2026–2030

Balancing Roadmap Switzerland

swissgrid

Contents

Introduction

Dear reader,

As the Swiss transmission system operator (TSO), one of Swissgrid's responsibilities is to procure frequency control products to ensure the balance between electricity generation and consumption. Since the publication of the last Balancing Roadmap in 2018, the energy systems and balancing markets in Switzerland and Europe have undergone rapid change and development. Swissgrid is now faced with additional challenges in ensuring grid stability due to the strong growth in electricity generation from photovoltaics (PV), the increase in flexibility potential enabled by new technologies, regulatory developments and advances in digitalisation.

The balancing markets on which frequency control products are procured must therefore be continuously reviewed and developed. This Balancing Roadmap presents the planned developments up to 2030 for the balancing markets and other factors that influence frequency control. It is intended for current and potential ancillary services providers (ASPs), companies owning flexible assets and other interested readers.

Due to the delay in concluding an electricity agreement with the EU and the ongoing exclusion of Swissgrid from the European automatic Frequency Restoration Reserve (aFRR) and manual Frequency Restoration Reserve (mFRR) platforms*, all preparations for a corresponding go-live were suspended in 2022. Since then, Swissgrid has concentrated on shaping the Swiss balancing markets while continuing to pursue existing international collaborations. In the coming years, Swissgrid will focus on the following topics:

* Swissgrid's technical readiness was confirmed. Switzerland's participation in the aFRR and mFRR platforms is governed by Articles 1.6 and 1.7 of the Electricity Balancing Guideline and, at the time of publication, is the subject of two legal proceedings against ACER before the European Court of Justice.

- Facilitating access to the balancing markets for new technologies and market players while maintaining non-discriminatory market conditions
- Enabling seamless integration into European balancing processes as soon as regulatory conditions allow
- Reducing the need for balancing energy by strengthening the day-ahead and intraday markets and enabling balance groups to actively support system balance
- Leveraging the opportunities offered by digitalisation and new decision-support systems

As the Swiss electricity system continues to evolve, Swissgrid encourages more market players to offer their flexibility on the balancing markets. This will not only increase the security and efficiency of the system, but also support the integration of renewable and flexible resources in line with Switzerland's energy strategy.

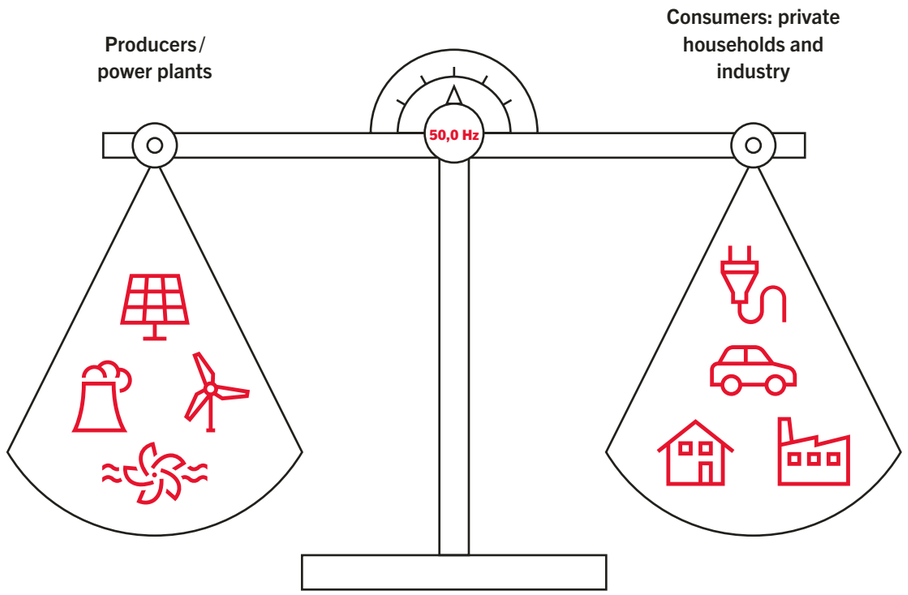
We hope you enjoy reading this publication.

Bastian Schwark
Head of Market Operations

Emanuele Colombo
Head of Market Strategy

How do the balancing markets work?

Electricity cannot be stored in the transmission grid, so the amount of electricity produced must always match the amount consumed to keep the system in balance. Swissgrid is responsible for maintaining this balance in Switzerland and therefore for guaranteeing secure and stable grid operation at a constant frequency of 50 Hertz (Hz). If the frequency deviates too far from 50 Hz, this can damage electrical systems and devices or, in extreme cases, lead to the automatic shutdown of power plants and consumers, or even to widespread power outages.



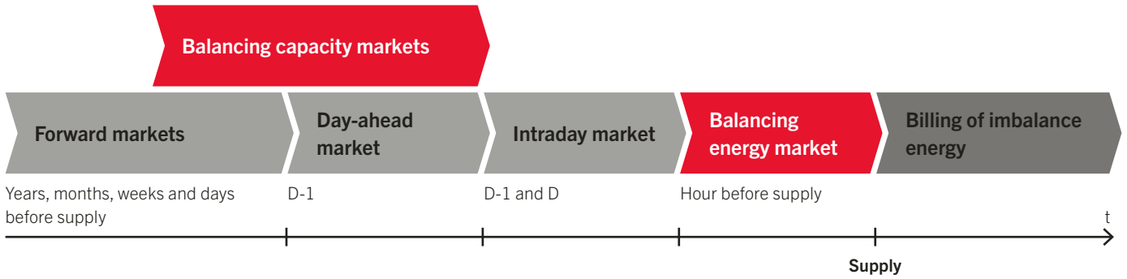
In the event of imbalances in the grid, Swissgrid utilises balancing energy and instructs power plants, storage systems or consumers to increase or decrease their generation or consumption. However, Swissgrid does not own any systems of its own, and must therefore procure ancillary services, or frequency control products, in order to operate the grid. This is done via its balancing markets, on which participating players make the flexibility of their resources available. This allows Swissgrid to increase or decrease electricity generation or consumption as required.

Flexible systems include hydroelectric power plants, nuclear power plants, batteries, PV installations, industrial facilities, large consumers, heat pumps and other controllable systems or devices. Participants in the balancing markets receive financial remuneration in return: firstly for **reserving their flexibility in advance,** and secondly for **activating it in real time** when imbalances in the grid need to be corrected. This allows market players to tap into additional revenue opportunities while contributing to grid stability at the same time.

In addition, Swissgrid can influence two other mechanisms to reduce imbalances in the grid and, consequently, the need for balancing energy.

The first mechanism concerns the power markets.
Energy producers and consumers* buy and sell electricity several months or years before it is supplied. Shortly before the supply date, the expected generation or consumption may change, for example due to updated weather forecasts that affect the expected PV production. The day-ahead and intraday power markets enable market players to adjust their planned positions so that generation and consumption remain balanced. Shortly before the start of the supply period, the intraday markets close and positions are fixed. Swissgrid does not operate these markets, but can help to improve the market conditions for cross-border trading.

The second mechanism is the billing of imbalance energy.
After the closure of the power markets, actual electricity generation and consumption rarely match the planned schedules exactly. These deviations – known as imbalances – are measured, and Swissgrid settles them financially with the relevant balance groups . Since 2026, the balance groups** have been incentivised to take measures that help to ensure that the grid remains balanced, instead of simply adhering strictly to their schedules. Deviations that improve the balance of the electricity system are financially rewarded, while deviations that worsen it are financially penalised. This allows the balance groups to actively support grid balancing by compensating for foreseeable imbalances, such as forecasting errors in PV electricity production.



Even though the power markets and the billing of imbalance energy help to reduce imbalances, electricity generation and consumption never match exactly at every moment. Forecasts are never completely accurate, and unexpected events, such as power plant failures, can occur at any time. In addition, the power markets and the billing of imbalance energy only take account of average values over intervals of 15 minutes. Short-term fluctuations within these time blocks cannot be considered. The balancing markets will therefore remain the central pillar of frequency maintenance in the future.

* Consumers include large consumers such as factories or retail chains, power plant owners who pump water into reservoirs, for example, or suppliers who procure electricity for households and other customers in their region.

** A balance group is an energy account that is managed by a balance group manager (BGM). The BGM can trade energy with other BGMs in Switzerland and abroad, accept energy from power plants or deliver energy to end consumers via this energy account. If a balance group's power import and export are not balanced, the balance group requires imbalance energy from Swissgrid.

Frequency control products

To ensure a stable system frequency of 50 Hertz and to restore this frequency after abrupt power plant failures, Swissgrid procures a range of frequency control products with different characteristics. Three types of frequency control products are used in the Swiss control area. In the event of a major power plant failure, they are deployed in a consecutive cascade:

Primary reserves are available within seconds of an event, such as an unplanned outage of a power plant. Primary reserves are distributed throughout continental Europe and serve to stabilise the frequency. Power plants are configured to respond automatically and without delay to any changes in grid frequency by increasing or reducing their power output.

Secondary reserves replace the primary reserves within a few minutes in the control area in which the event took place, restoring the system frequency of 50 Hertz. Power plants supply the power automatically in response to an automatic signal sent by Swissgrid.

If the imbalance lasts longer than 15 minutes, **tertiary reserves** can be activated manually and used to release secondary reserves.

The principle of this successive cascade activation ensures that an additional reserve is always available in the event of another unexpected event.

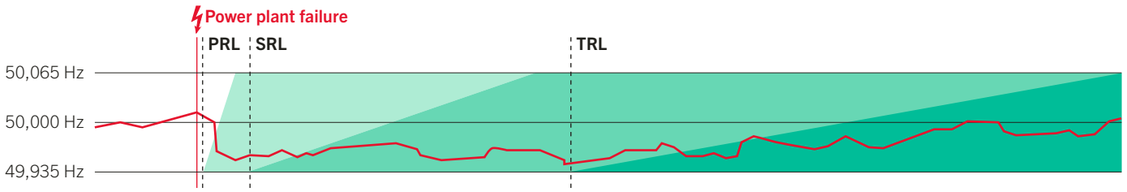
The current characteristics of individual products, as well as the planned changes, are summarised in the product overview at the end of this publication. The current characteristics can also be found on the **Swissgrid website.**

The three levels of balancing energy activation

Primary reserves
30 seconds after failure

Secondary reserves
5 minutes after failure

Tertiary reserves
15 minutes after failure



Balancing markets

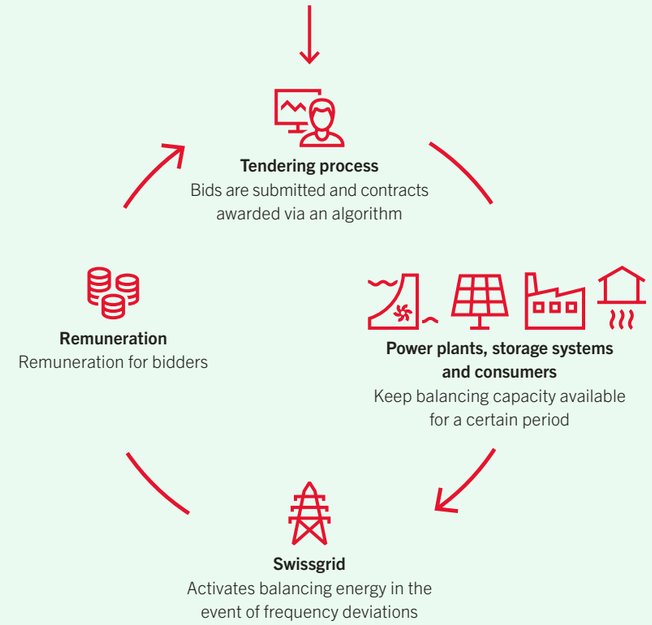
Swissgrid's balancing markets are divided into two different categories: the **balancing capacity market** and the **balancing energy market**. Participating players on the balancing capacity market are remunerated for providing flexibility, i.e. for keeping reserve power available. This ensures that sufficient power reserves are always available to meet the demand for balancing energy and to respond to unforeseen events.

For primary control, there is only one balancing capacity market on which **primary balancing capacity (PRL*)** is auctioned. If PRL bids are awarded on the capacity market, they are automatically activated in line with grid requirements. Swissgrid procures its PRL on a common market with other TSOs as part of PRL cooperation.

For secondary and tertiary control, there are both balancing capacity and balancing energy markets. If a bid for **secondary balancing capacity (SRL**)** or **tertiary balancing capacity (TRL**)** is selected on the balancing capacity market, the market player is also obliged to submit a corresponding bid on the balancing energy market for **secondary balancing energy (SRE**)** or **tertiary balancing energy (TRE**)**. It is also possible to submit bids on the balancing energy market without having been awarded in the corresponding balancing capacity tenders. These bids are referred to as "free bids". Activation then takes place via the bids submitted on the corresponding balancing energy market.

Further information on Swissgrid's tenders for ancillary services can be found on our **website**.

Product	Balancing capacity market	Balancing energy market
Primary control	PRL	
Secondary control	SRL	SRE
Tertiary control	TRL	TRE



* This corresponds to the German term "Primärregelleistung" (PRL). The international term "Frequency Containment Reserves" (FCR) is also commonly used, as this product is procured and activated at European level.

** The abbreviations used here originate from the German terms as these are commonly used in Switzerland across all languages. Internationally, SRL and SRE correspond to aFRR capacity and aFRR energy, respectively. TRL and TRE are similar to mFRR capacity and mFRR energy but, until the end of 2025, included Replacement Reserves (RR) and the slow mFRR product called TRE_l.

Market access and prequalification

In order to participate in the markets for ancillary services, operators of flexible assets must either be ASPs themselves or cooperate with an existing ASP. This ensures that bidders meet the prequalification criteria and can provide the services offered with a high degree of reliability. A list of active Swiss ASPs can be found on the **Swissgrid website**.

To participate in these markets, operators of flexible assets must also undergo a prequalification procedure for their technical units in order to demonstrate compliance with the technical requirements for the relevant products. Further information on prequalification can also be found on the **Swissgrid website**.

Reserve dimensioning

International dimensioning of primary balancing capacity

PRL is procured on a **common market** as part of PRL cooperation. The tenders of all participating countries are bundled for this purpose. The total demand for PRL is determined annually by ENTSO-E* at cooperation level and is distributed between individual TSOs based on net consumption and generation in their control area.

Each TSO receives a **core share**, which represents the minimum volume that must be covered by units within its specific load-frequency control block (LFC block).In addition, **export limits** are set to determine how much PRL may be exported to other LFC blocks. The market clearing algorithm determines the ideal combination of bids that takes these restrictions into account and minimises the total procurement costs within the cooperation.

For 2026, the PRL demand for continental Europe amounts to 3,450 MW, 80 MW of which have been allocated to Switzerland. Further information on PRL can be **found on the ENTSO-E website under Frequency Containment Reserve (FCR).**

Coupled national dimensioning of secondary and tertiary balancing capacity

While PRL is dimensioned at European level, Swissgrid is responsible for the dimensioning of secondary and tertiary reserves. The dimensioning processes are based on the requirements of the Synchronous Area Framework Agreement, the Electricity Balancing Guideline and the System Operation Guideline. Swissgrid's aim is to ensure operational security while simultaneously optimising procurement costs.

Swissgrid has been using a dynamic dimensioning procedure for SRL and TRL since September 2025. The volumes required for each product (SRL-, SRL+, TRL-, TRL+) and for each four-hour block are calculated uniformly for the whole following week. This allows the procured volumes to be adapted more effectively to the actual requirements in the individual time blocks. To date, there have only been minor differences between the four-hour blocks, most of which are under 50 MW. However, this may change in the future if the underlying parameters become more dynamic.

The most important factors for dimensioning are:

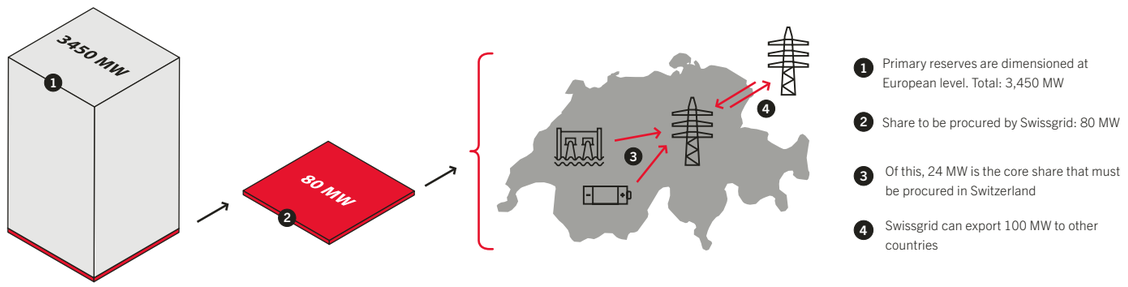
- Historical imbalance
- Historical free bids
- TRL: reference case (i.e. outage of the largest power plant)
- TRL: minimum volume considering the Mutual Emergency Assistance Service (MEAS) contracts

+	−
Reference case **Historical imbalance**	**Historical free bids**

Minimum volume

The dimensioned reserve volume is procured via various tenders: early, weekly or daily. Early procurement usually takes place in the previous year in order to ensure sufficient reserves between February and May. The remaining calculated reserve requirements are **divided between daily and weekly tenders** for the individual products. This makes it possible to keep the total procurement costs as low as possible.

International dimensioning of PRL

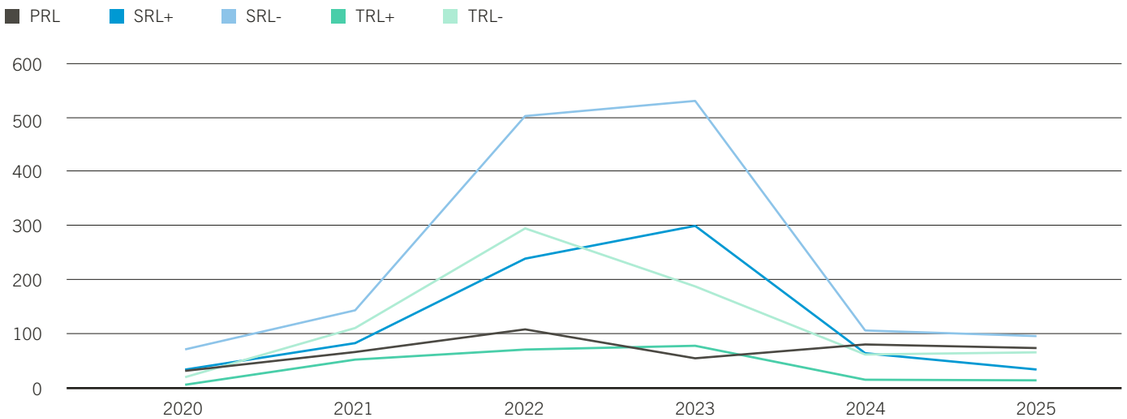


* ENTSO-E is the European Network of Transmission System Operators.

Market trends: prices and volumes

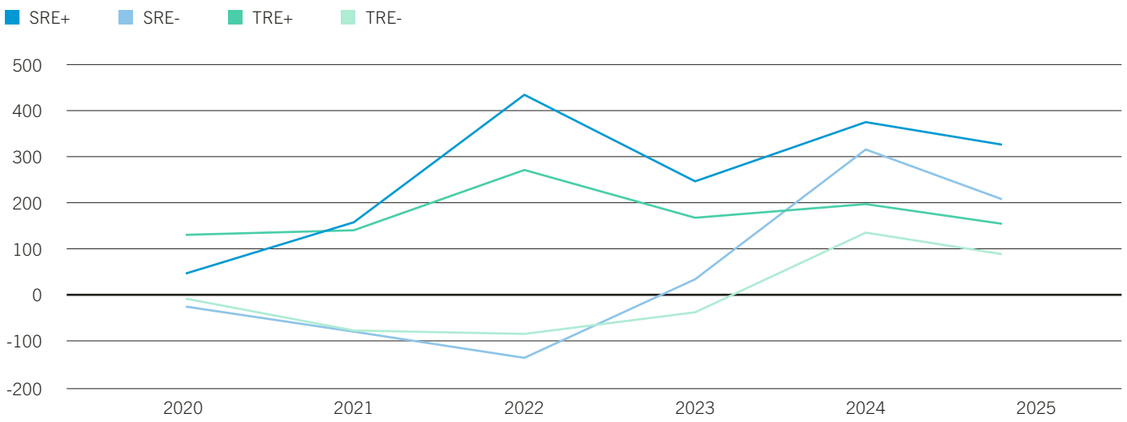
Prices on the balancing markets are constantly changing and depend on various factors, such as the prevailing situation on the power markets. Market players can be remunerated for both balancing capacity and balancing energy (except in the case of primary control, where only balancing capacity is remunerated). Prices have fluctuated considerably over the years. In 2022 and 2023, the prices for balancing capacity were heavily influenced by the European energy crisis. Since then, prices have largely recovered.

Average annual prices for balancing capacity
[CHF 1,000/MW/year]



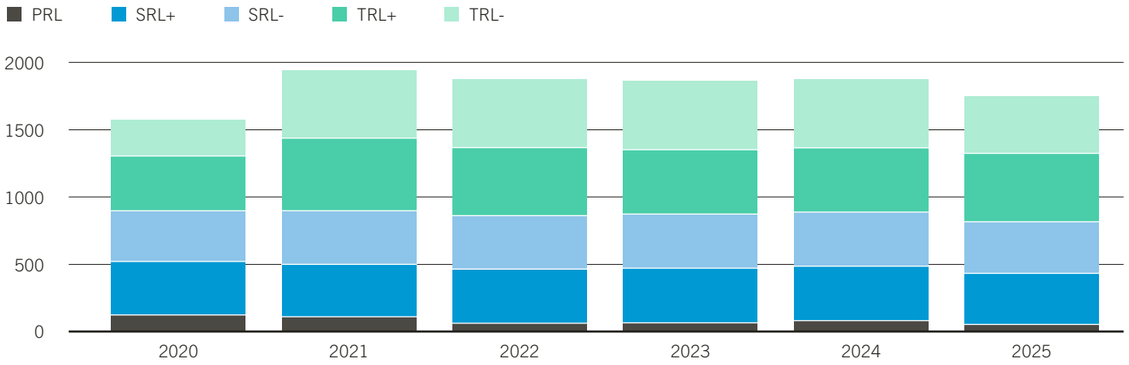
Prices for positive balancing energy (SRE+ and TRE+) also rose sharply in 2022 due to the European energy crisis. In addition, PV feed-in increasingly reduced the availability of flexible hydropower plants for negative balancing energy (SRE- and TRE-) during daytime hours, which also drove prices up. Combined with extreme imbalances in the electricity system – exacerbated by partially inaccurate PV forecasts from the balance groups – these developments led to a significant increase in total SRE costs in 2024. Since then, prices have stabilised at a slightly lower level.

Average prices for balancing energy
[EUR/MWh]



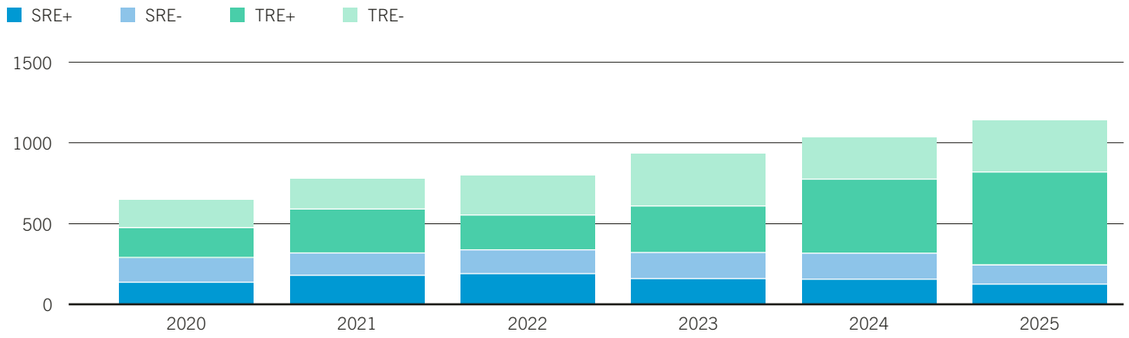
The need for balancing capacity has remained largely stable over the years, as the underlying dimensioning parameters have hardly changed at all. The dimensioned demand for PRL has risen slightly, from 62 MW in 2022 to 67 MW in 2025. However, due to high prices and the option to procure PRL via PRL cooperation, slightly lower volumes were awarded to Swiss market players. For 2026, a change in the European dimensioning procedure will lead to a significant increase in PRL demand, from 67 MW to 80 MW. SRL volumes remained stable and then declined slightly in 2025 due to the new dimensioning procedure. TRL volumes increased between 2020 and 2021 and remained relatively stable until 2025. In response to lower SRL+ procurement, more TRL+ was procured in 2025. This effect also happened for TRL-, however, this was offset by a recalculation of the reference case, resulting in a lower overall need for TRL-.

Average allocated balancing capacity
[MW]



The demand for balancing energy has risen continuously over the last six years, primarily due to the growing integration of PV. This additional demand was largely met by TRE, which is generally less expensive than SRE. Furthermore, the automated forecasting of system imbalances and optimised activation of TRE, introduced in April 2025, have made it possible to further reduce the amount of SRE needed and thereby considerably lower costs (see “Autopilot Optimizer Balancing Energy”). Although the total volume of SRE activated has remained relatively stable in recent years and declined in 2025, there has been a clear shift towards more frequent activations of large volumes, in which the entire merit order list is requested. These extreme events, which mainly occurred during daytime hours in the summer, were most pronounced in 2024 and contributed significantly to the increase in SRE costs. The situation improved in 2025, as significantly fewer extreme activation events occurred. This improvement is not least due to the fact that Swissgrid worked with industry to significantly improve the accuracy of PV forecasts – because the more accurate the forecasts by energy suppliers (balance groups), the lower the need for control energy.

Total activated balancing energy
[GWh]



Total volumes of individual balancing energy products activated to balance the Swiss control area. TRE activations for purposes other than frequency control (e.g., redispatch) or TERRE activations for other TSOs are excluded.

Balancing market data is published regularly on the **Swissgrid website** and the **ENTSO-E Transparency Platform**.

Drivers for the further development of the balancing markets

The electricity system in Europe and Switzerland is undergoing fundamental change. This transformation is being driven by the transition to renewable energies, ambitious energy policy targets and the rapidly falling costs of various technologies. Large, centralised power plants are increasingly giving way to smaller, decentralised plants. At the same time, electricity demand is expected to increase as a result of the decarbonisation and digitalisation of society and the electrification of other sectors, such as mobility and heating. However, the balancing markets were originally designed for a system characterised by large, centralised electricity generation and inflexible demand. As part of the transformation of the electricity system, Swissgrid is therefore adapting its frequency control products and processes in order to integrate new technologies and harness their potential. Four key drivers have been identified that will determine the further development of the balancing markets:

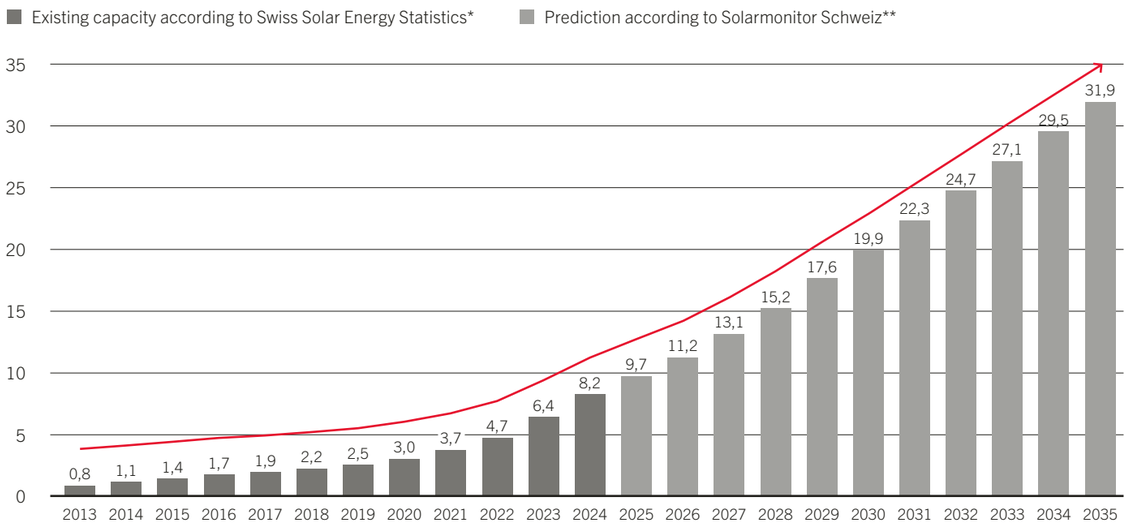
Rapid growth in PV electricity generation

Increasing flexibility potential from new technologies

Regulatory developments

Progress in digitalisation

Cumulative installed PV capacity in Switzerland (GW)



* Swiss Federal Office of Energy (SFOE): Statistik Sonnenenergie 2024, July 2025.
** Swissolar: SOLARMONITOR Schweiz 2024 – Entwicklungen, Trends und Perspektiven im Photovoltaik-Markt Schweiz, November 2024.

Rapid growth in PV electricity generation

The rapid expansion of PV generation is a cornerstone of the energy transition and a necessary development to achieve climate and energy policy objectives. PV contributes significantly to decarbonisation, security of supply through domestic generation, and the diversification of the generation portfolio. Its growing role in the electricity system is therefore both desirable and unavoidable. At the same time, its growing share is changing system dynamics and has several implications for the balancing markets:

- **PV forecast errors:** Imbalances due to errors in PV production forecasts can lead to a high demand for balancing energy. These imbalances are mainly compensated for using TRE, as PV forecast errors generally occur in the same direction over longer periods of time. Although these errors increase the volume of balancing energy activations, they are not yet the primary driver of reserve dimensioning. Reference losses or deviations at conventional power plants are currently still much higher.

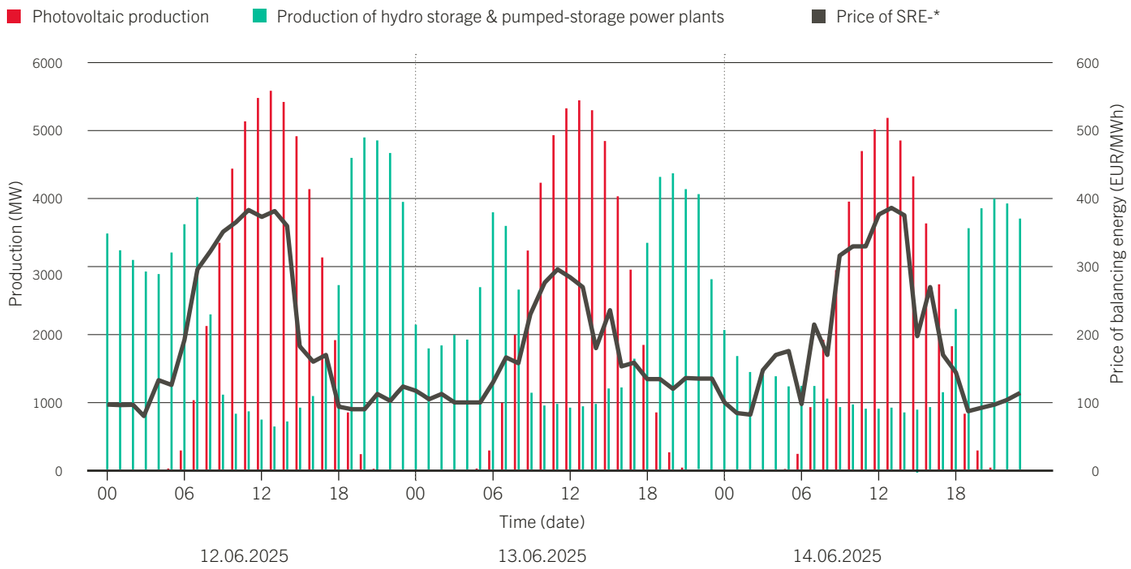
- **PV production ramps:** The natural production ramps of PV feed-in increase the need for balancing energy even more, as solar power generation can change even within the 15-minute trading blocks on the power market. In the morning, solar radiation constantly increases within a 15-minute block, which initially leads to underproduction and later to overproduction in each quarter-hour. In the evening, the opposite effect occurs. Rapid cloud movements can cause similar under- or overproduction effects during the day.

- **PV flexibility potential:** In principle, PV installations could provide large volumes of negative balancing energy and could potentially even supply balancing capacity throughout the day. In the event of curtailment, they could theoretically also supply positive reserves. This would allow reserves to be made available precisely when needed to compensate for PV forecast errors and PV production ramps. However, only a few PV plants are currently prequalified for participation on the balancing markets.

- **Increasing market volatility:** PV production fluctuates seasonally as well as on a weekly and daily basis. When a large amount of PV electricity is produced, flexible plants such as hydro storage and pumped-storage power plants reduce their output due to low electricity market prices. This fluctuating availability of flexible plants increasingly affects the balancing markets. The growing share of PV production therefore increases the volatility of liquidity and prices on the balancing markets (see figure below). Precisely at times when high PV feed-in often leads to a substantial need for negative balancing energy, its availability is reduced and prices for negative balancing energy rise sharply.

- **Decreasing system inertia:** During hours with high PV production and low hydroelectric and nuclear power production, system inertia decreases as there are fewer rotating masses in the system. Without appropriate countermeasures, this may eventually impair frequency stability. In the future, however, grid-forming inverters could enable PV installations and batteries to contribute to system inertia. Further information on system inertia can be found at the end of this document.

Influence of photovoltaic electricity generation on the dynamics of balancing energy prices



* Average price of SRE- for a theoretical 100 MW activation

New flexibility potential

In addition to PV, various other technologies such as electromobility, heat pumps, batteries, home energy management systems, data centres, wind farms, electrolysers and the electrification of industrial processes are driving the energy transition. These technologies have the potential to make a significant contribution to frequency control. To date, however, only a small proportion of these technologies have been prequalified for the provision of balancing capacity and balancing energy. In order to promote and increasingly utilise this new flexibility potential, close coordination with distribution system operators is generally required, as these technologies are mainly connected to the distribution grid. The organisation and design of the balancing markets must be refined in order to lower barriers to market entry and enable new market players to gain access. At the same time, fair and non-discriminatory framework conditions must be maintained for existing participants.

Regulatory developments

Swissgrid designs the balancing markets in accordance with the regulatory requirements and in coordination with the Swiss electricity industry. Due to Switzerland's central geographical location and its strong integration into the European transmission grid, close cooperation with European TSOs is also essential in order to guarantee security of supply and grid stability.

The **electricity agreement** has the greatest regulatory impact on the Swiss balancing markets. If the agreement is accepted, Swissgrid would be able to participate in all European balancing platforms as well as in the trading platforms for intraday and day-ahead energy exchange. This would increase operational security, strengthen competition and improve market liquidity. Acceptance of the electricity agreement would therefore reduce the costs of activating balancing energy, reduce overall operational security risks and strengthen Switzerland's security of supply with regard to electricity. As far as the Swiss balancing markets are concerned, Swissgrid is concentrating on maintaining its readiness for integration into the most important European processes and on implementing measures that are beneficial no matter the outcome of the referendum.

The most important **Swiss regulatory development**, on the other hand, is the recent revision of the Electricity Supply Act, which is guided by the Energy Strategy 2050. As part of this revision, the decision was made to modify the subsidy system so that PV installations are be exposed to market prices. This creates a financial incentive to install control and communications equipment and local storage systems, making it easier to offer flexibility on the balancing markets. In addition to legal developments, regulatory interventions such as the SRE price cap requested by ElCom could lead to further uncertainties.

Finally, **European regulatory developments** must also be taken into account. There are major ongoing efforts to achieve international harmonisation of balancing products and processes, as well as to develop pan-European balancing markets based on the Electricity Balancing Guideline (EB GL) and the System Operation Guideline (SO GL). The regulations published as part of the EU's "Fit for 55" package will have further indirect effects, including the faster expansion of renewable electricity production, increased cross-border trading with shorter lead times and the promotion of demand-side flexibility, for example.

Digitalisation

Digitalisation enables Swissgrid to operate markets and grids more efficiently, at a lower cost and with shorter lead times. When used correctly, it improves the observability, predictability and controllability of decentralised generation, storage and consumption. In addition, advanced, data-driven decision-support tools facilitate the operation of an increasingly complex electricity system. In order to take full advantage of these opportunities, Swissgrid is continuously striving to improve data availability and quality and to establish a modern digital infrastructure.

Market design principles

Swissgrid is continuously developing its balancing markets to adapt them to changing conditions. These measures are developed based on the following principles:

Frequency control products are procured via transparent, non-discriminatory and market-based processes.

The balancing markets and frequency control products are designed to guarantee operational security and while minimising costs.

Frequency control products are continuously improved, forward-looking approaches are promoted and the integration of new technologies into the balancing markets is supported.

Market players are offered incentives to actively participate in balancing the Swiss control area via imbalance energy billing in order to reduce the need to activate balancing energy.

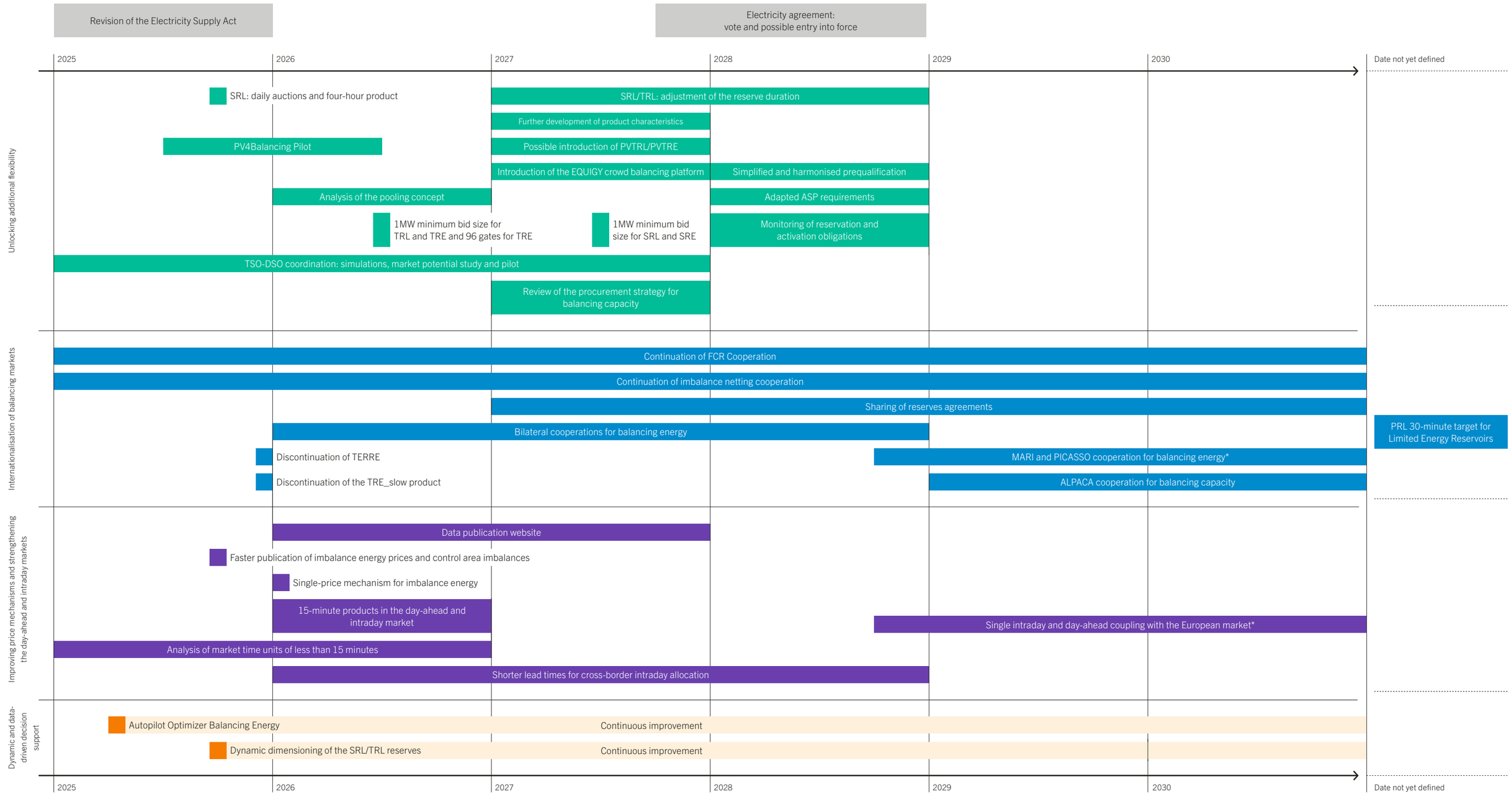
Swissgrid is committed to cooperation with national and international stakeholders and focuses on the full integration of the Swiss control area into EU market processes.

Market development

In order to ensure secure and stable system operation despite the challenges outlined above, Swissgrid will implement the measures mentioned in Section 5 and shown in the following diagram, in cooperation with the Swiss electricity industry. In view of current uncertainties and the urgency of the underlying factors, Swissgrid is also exploring additional, more centralised and regulated measures to prepare for the following scenarios:

- A negative outcome of the vote on the electricity agreement and the package of agreements between Switzerland and the EU
- The challenges are growing faster than the necessary improvements can be implemented
- The measures are not sufficient to achieve the objectives described in this section

Overview of planned measures



* Dependent on an electricity agreement with the EU

Unlocking additional flexibility

Swissgrid is increasing market liquidity by simplifying prequalification processes, establishing suitable interfaces and making frequency control products more flexible.

Analysis of the pooling concept

The Swiss "Regelpooling" concept was introduced in 2013 and enables ASPs to provide balancing energy from decentralised resources in other balance groups. Based on the experience to date and the growth of decentralised energy resources, Swissgrid is analysing the concept and discussing potential improvements with the affected parties. The aim is to make the concept scalable for large volumes of decentralised flexibility.

Reduction of the minimum bid size to 1 MW (SRL, SRE, TRL and TRE)

To make it easier for smaller plants to enter the market, Swissgrid is lowering the minimum bid size from 5 MW to 1 MW for TRL and TRE (mid-2026). The minimum bid size for SRL and SRE will subsequently also be reduced to 1 MW (mid-2027). For technical reasons, an earlier introduction of the lower bid size is not possible for SRL and SRE.

TRE: 96 gates

TRE is currently procured on an hourly basis for the four subsequent quarter-hour blocks (24 gate closures per day). In mid-2026, 96 gate closures per day will be introduced in the tertiary energy market so that bidders can react more dynamically to changes in supply and demand.

Further development of product characteristics

Additional options for ASPs may be considered to make it easier for technologies with Limited Energy Reservoirs and rebound effects to participate in the balancing markets. Possible measures include permitting the linking of bids (e.g. in terms of logic or timing) and/or the submission of divisible bids. In addition, the maximum bid sizes in balancing capacity tenders will be reassessed.

Review of the procurement strategy for balancing capacity

Swiss procurement of balancing capacity comprises recurring daily and weekly tenders, as well as early procurement for the winter and spring months. Swissgrid will analyse the procurement strategy, taking into account the Electricity Balancing Guideline, which stipulates that contracts for balancing capacity should not be concluded more than one day before provision.

Simplified and harmonised prequalification

Swissgrid is committed to simplifying and harmonising the prequalification process in order to lower barriers to entry while ensuring a high quality of supply.

Monitoring of reservation and activation obligations

Swissgrid is currently monitoring compliance with the reserve reservation obligation. Given the increasing participation of decentralised technologies in the balancing capacity markets, more systematic monitoring of supply may be required in the future.

SRL/TRL: adjustment of the reserve duration

SRL and TRL are currently procured as weekly and four-hour products. Swissgrid may adjust this reserve period in line with emerging needs and opportunities in the future in order to meet the requirements of both conventional power plants and new technologies. Several new technologies are unable to guarantee availability during an entire four-hour block, which leads to high supply risks and can make participation in the balancing capacity markets economically unattractive.

Swissgrid is facilitating market access for new participants by adapting the ASP requirements, prequalification and interfaces for decentralised energy resources, without compromising system security.

Introduction of the EQUIGY crowd balancing platform

The current end-to-end process for the provision of ancillary services – from registration and bidding to activation and billing – requires the connection of several technical interfaces. This represents a substantial hurdle for aggregators of small, decentralised resources and their ASPs. With the introduction of the EQUIGY crowd balancing platform, aggregators of small resources will be able to participate in the PRL, SRE, SRL, TRE and TRL markets via a single interface.

Adapted ASP requirements

ASPs are currently required to be prequalified by Swissgrid according to uniform criteria, regardless of which ancillary services are offered. The complete requirements and further information can be found on the **Swissgrid website**. Swissgrid is examining the possibility of revising the ASP requirements and adapting them to current and future needs. One option would be to introduce a product-specific ASP prequalification in order to improve market access for all participants.

Swissgrid is testing innovative approaches to utilise the flexibility of decentralised energy resources in a grid- and system-supportive manner.

PV4Balancing

The share of PV production in total electricity generation is increasing rapidly, making it crucial to harness its flexibility potential. However, only a negligible volume of the electricity generated by PV installations is currently offered on the SRE and TRE markets. The PV4Balancing pilot project introduced a new product (PVTRE-) that is tailored specifically to PV installations. The aim is to test how PV can reliably contribute to system stability without complex retrofitting. If the pilot project is successful, a full rollout (incorporating findings and adjustments from the pilot phase) is planned for 2027. In addition, Swissgrid will examine the possibility of using PV installations to provide primary and secondary reserves.

TSO-DSO coordination: simulations, market potential study and pilot

Flexibility from decentralised resources such as electric vehicles, heat pumps and PV installations is not currently offered on a large scale on Swissgrid's balancing markets. By improving coordination with the distribution system operators, this flexibility should be made available to both Swissgrid and the distribution system operators without compromising secure grid operation. Following the conceptual phase (phase B), Swissgrid, together with various distribution system operators and ASPs, is now working on simulations and a corresponding pilot project. This includes testing how market areas, critical grid elements and flexible resources can be coordinated under real conditions (phase C). A market potential study and a survey will also be carried out to assess the feasibility of broad-based flexibility markets and stakeholder interest in them. The results of the survey, the simulations and the pilot project will serve as a basis for determining the scope and timing of an initial implementation in phase D.

Internationalisation of the balancing markets

Swissgrid is improving grid security and reducing costs by continuing existing international cooperation and maintaining readiness for integration with the European balancing platforms.

The organisation of centralised balancing markets across several countries offers several advantages. By exchanging balancing energy and balancing capacity between TSOs, fluctuations in the availability of flexibility across different control areas can be evened out. Furthermore, centralised markets improve market liquidity and security of supply. For ASPs, they offer greater sales potential due to higher demand for flexible power plant output. Finally, the netting of imbalances across different control areas reduces the need to activate balancing energy, as opposing imbalances can be offset without activating reserves.

Continuation of the FCR Cooperation and imbalance netting cooperation

Swissgrid procures PRL via the international FCR Cooperation, which increases security and efficiency. It also participates in the imbalance netting cooperation, which significantly reduces the extent of SRE activation required. This existing cooperation will be continued.

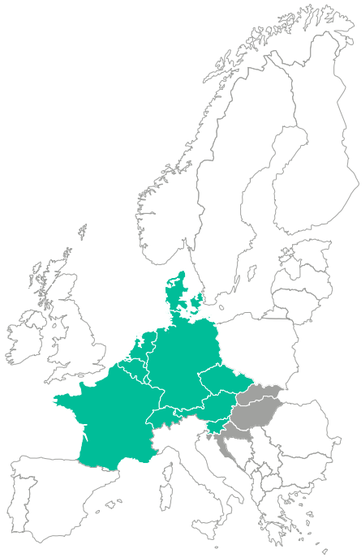
Bilateral cooperations for balancing energy

Following the discontinuation of the Trans European Replacement Reserves (TERRE) platform in December 2025, Swissgrid is examining the possibility of introducing bilateral cooperations with neighbouring TSOs for the exchange of products similar to the replacement reserve (RR) products.

Status at the end of 2025

FCR Cooperation

Member Observer



Imbalance netting (IGCC)

Member

Sharing of reserves agreements

Swissgrid will evaluate the potential for establishing sharing of reserves agreements with neighbouring TSOs. Such agreements would allow Swissgrid to reduce procurement costs for balancing capacity while complying with the provisions of the System Operation Guideline on ensuring operational security.

MARI and PICASSO cooperation for balancing energy*

Switzerland's participation in the aFRR-Platform (PICASSO) and mFRR-Platform (MARI) is governed by Articles 1.6 and 1.7 of the EB GL and is currently the subject of litigation initiated by Swissgrid at the Court of Justice of the European Union. In the event of an electricity agreement or a favourable court ruling, Switzerland would be obliged or permitted to actively participate in the platforms. As participation would provide significant benefits in terms of grid security and costs, Swissgrid is maintaining technical readiness for connection to both platforms.

* Dependent on an electricity agreement with the EU

ALPACA cooperation for balancing capacity

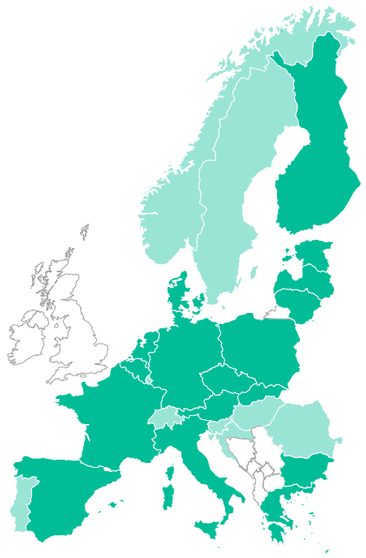
In contrast to the established European platforms for balancing energy, one of the first platforms for the joint procurement of balancing capacity was only introduced in September 2025. The Allocation of Cross-zonal Capacity and Procurement of aFRR Cooperation Agreement (ALPACA) platform enables participating TSOs to increase security and reduce costs by procuring aFRR reserves across borders. Swissgrid is an observer member of this cooperation and plans to participate as soon as Switzerland has been integrated into the PICASSO platform. This would enable the subsequent exchange of balancing capacity.

PRL 30-minute target for Limited Energy Reservoirs

Limited Energy Reservoirs (LERS), such as batteries, that provide PRL must currently have sufficient capacity to sustain full PRL activation for at least 15 minutes. Continental European TSOs have suggested raising this requirement to 30 minutes in order to increase security. If this increase is approved by the regulatory authorities, Swissgrid will also be obliged to adjust this requirement. The revised requirement would apply only to LERs that are newly prequalified. The specific date of introduction has yet to be determined, and a transition period will apply following the decision.

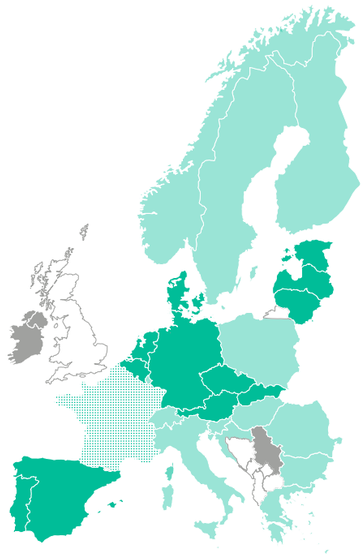
PICASSO

Member Non-operational member



MARI

Member Observer Non-operational member
Sharing available transfer capacity



Improving price mechanisms and strengthening the day-ahead and intraday markets

Swissgrid is supporting the active reduction of system imbalances by balance groups through the use of a single-price mechanism for imbalance energy.

Faster publication of imbalance energy prices and control area imbalances

The publication of provisional imbalance energy prices within 30 minutes was introduced in the second quarter of 2025. In the fourth quarter of 2025, the publication time for provisional imbalance energy prices and control area imbalances was reduced to less than 15 minutes. This gives market players rapid signals, enabling them to take corrective action via the intraday market.

Single-price mechanism for imbalance energy

Until the end of 2025, Swissgrid billed imbalance energy using a dual-price system. Under this system, balance groups with an imbalance were penalised even if this reduced the overall imbalance in Switzerland. The new single-price mechanism creates incentives for balance groups to actively contribute to balancing the Swiss control area before balancing energy has to be activated. This reduces costs, as less balancing energy needs to be activated. The change also enables small decentralised systems to contribute to the reduction of imbalances without needing to be prequalified for balancing markets. Furthermore, it harmonises Swiss imbalance settlement with the requirements of the Electricity Balancing Guideline.

Data publication website

Currently, data that may be helpful for balance groups in anticipating imbalances in the Swiss control area is published by Swissgrid on its website. Swissgrid plans to publish this data more quickly on its own website and make it more accessible through an API. The website will also contain additional data on topics such as the activation of ancillary services, redispatch and MEAS. An internal project was launched at the end of 2025, with a go-live planned for the end of 2026 at the earliest.

Swissgrid is promoting day-ahead and intraday trading so that market players can map their portfolio more effectively and close open positions on the intraday market at shorter notice.

15-minute products in the day-ahead and intraday markets

The European Single Day-Ahead Coupling (SDAC) has recently introduced 15-minute products. Although Switzerland is currently excluded from SDAC and Single Intraday Coupling (SIDC), Swissgrid is working with neighbouring TSOs and electricity market operators on the introduction of 15-minute products. The go-live for 15-minute products in explicit day-ahead and intraday auctions is planned for the third quarter of 2026. At the CH-DE and CH-AT borders, capacity is already explicitly allocated on a continuous basis according to the "first come, first served" principle using 15-minute products. The introduction of 15-minute products at the CH-IT and CH-FR borders is planned for 2027 and 2029, respectively.

Shorter lead times for cross-border intraday allocation

Intraday capacity can currently be allocated with a lead time of 60 minutes. Swissgrid is working to reduce this lead time from 60 to 30 minutes at all borders. Implementation will take place gradually over the next few years.

Analysis of market time units of less than 15 minutes

Swissgrid is working with other transmission system and electricity market operators to examine the potential for reducing market time units to less than 15 minutes. This would make it possible to reduce the volume of balancing energy required to compensate for PV production ramps and would also reflect the value of variable renewable energies more accurately on the market. Such a change would require a simultaneous reduction in the period for imbalance energy billing. The analysis is still at an early stage. As the implementation would require major changes by all parties involved, its introduction would only be possible after close consultation with all stakeholders.

Single intraday and day-ahead coupling (SIDC and SDAC) with the European market*

SIDC and SDAC aim to create a standardised European intraday and day-ahead power market. Switzerland is currently excluded from this coupling due to the lack of an electricity agreement with the EU. Access to these markets would increase efficiency, as electricity and capacity are traded together. It would also improve liquidity and allow market players to trade across borders up to 30 minutes before supply. This would significantly enhance market players' ability to rebalance before Swissgrid has to activate balancing energy.

* Dependent on an electricity agreement with the EU

Dynamic and data-driven decision support

Swissgrid is increasing operational security and cost efficiency by developing dynamic, data-driven decision-support tools for dimensioning, procuring and activating reserves.

Autopilot Optimizer Balancing energy

In order to reduce the use of expensive SRE, Swissgrid proactively activates TRE to compensate for expected imbalances. An AI-supported decision-support tool optimises the activation of TRE in near real time, based on short-term forecasts of system imbalances and market prices. The optimiser has been in use since May 2024 and has been running in autopilot mode since April 2025. It has significantly reduced costs, improved the availability of SRE and freed up the system operators' capacity for other tasks. Swissgrid is continuously working to further improve the performance of the tool.

Dynamic dimensioning of SRL/TRL reserves

Until September 2025, balancing capacity reserves were calculated once a year. Since then, a rolling weekly approach using four-hour blocks has been applied. This makes it possible to determine the SRL and TRL volumes to be procured more precisely, taking into account seasonal patterns, variations by time of day and short-term changes in the generation mix. Swissgrid is continually seeking to refine this process, for example by carrying out daily calculations or incorporating additional dynamic input values.

Excursus on system inertia

Primary, secondary and tertiary control stabilise or restore frequency within seconds or minutes. In addition, frequency is supported by system inertia, as the kinetic energy stored in rotating masses directly dampens changes in frequency. The higher the system inertia, the more slowly system frequency changes as a result of an imbalance. In the past, system inertia in Europe was predominantly provided by conventional power plants such as hydroelectric, nuclear and fossil-fuelled power plants as a by-product of electricity generation. As the proportion of converter-based resources such as PV installations and battery storage systems rises, greater priority must be paid to system inertia in the future, as these resources do not automatically contribute to it.

Although Switzerland is centrally located in Europe and has a highly meshed grid, as well as significant hydroelectric and nuclear power production, Swissgrid will analyse and monitor system inertia. As an initial measure, Swissgrid has revised the general grid connection contracts to include requirements for the grid-forming characteristics of converter-based energy storage systems. To address the topic of inertia, some European TSOs have started to procure system inertia and so-called Fast Frequency Response (FFR) products as new ancillary services. Even if this is unlikely to be necessary in the next few years, Swissgrid will consider introducing similar products if required.

Product overview

The product specifications at the time of publication and the most important planned changes (indicated in bold) are summarised in the following tables.

Primary balancing capacity

		Current status
Technical requirements	Activation signal	Measurement of frequency deviation and corresponding reaction without Swissgrid signal
	Ramping rate	100% of the prequalified power in 30 seconds
Balancing capacity	Auction timing	The day before delivery for four-hour blocks
	Bid structure	Symmetric balancing capacity bands (upward and downward is tendered together), divisible or indivisible bids
	Volume	1 to 25 MW
Balancing energy		No energy tenders. If a contract is awarded on the balancing capacity market, bids are automatically activated according to the measured frequency.
Remuneration	Balancing capacity	Pay-as-cleared
	Balancing energy	No remuneration

Secondary balancing capacity and energy

		Current status	Possible changes after 2026
Technical requirements	Activation signal	Swissgrid signal is sent every second	
	Ramping rate	100% of the prequalified power in 5 minutes	
Balancing capacity	Auction timing	Tuesday of each previous week for one week or two to four days beforehand for four-hour blocks	**Shorter lead time and product duration**
	Bid structure	Asymmetric product, indivisible bids, possibility of multilevel bids	Asymmetric product, indivisible and/or **divisible bids**, possibility of multilevel bids
	Volume	5 to 100 MW	**1 to less than 100 MW**
Balancing energy	Time of the tendering procedure	96 gate closures per day, each 25 minutes before the start of the delivery period	
	Volume	5 to 100 MW	**1** to 100 MW
	Delivery period	15 minutes	
Remuneration	Balancing capacity	Pay-as-bid	
	Balancing energy	Pay-as-bid	**If PICASSO is introduced: pay-as-cleared**

Tertiary balancing capacity and energy

		Current status	From Q4 2026	Possible changes after 2026
Technical requirements	Activation signal	Sent by Swissgrid at least 2.5 minutes before the start of ramping		
	Ramping rate	100% of the activated power in 10 minutes		
Balancing capacity	Auction timing	Tuesday of each previous week for one week or two to four days beforehand for four-hour blocks		**Shorter lead time and product duration**
	Bid structure	Asymmetric product, indivisible bids, possibility of multilevel bids		Asymmetric product, indivisible bids and/or **divisible bids**, possibility of multilevel bids
	Volume	5 to 100 MW	**1** to 100 MW	**1 to less than 100 MW**
Balancing energy	Time of the tendering procedure	24 gate closures per day, each 25 minutes before the start of the full hour that covers the delivery period	**96 gate closures, each 25 minutes before the start of the delivery period**	
	Volume	5 to 100 MW		**1** to 100 MW
	Delivery period	15 minutes		
Remuneration	Balancing capacity	Pay-as-bid		
	Balancing energy	Pay-as-bid		**If MARI is introduced: pay-as-cleared**

List of abbreviations

aFRR	Automatic Frequency Restoration Reserve
ALPACA	Allocation of Cross-zonal Capacity and Procurement of aFRR Cooperation Agreement
API	Application Programming Interface
AT	Austria
CH	Switzerland
DE	Germany
ElCom	Electricity Federal Commission (national regulator)
EU	European Union
FCR	Frequency Containment Reserves
FFR	Fast Frequency Response
FR	France
IT	Italy
LER	Limited Energy Reservoir
LFC	Load-Frequency Control
MARI	Manually Activated Reserves Initiative
MEAS	Mutual Emergency Assistance Service
mFRR	Manual Frequency Restoration Reserves
PICASSO	Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation
PRL	Primary balancing capacity
PV	Photovoltaics
SDAC	Single Day-Ahead Coupling
SIDC	Single Intraday Coupling
ASP	Ancillary Services Provider
SRE	Secondary balancing energy
SRL	Secondary balancing capacity
TERRE	Trans European Replacement Reserves Exchange
TRE	Tertiary balancing energy
TRL	Tertiary balancing capacity
TSO	Transmission System Operator

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