

## Factsheet

# TERRE – European platform for the joint provision of balancing capacity

Date April 2021

## 1 Initial situation

In autumn 2014, Swissgrid established the «Trans European Replacement Reserve Exchange» (TERRE) cooperation together with other members of the European Network of Transmission System Operators for Electricity (ENTSO-E) to create a common market for slow tertiary control energy. At the same time, the European Union drafted a regulation that was adopted as the Electricity Balancing Guideline (EB GL) in 2017. To implement the requirements for the adjustments of the local Swissgrid applications, Swissgrid launched an implementation project in November 2017.

On 8 October 2020, Swissgrid went live with the TERRE process. Together with Italy, France, Spain and Portugal, Switzerland is now part of a common market for the cross-border exchange of tertiary control energy with an activation lead time of 30 minutes. The opinions of all EU transmission system operators («all TSOs») and the Agency for the Cooperation of Energy Regulators (ACER) that are legally required for Swissgrid's participation in the EU Electricity Balancing Guideline were submitted to the European Commission by April 2020. However, the EU Commission has not reached a positive decision on Swissgrid's participation to date, as it believes that the preconditions have not been met. The TERRE cooperation partners would welcome Swissgrid's participation for system security reasons.

## 2 50 Hertz – the pulse of our grids

Transmission systems act as lifelines for security of supply, and their pulse (or frequency) is 50 Hertz.

The frequency is a physical measure of the alternating current and is measured in Hertz (Hz). It indicates the number of times that the current oscillates per second. The standard frequency in the European interconnected grid is 50 Hertz (Hz). The current changes direction 100 times a second, meaning it completes 50 cycles of oscillation per second. The permissible fluctuation is between 49.8 and 50.2 Hz. Within this range, major installations and small appliances operate without any issues. As the Swiss transmission system operator, Swissgrid is tasked with ensuring secure, high-performance and efficient grid operation. The system frequency of 50 Hz remains stable only if the generation and consumption of electrical power are in balance. This means that generation must comply precisely with demand.

## 3 What is balancing capacity, and what is it used for?

Electricity demand can differ significantly depending on the time of day. For instance, it is different in the early morning compared to midday or in the evening, when lights and televisions are switched on. These fluctuations during the day are usually easy to predict. Swissgrid receives the relevant forecasts from the energy suppliers in the form of «schedules» for the energy exchange within Switzerland and across bor-

ders. In the grid control rooms in Aarau and Prilly, Swissgrid ensures 24/7 that the balance between generation and consumption is maintained and that reserves are available to compensate for frequency fluctuations and imbalances in the Swiss control area at all times. These imbalances inevitably occur because planned electricity consumption never exactly matches actual consumption, and fluctuations can also occur on the generation side.

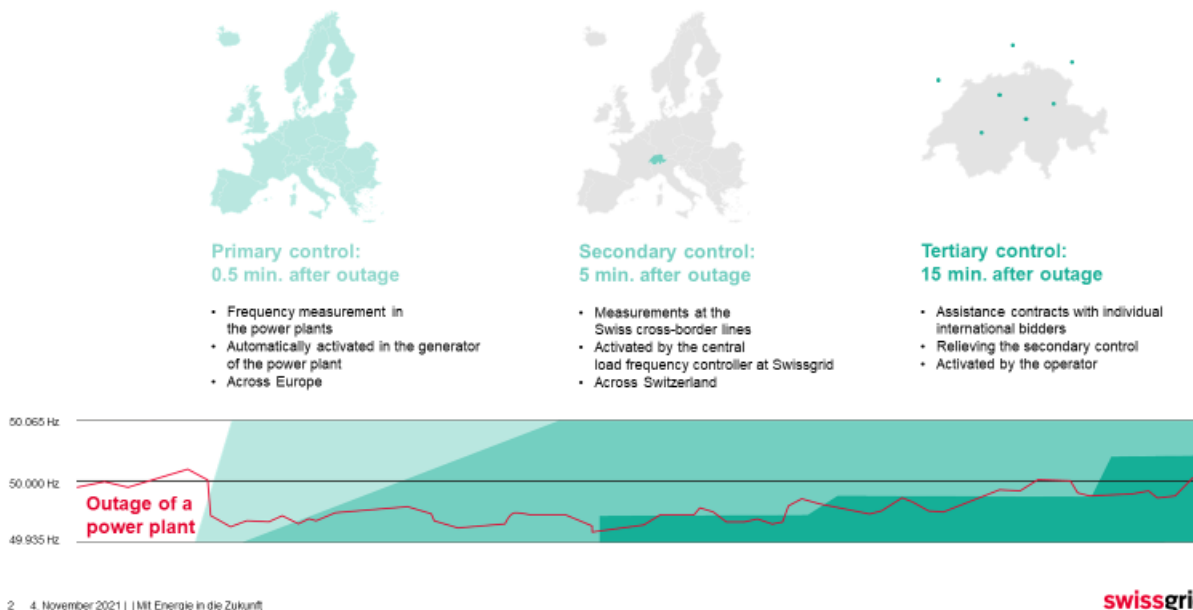
In addition to these normal plan/actual deviations, however, unplanned events can also occur, which lead to a significant imbalance between generation and consumption and require a rapid response by the transmission system operator. For these kinds of cases, balancing capacity is also reserved to stabilise the grid in the event of disturbances.

Balancing capacity or control energy is the energy that a system operator needs to balance unforeseen power fluctuations in the grid. The grid frequency can fluctuate and be destabilised in both directions: if electricity consumption exceeds the supply, positive control energy is needed to establish equilibrium. This means that either more electricity needs to be quickly generated and fed into the grid, or electricity consumption needs to be reduced. Conversely, where supply is too high and demand for electricity is too low, negative control energy is used – electricity consumption is rapidly increased, or electricity generation needs to be reduced.

Transmission system operators have access to three balancing power qualities:

- **Primary control energy**, which is accessed to rapidly stabilise the grid **within 30 seconds** (automatically activated in the generator of the power plant). All across Europe, for example, hydropower plant and battery generators immediately respond to a frequency deviation and supply more electricity. The primary control is used only for initial stabilisation and is replaced by secondary control as quickly as possible so that it is available for the next deployment.
- **Secondary control energy** must be available **within five minutes** (activated by the central load frequency controller at Swissgrid). It is typically provided by hydropower plants, which release more water to generate more electricity or pump more water to increase electricity consumption. Or the hydropower plants decrease their output to reduce the «excess» electricity. Swissgrid adjusts the unexpected additional and reduced generation the day after via «post-scheduling» to indemnify the balance groups.
- **Tertiary control energy** is the slowest form of control energy. If primary and secondary control are insufficient, Swissgrid manually activates (via the operator) tertiary control **after 15 minutes**.

## If oscillations occur, Swissgrid activates control energy in three stages



The control energy market can be clearly explained by comparing it with adaptive cruise control in a vehicle. Adaptive cruise control detects a vehicle driving in front of you and automatically maintains the defined safety distance. If you are driving at 100 km/h, the safety distance should always be at least 50 m. If your vehicle approaches the one in front of you, your vehicle automatically brakes. If the distance increases, it accelerates. This stop-and-go method lets ensures constant compliance with the minimum distance.

A similar concept applies to the system frequency. It should always be 50 Hz. To balance fluctuations, energy needs to quickly be added or removed from the grid as required (similar to the acceleration and braking of adaptive cruise control).

Companies tender their flexible power on the control energy market on a daily or weekly basis. If a company's bid is successful, it is responsible for ensuring that its flexible installations can be switched on or off as necessary during the tendered time period. Swissgrid pays a premium for this availability. In addition, a price per megawatt hour is paid for the actual ramp-up and shut-down of the installations.

## 4 How do balancing power platforms work, and TERRE in particular?

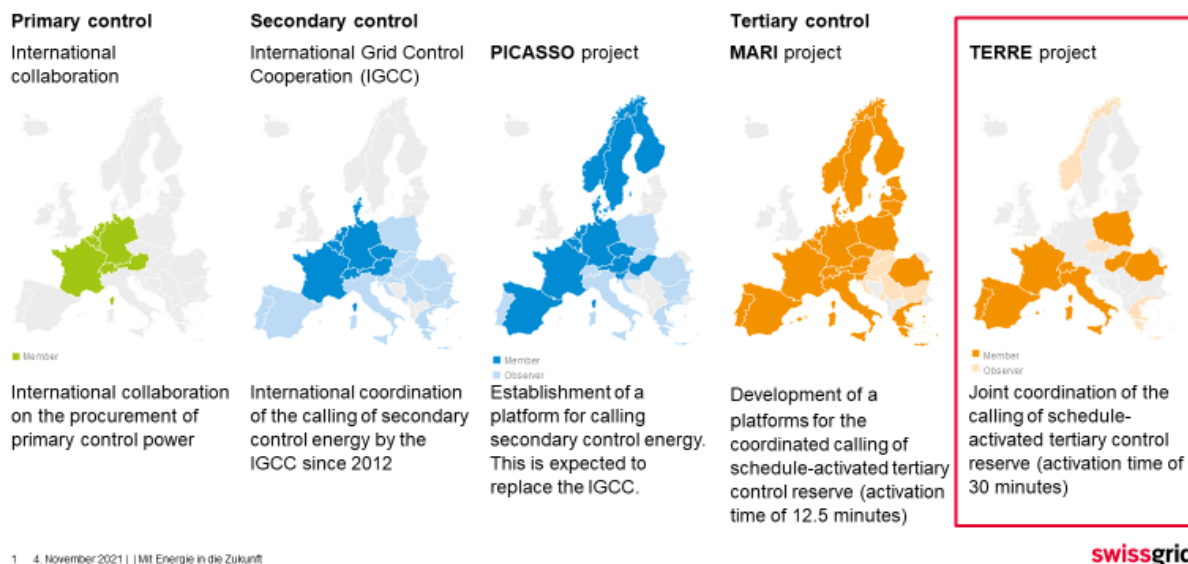
PICASSO, MARI and TERRE are three digital platforms on which control energy and ancillary services are to be auctioned, billed and monitored within the European internal market for electricity in future. These are standard products with a defined time in the control energy segment. The TERRE platform was launched in 2020, while MARI and PICASSO will follow from 2022.

Once a country in the TERRE association reports demand for control energy, the first step is to carry out analysis of the countries between which cross-border capacities for exchanging control energy remain available.

Specifically, the hourly TERRE process proceeds as follows: the ancillary service providers (ASP) of every participating country send their transmission system operator (TSO) the control energy tenders for the coming hour. Every TSO transfers these tenders, together with its control energy demand and the available cross-border capacity, to the common optimisation platform «Libra». This determines the optimal economic method of covering the control energy demand of all TSOs and sends the results (covered control

energy demand and selected balancing power tenders) to the relevant TSOs. Every TSO then calls the accepted tenders from their ASPs.

### Swissgrid is involved in the following international collaborations



## 5 Benefits of TERRE for Switzerland

Previously, tertiary control energy was virtually exclusively the domain of national markets. Swissgrid’s participation in the TERRE cooperation ensures that Switzerland is considered at the operational level in the critical period close to real-time operation.

If Swissgrid were excluded from TERRE, it would be made aware of cross-border load flows resulting from trade via the TERRE platform only at very short notice (approx. 15 minutes beforehand). This would lead to a further increase in unplanned load flows in the Swiss grid and make it even more challenging to ensure grid stability. In addition, the EU transmission system operators would not have access to flexible Swiss hydropower, which accounts for a key part of their control energy, particularly in France.

## 6 Reasons for the threat of exclusion

As an electricity agreement is still not in place with the EU, according to the Electricity Balancing Guideline (EB GL), Switzerland’s participation in TERRE is possible only if Switzerland’s exclusion could lead to unplanned physical power flows through Switzerland that would place the system security of the region at risk. This danger was confirmed in an «All TSO Opinion» (December 2017) and by ACER (April 2018). Initial operational findings also support this analysis. The TERRE cooperation partners therefore support Swissgrid’s continued participation for system security reasons.

However, from the EU Commission’s perspective, Swissgrid’s participation breaches the Electricity Balancing Guideline (Art. 1.6 and 1.7 EB GL) and would be possible only if the EU Commission reaches a positive decision. The EU Commission is currently of the opinion that the preconditions for such a decision are not in place. The EU Commission also argues that Swissgrid’s participation in TERRE is not essential to ensure system security. According to the EU Commission, the European TSOs would have adequate emergency measures at their disposal to take action in the event of disruptions in operation, even without Swissgrid.

## **7 Consequences of exclusion**

The Swiss extra-high-voltage grid is located in the centre of the European interconnected grid. Close collaboration with partners in Europe is therefore extremely important for system security in Switzerland and in neighbouring European countries. If Swissgrid were excluded from TERRE, it would be made aware of cross-border load flows resulting from trade via the TERRE platform only at very short notice (approx. 15 minutes beforehand).

Without an electricity agreement, which would establish legal certainty and ensure Switzerland's involvement in the relevant European coordination processes and committees, this collaboration and the secure supply of electricity in Switzerland is increasingly threatened. Unplanned flows through Switzerland would continue to increase together with the risks to secure grid operation. This could also place the system security of the region at risk.