency CCGTs, which were acquired through the 2024 Capacity Market auctions. These factors will keep the baseload CSS in negative territory. In the Low scenario, where renewable development is greater, and in the High scenario, where demand is lower, and the competition within the thermoelectric sector is stronger, this effect will be even more pronounced.
31-50	After 2030, a significant decrease in net import flows and the exit of some ageing capacity allow existing CCGTs (53%-efficiency) to remain the marginal technology in the system for at least 85% of the hours, with the baseload CSS around -1 €/MWh. Greater renewable penetration in the Low scenario, maintain the baseload CSS below 4 €/MWh also in the long-term. In the High scenario reduce renewable development favor CCGT production increasing the baseload CSS.

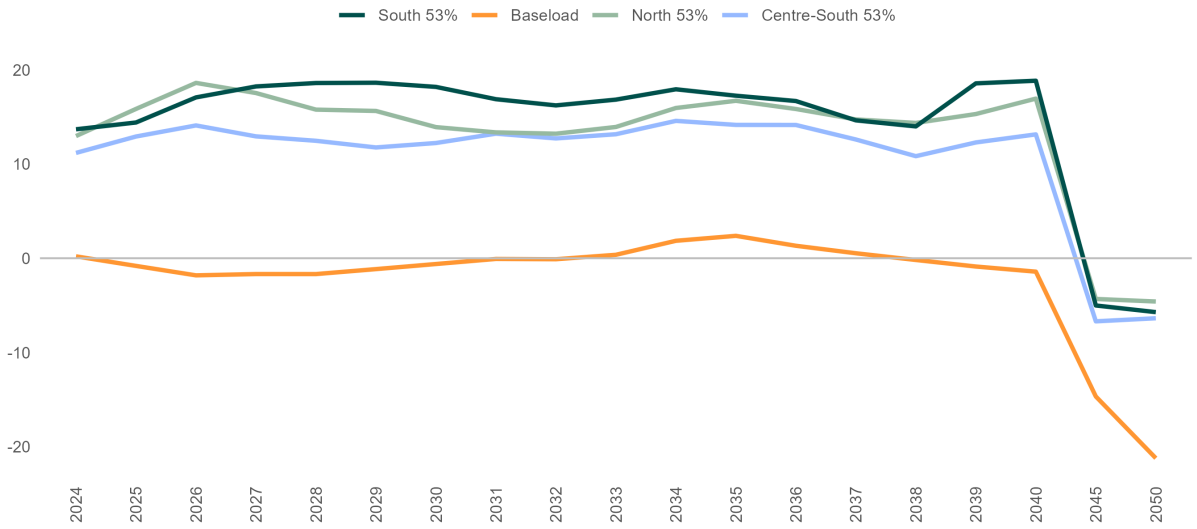
Main updates	Increase in CSS in the short term is driven by reviewed mix generation in the three scenarios.

7.4.2 Day-Ahead Market Profitability for CCGT Units

IN THE SHORT-TERM, EXISTING UNITS ARE EXPECTED TO SUFFER FROM WEAKER SWITCHING CONDITIONS, BUT THE GROWING PENETRATION OF SOLAR IS EXPECTED TO BOOST EVENING PRICE SPIKES IN THE MID- AND LONG-TERM. HIGH-EFFICIENCY UNITS TO MAXIMIZE DAM VOLUMES WHILE PRESERVING A DOUBLE DIGIT CAPTURED MARGINALITY

Captured CSS of CCGT Units, Reference Scenario

€/MW



Source: MBS Consulting elaborations

24-25	Captured CSS evolve depending on the zone mix, with southern bidding zones suffering the high operativity of coal-fired units and significant risk of operation at loss, while CCGT producing in the northern zone manage to guarantee positive margins at around 20 €/MWh , favored by the current market dynamics.
26-30	As renewable capacity increases, existing units tend to concentrate their operations during evening hours to maximize captured margins. The high-efficiency gas-fired capacity captured CSS is subject to competitive market conditions as new projects enter the market with support from the latest CM auction. Despite this, the high efficiency of these projects enables them to maintain an average captured margin above 15 €/MWh.
31-50	Growing renewable penetration intensifies overgeneration phenomena and accentuates evening price spikes, determining an increasing trend for captured marginality for existing units in the first half of the 2030s but load factors reduce progressively on increasing renewables share and increase competition from high efficiency units.
Main updates	Expected load factor and marginality of CCGT units depend on updated hypothesis concerning commodity prices, market dynamics and new thermoelectric installed capacity.

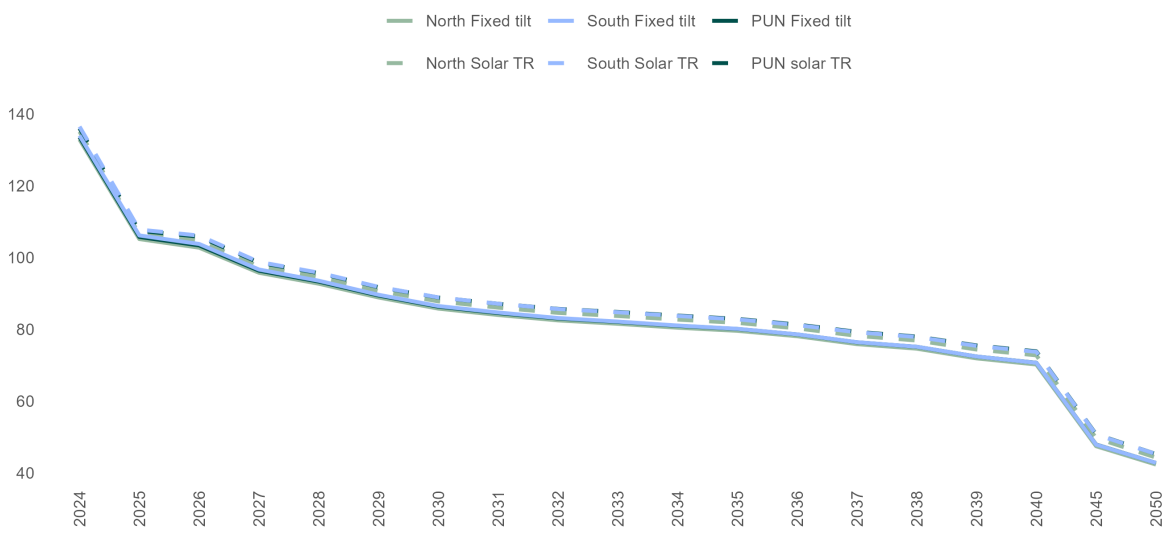
7.5 Captured Prices of Renewable Sources

7.5.1 Solar Captured Prices

PROGRESSIVELY INCREASING CANNIBALIZATION EFFECT IS EVIDENT ON SOLAR PRICES FROM THE LATE 2020s, ESPECIALLY IN SOUTHERN MARKET ZONES, WHERE RENEWABLE PENETRATION IS GREATER AND INTERCONNECTION CAPACITY WITH NORTHERN ZONES IS LIMITED

Solar Captured Prices, Reference Scenario - detail of North and South market zones

€/MWh



Source: MBS Consulting elaborations

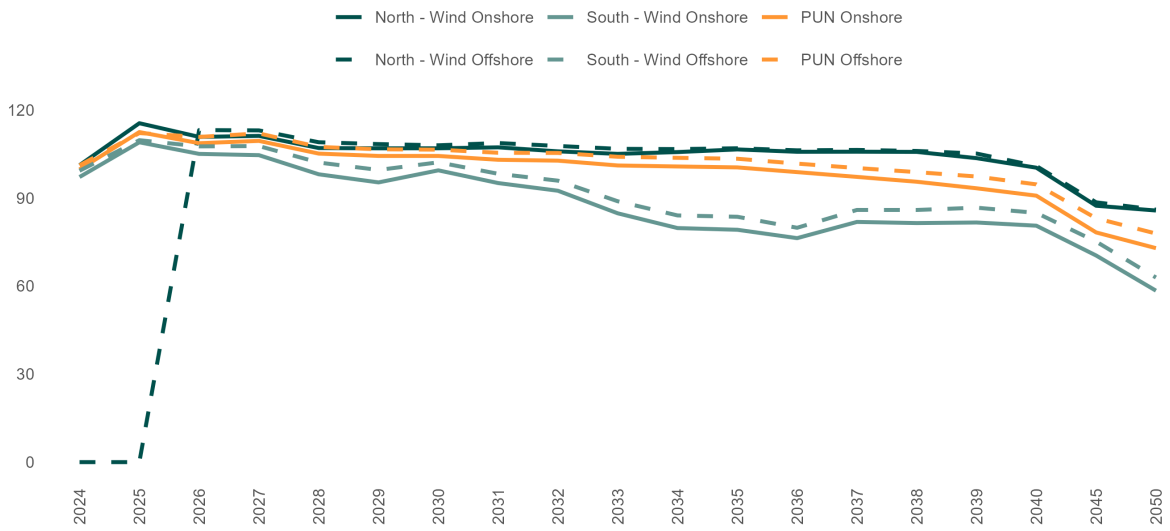
24-25	Solar power plants benefit of power prices, with captured prices around 133 €/MWh.
26-30	Increasing pace of installations and the consequent cannibalization and overgeneration effects – only partially limited by power intensive storages and grid developments – have an impact on zonal captured prices, which trend diverges compared to baseload prices.
31-50	The increasing occurrence of overgeneration serves as a market signal for the entry of energy-intensive storages, which partially mitigate the cannibalization phenomenon. After 2030, the cannibalization effect becomes more noticeable in the captured prices of solar energy, parcularly in southern market zones with higher renewable penetration.
Main updates	Short- results supported by the trend of commodities prices and their effect on power prices. Mid and long- term results are affected by the high degree of cannibalization effect.

7.5.2 Wind Captured Prices

WIND GENERATION IS LESS CONCENTRATED THAN SOLAR PRODUCTION AND ITS GREATER DISTRIBUTION OVER THE SEASONS AND THE HOURS OF THE DAY LEADS CAPTURED PRICES TO ALIGN WITH – OR EVEN OUTPERFORM – BASELOAD PRICES

Wind Captured Prices, Reference Scenario - detail of North and South market zones

€/MWh



Source: MBS Consulting elaborations

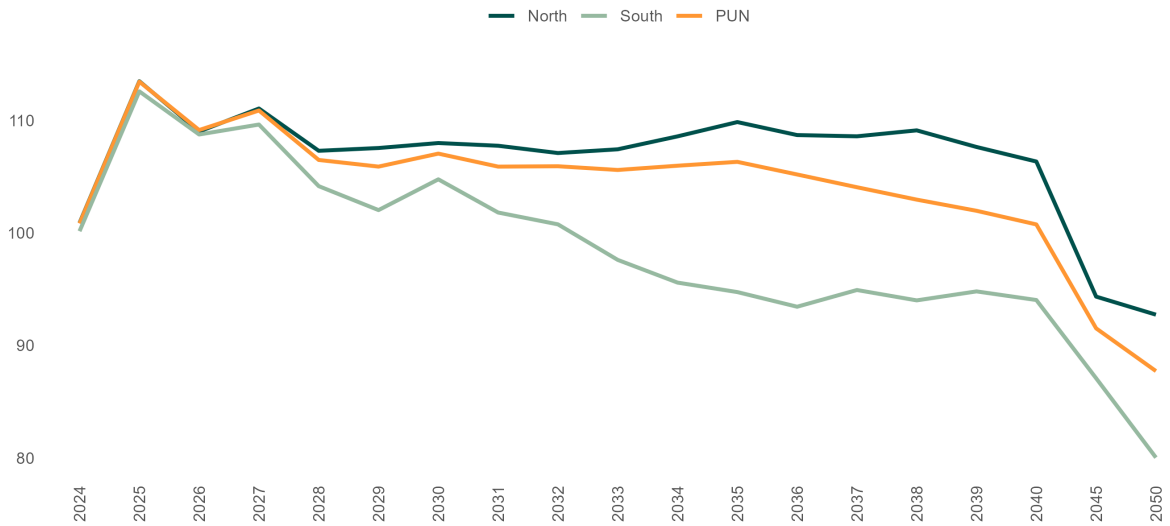
24-25	Captured prices are aligned to zonal baseload prices and benefit from power prices, with captured price around 100€/MWh.
26-50	Captured prices remain basically in line zonal baseload prices also in the long-term. The overgeneration induced by the growing solar production has a major impact in the early 2030s, but the results of both sources remain more connected to zonal market dynamics than to the evolution of the price shape. Also, both sources benefit from a production profile which is more distributed over the hours of the day and over the year.
Main updates	Short- results supported by the trend of commodities prices and their effect on power prices. Mid and long- term results are affected by the high degree of cannibalization effect.

7.5.3 Hydro Run-of-River Captured Prices

HYDROPOWER GENERATION IS MORE SENSITIVE TO SEASONAL WATER INFLOWS TRENDS THAN TO HOURLY VARIABILITY, SO THAT CAPTURED PRICES REMAIN BASICALLY IN LINE WITH BASELOAD PRICES

Small-size, Run-of-river Hydro Captured Prices, Reference Scenario

Small-size, Run-of-river Hydro Captured Prices, Reference Scenario



Source: MBS Consulting elaborations

24-25	Captured prices are basically aligned to zonal baseload prices and benefit from high power prices.
26-50	Captured prices remain basically in line zonal baseload prices also in the long-term. The overgeneration induced by the growing solar production has a major impact in the early 2030s, but the results of both sources remain more connected to zonal market dynamics than to the evolution of the price shape. Also, both sources benefit from a production profile which is more distributed over the hours of the day and over the year.
Main updates	Short- results supported by the trend of commodities prices and their effect on power prices. Mid and long- term results are affected by the high degree of cannibalization effect.

8 Ancilliary Services & Fuels Mix

8.1 Ancilliary Services Volumes, Reference Scenario

ANCILLARY SERVICES NEEDS ARE EXPECTED TO SHRINK IN THE FUTURE FOLLOWING THE MOST RECENT PAST, AS A CONSEQUENCE OF PECULIAR MARKET CONDITIONS AND CHANGES IN THE SYSTEM MANAGEMENT APPROACH ADOPTED BY THE TSO. IN THE LONG-TERM BESS AND GRID DEVELOPMENT CAN IMRPOVE THE ANCILLARY SERVICES MARKET

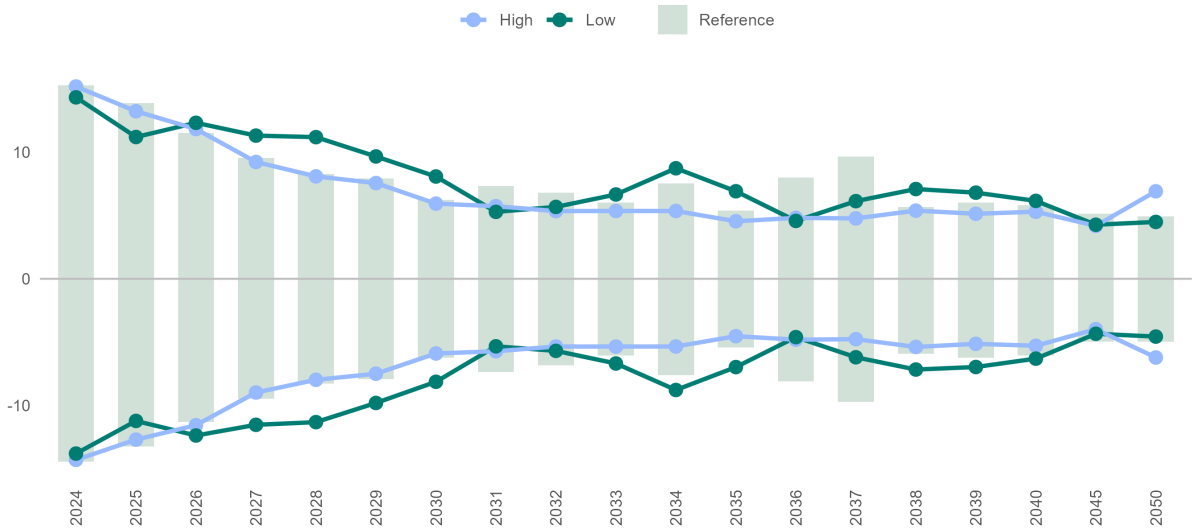
24-25	Procured ex-ante ancillary services volumes are expected to partially recover from 2022, but remaining lower compared to the past as a consequence of (i) greater availability of thermoelectric running reserve due to reversed switching conditions, (ii) changes in the network management approach adopted by Terna since the beginning of the cost-containment incentive scheme (2022), (iii) feasibility intervals imposed to power plants in the new Intra-Day Market structure.
26-31	The exit of coal-fired units on the mainland and the progressive increase in the energy mix of renewable production are compensated by the entry of (i) new thermoelectric and energy intensive storage capacity sustained by the Capacity Market mechanism, and (ii) the diffusion of power intensive BESS that are going to reduce the need of ex ante scheduling, given the availability of flexible resources in the system.
31-50	ASM ex-ante volumes are expected to contract and then remain stable during the 2030s as consequence of a more efficient purchase, thanks to flexible resources and grid reinforcement. On the other side an increase of MB can be expected in line with the increasing volatility driven by the strong development of RES in the scenario, sustaining units operativity.
Main updates	ASM volumes incorporate the most recent trends – which are reckoned to be structural in the market – over the entire me horizon simulated. Upward and downward volumes resulting from our model are very symmetric due to the deterministic approach adopted in the simulations. The contingent portion of balancing market linked to real time imbalances are not included in the estimations.

8.2 Ancilliary Services Volumes, Alternative Scenario

ANCILLARY SERVICES EX-ANTE VOLUMES EVOLVE ACCORDING TO THE COMPOSITION OF THE GENERATION MIX AND DAM DYNAMICS IN THE DIFFERENT SCENARIOS. IN THE POST-2030 SCENARIO, STORAGE SYSTEMS AND GRID REINFORCEMENTS ARE EXPECTED TO LIMIT THE EXPANSION TREND IN THE THREE SCENARIOS

ASM Ex-ante Zonal Volumes, Alternative Scenario

TWh

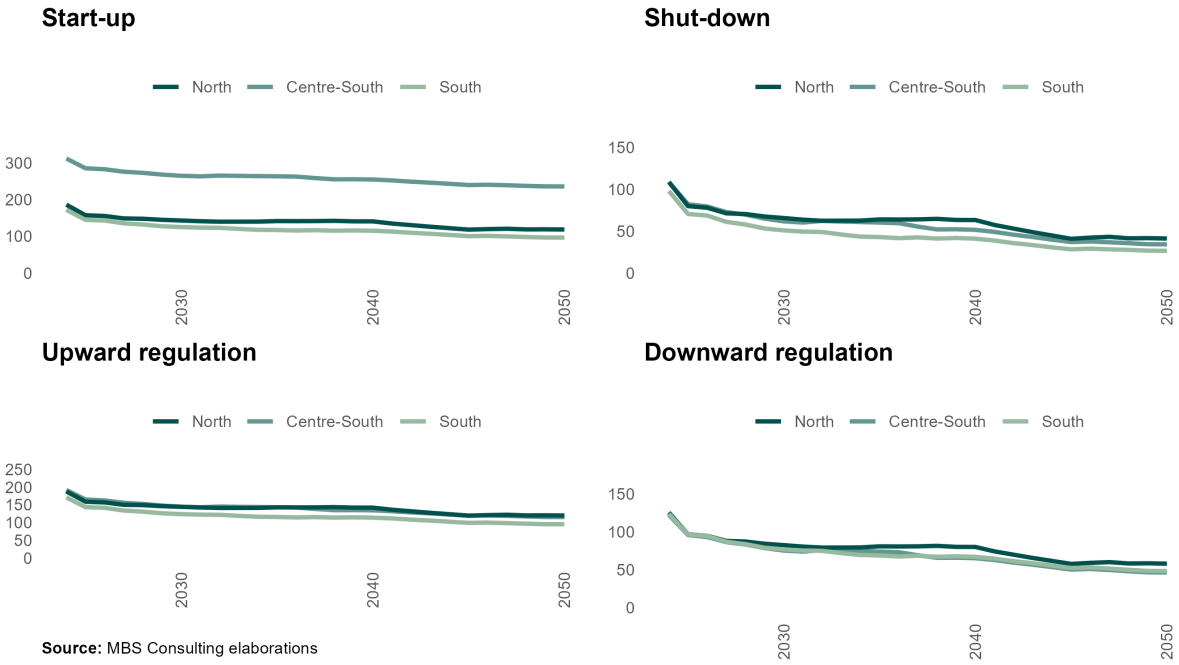


Source: MBS Consulting elaborations

24-25	Procured ex-ante ancillary services volumes are expected to remain low compared to the recent past also in the alternative scenarios, with some differences determined by the different degree of competition in the thermoelectric sector on the DAM – that translates into different levels of running reserve.
26-31	Rapid growth of non-programmable renewable generation in the Low scenario is counterbalanced by grid developments and a faster development of energy intensive storages. In the High scenario the development of less flexible resources increases the need to purchase more volumes on MSD.
31-50	In the Low scenario, further grid development and a major development of energy intensive storage assets help containing ASM volumes. In the High scenario instead ASM volumes remains stable, because of an increased presence of CCGT on the DAM and the of still active coal plants untill 2025, furthermore development of energy intensive storage allows to beer regulate the system.
Main updates	ASM volumes incorporate the most recent trends – which are reckoned to be structural in the market – over the entire me horizon simulated. Upward and downward volumes resulting from our model are very symmetric due to the deterministic approach adopted in the simulations. The contingent portion of balancing market linked to real me imbalances are not included in the estimate.

8.3 Ancilliary Services Market prices

GRID BOTTLENECKS RESOLUTION AND BESS PENETRATION ARE AMONG THE MAIN DRIVERS OF THE FUTURE ASM COMPETITIVE DYNAMICS. THE CAPACITY MARKET STRIKE PRICE (IN DELIVERY YEARS) COULD BECOME THE REFERENCE UPWARD PRICE, WITH MAJOR IMPACTS IN THE CENTRE-SOUTH MARKET ZONE



Source: MBS Consulting elaborations

24-25

During the first years of delivery of the Capacity Market, the strike price is expected to have a cap effect on prices for start-up and upward regulation, especially in the Centre-South market zone. However, the recent downward trend of ASM volumes could foster price competition all over Italy compared to past years.

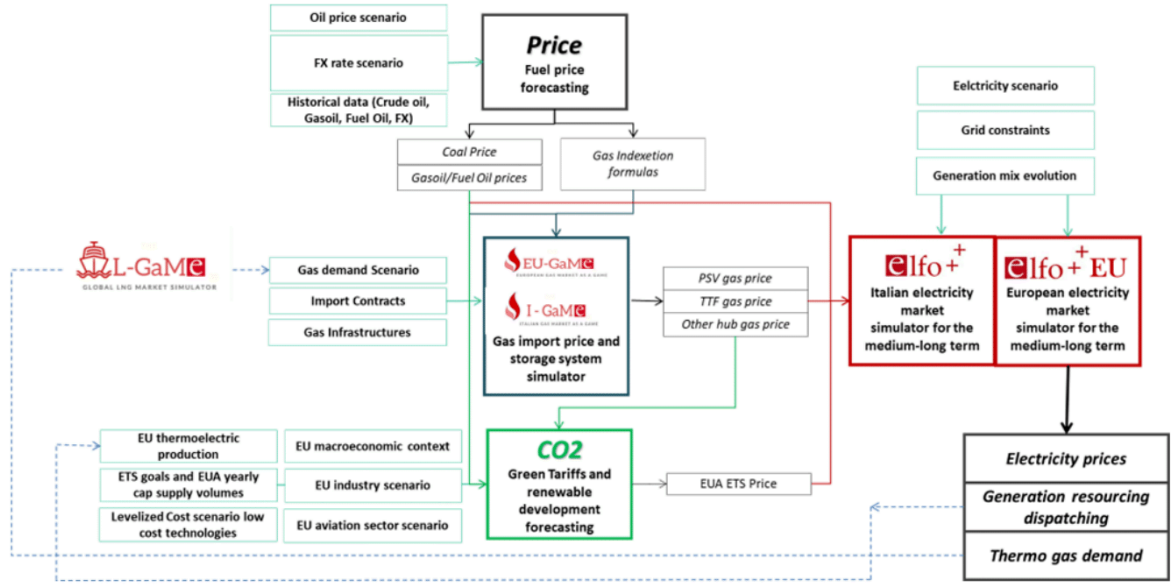
26-50

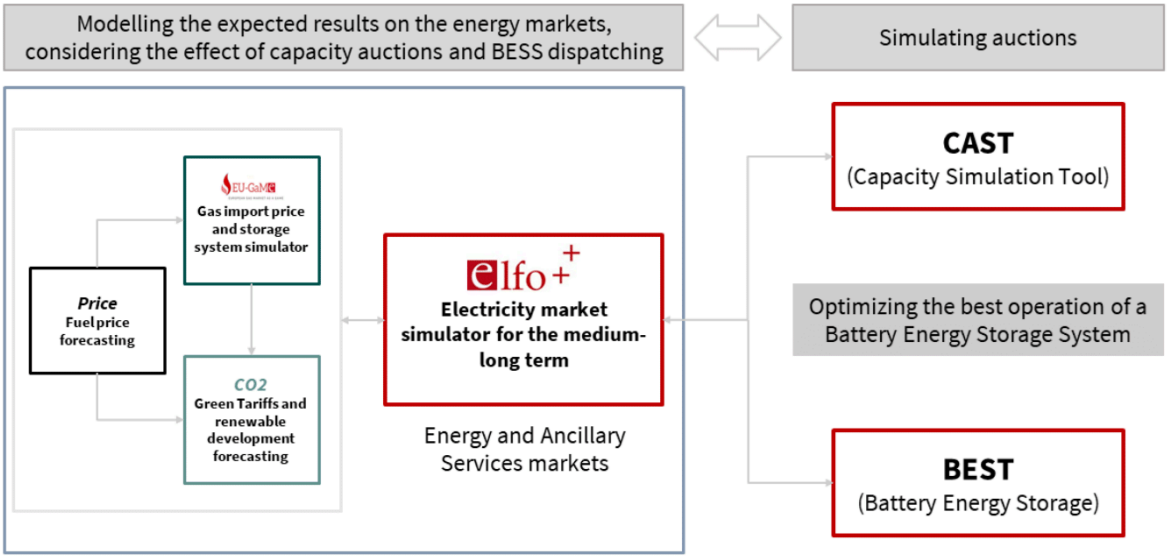
Price competition on the ASM is expected to grow progressively as innovative technological solutions will be gradually available in the system at an increasingly competitive price (e.g., electrochemical storages). Under the hypothesis of an extension of the capacity remuneration mechanism, the strike price, together with the LCOS of batteries, could become the main factors influencing ancillary services prices in the future.

Main updates

Price projections are based on a statiscal approach describing the historical bidding strategies of market players on the ASM. Historical distribuotins of price spreads between DAM and ASM prices for each type of service are assumed constant in the future. Compared to the previous release, the new ASM price projections incorporate the effects of updated hypothesis determining DAM dynamics and prices.

9 Our Suite of Market Models





ELFO ++ suite has been included among the benchmark models for energy systems' planning in the World Bank database and it is included in the top list of electricity market simulation models prepared in 2017 by the Joint Research Center of European Commission. ELFO ++suite and its database are used for research acvities in numerous universities with which REF-E has a consolidated collaboration (Florence School of Regulation, University of Milan-Bicocca, Bocconi University, Milan Catholic, Milan Polytechnic, Turin Polytechnic, University of Pavia, University of Padua, University of Verona, others).

10 Acronyms

ACER	Agency for the Cooperation of Energy Regulators
AL	Adriatic Link
ARERA	Autorità di Regolazione per Energia Reti e Ambiente
ASM	Ancillary Services Market
BAU	Business-As-Usual
BESS	Battery Energy Storage System
BM	Balancing Market
CALA	Calabria, market zone of the Italian system
CCGT	Combined Cycle Gas Turbine
CDS	Clean Dark Spread
CM	Capacity Market
CNOR	Centre-North, market zone of the Italian system
CpC	Cost per Cycle (referred to BESS)
CRM	Capacity Remuneration Mechanism
CSS	Clean Spark Spread
CSUD	Centre-South, market zone of the Italian system
DAM	Day-Ahead Market
EC	European Commission
ECB	European Central Bank
EI	Energy Intensive (referred to BESS)
ETS	Emission Trading System
EV	Electric Vehicles
FED	Federal Reserve (US)
GCV	Gross Calorific Value
GDC	Gross Domestic Consumption
GDP	Gross Domestic Product
GHG	Green House gases
GME	Gestore dei Mercati Energetici
GSE	Gestore dei Sistema Energetico
GY	Gas Year
H&C	Heating and Cooling
HVDC	High Voltage Direct Current
IDM	Intraday Market
IMF	International Monetary Fund
IPEX	Italian Power Exchange
LNG	Liquefied Natural Gas
NDP	National Development Plan
NIECP	National Integrated Energy and Climate Plan
NORD	North, market zone of the Italian system
NRRP	National Recovery and Resilience Plan

OCGT	Open Cycle Gas Turbine
OECD	Organization for Economic Co-operation and Develpment
OTC	Over-the-counter
PdS	Piano di Sviluppo (Development Plan, Terna)
PEV	Pure Electric Vehicle
PHEV	Plug-in Hybrid Electric Vehicle
PI	Power Intensive (referred to BESS)
PSV	Punto di Scambio Virtuale
PUN	Prezzo Unico Nazionale
PV	Photovoltaic
RES	Renewable Energy Source(s)
RES-E	Electricity from Renewable Energy Source(s)
RIU	Reti Interne di Utenza
SARD	Sardinia, market zone of the Italian system
SEU	Sistemi Efficienti di Utenza
SICI	Sicily, market zone of the Italian system
STEG	Société Tunisienne de l'Electricité e du Gaz
SUD	South, market zone of the Italian system
TAP	Trans Adriatic Pipeline
TIDE	Testo Integrato del Dispacciamento Elettrico
TL	Tyrrhenian Link
TSO	Transmission System Operator
TTF	Title Transfer Facility
TYNDP	Ten-Year Network Development Plan
WACC	Weighted Average Cost of Capital