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Factsheet
MARI and PICASSO – European balancing platforms

Date October 2022

1 Initial situation

In 2017, Swissgrid and other members of the European Network of Transmission System Operators for Electricity (ENTSO-E) together established the «Manually Activated Reserves Initiative» (MARI) and the «Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation» (PICASSO), which is to be used to exchange control energy across borders in future. While «PICASSO» encompasses the tenders for secondary control energy (SCE), «MARI» does the same for fast tertiary control energy (TCE; activation time of 12.5 minutes and delivery time of 15 minutes). The platform for slow tertiary control energy (activation time of 30 minutes and delivery time of up to one hour), the «Trans European Replacement Reserve Exchange» (TERRE), has been in operation since October 2020 (cf. «TERRE» factsheet).

Go-live of PICASSO in June 2022

Swissgrid was the first participating transmission system operator (TSO) to successfully complete all the operational tests for the PICASSO platform. In May 2022, the Steering Committee for the PICASSO project therefore confirmed Swissgrid's technical readiness to start operations. At the same time, however, the go-live was postponed until further notice due to legal and political uncertainties surrounding the relationship between Switzerland and the EU. This means that although PICASSO has been in operation for the Swiss market since 1 June 2022, a connection has not yet been established with the central PICASSO platform. Consequently, no Swiss bids or requests are possible on the platform for the time being. However, the product properties of SCE in Switzerland have been harmonised with those of PICASSO since 1 June 2022, meaning that compatibility is ensured at all times.

Go-live of MARI in October 2022

The MARI platform went live at the beginning of October 2022. In Switzerland, the TCE product properties will be harmonised with those of MARI as early as the end of August 2022 to ensure compatibility. The decision as to if and when an exchange of control energy is possible with the MARI platform will be determined by the same legal and political uncertainties that PICASSO is subject to.

TERRE in operation since October 2020

The TERRE platform has been in operation since October 2020. Consequently, from autumn 2022 onwards, there will be three new common European platforms, MARI, PICASSO and TERRE, contributing to the EU's goal of establishing a complete European single electricity market.

2 50 Hertz – the pulse of our grids

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

Frequency is a physical measure of 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 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.

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. As the Swiss transmission system operator, Swissgrid is tasked with ensuring secure, high-performance, and efficient grid operation. It is responsible for making sure that the system frequency remains within the permissible range of 49.8 to 50.2 Hz.

3 What is control power, and what is it used for?

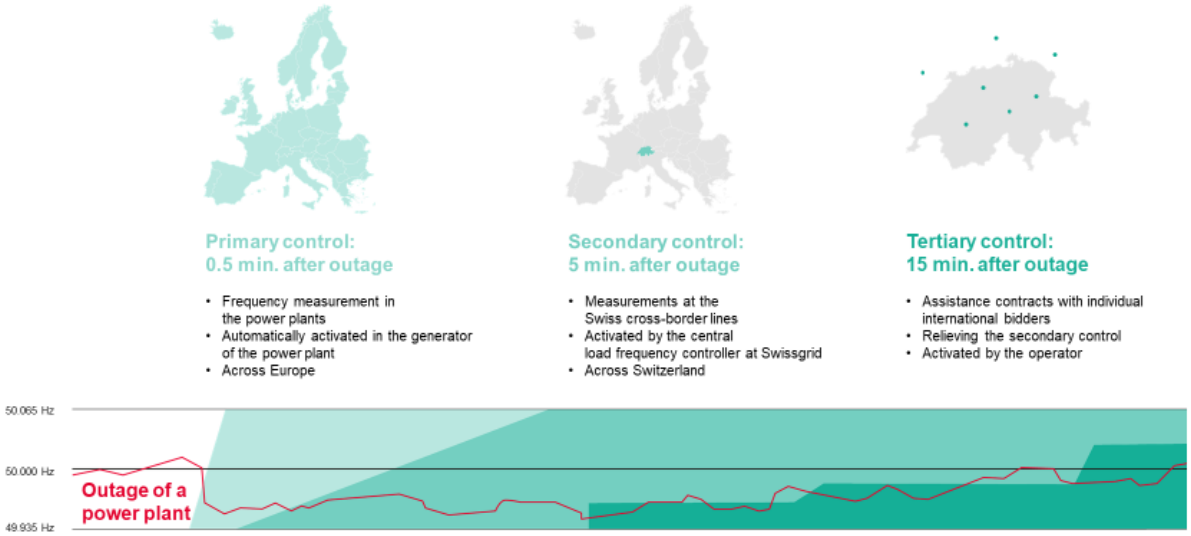
Electricity demand can differ significantly depending on the time of day. For instance, it is different in the early morning compared to midday or in the evening, when lights and televisions are switched on. These fluctuations during the day are usually easy to predict. Swissgrid receives the relevant forecasts from the energy suppliers (balance groups) in the form of «schedules» for the energy exchange within Switzerland and across borders. 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 at all times to compensate for frequency fluctuations and imbalances in the Swiss control area. 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 schedule deviations, however, unplanned events can also occur that lead to a significant imbalance between generation and consumption and require a rapid response by the TSOs. For these kinds of cases, control power is also reserved to stabilise the grid in the event of disturbances.

Control energy is the energy that a grid operator needs to balance unforeseen 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.

TSOs have access to three control energy qualities:

- **Primary control energy**, which is accessed to rapidly stabilise the grid **within 30 seconds** (automatically activated in the generator of the power plant). Across Europe, for example, hydropower plant and battery generators immediately respond to a frequency deviation and increase or reduce the supply of 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** (it is activated by the central load frequency controller at Swissgrid). It is typically provided by hydropower plants, which release water to generate electricity or pump water to increase electricity consumption. Swissgrid adjusts the unexpected additional or reduced generation the next day 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 tertiary control (i.e., the request is made by the operator in the Swissgrid control centre) **within 15 minutes.**



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 metres. 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 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 be added or removed from the grid quickly as required (similar to the acceleration and braking of adaptive cruise control).

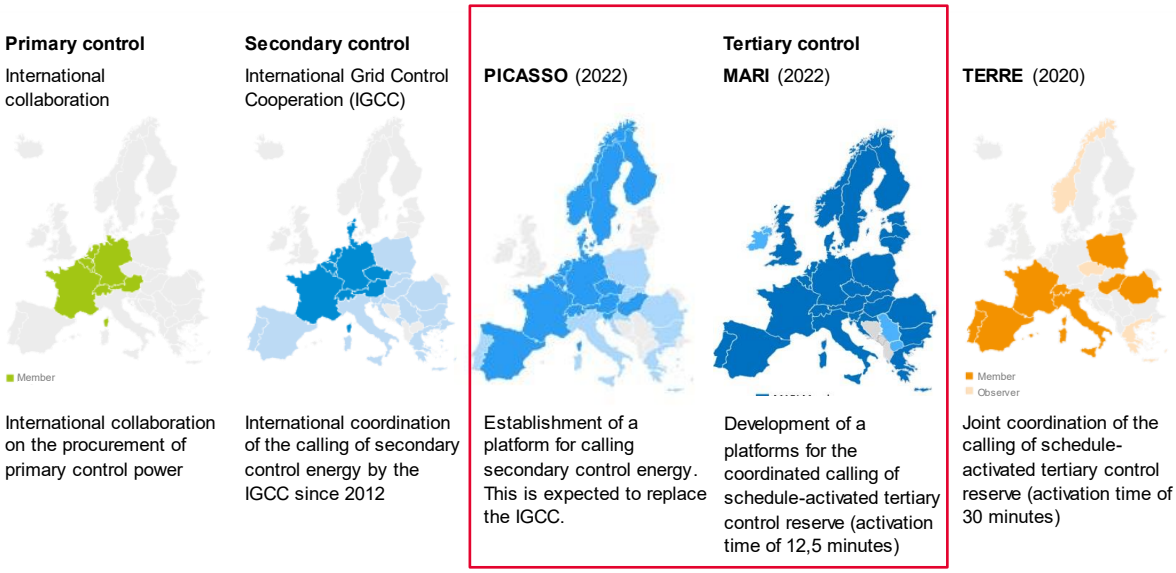
Companies tender their flexible power on the control energy market on a daily or weekly basis. If a company's bid is successful, it is responsible for ensuring that its flexible installations can be switched on or off as necessary during the tendered time. Swissgrid pays a premium for this availability.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

4 How do balancing platforms work, and MARI and PICASSO in particular?

MARI, PICASSO and TERRE are three digital platforms that will be used to auction, bill and monitor control energy within the European internal electricity market in future. These are standard products with defined times in the control energy segment.

Specifically, the quarter-hourly MARI process proceeds as follows: the ancillary services providers (ASP) of every participating country send their TSO the control energy tenders for the coming quarter of an hour. Every TSO transfers these tenders, together with their control energy demand and the available cross-border capacity, to the common optimisation platform «Libra». Libra determines the most economic method of covering the control energy demand of all TSOs, considering the available cross-border capacities, and sends the results (covered control energy demand and selected control energy tenders) to the relevant TSOs. Every TSO then requests the accepted tenders from their ASPs.

The PICASSO platform is based on the «International Grid Control Cooperation» (IGCC) functionality (netting of opposing demand for secondary control energy of TSOs; see also «IGCC» factsheet). In addition to IGCC, the introduction of PICASSO means that the request for remaining demand is also made jointly. This request is then made in the country within the PICASSO network with the most favourable tenders at that time. As with MARI, the available cross-border capacities are considered.



5 Benefits of MARI and PICASSO for Switzerland – higher system security and lower costs

Previously, secondary and tertiary control reserves were virtually exclusively the domain of national markets. With the Electricity Balancing Guideline (EB GL), the EU has established a binding regulation for the procurement of control energy in the EU that transforms the control energy market from a national to a pan-European matter. The aims are to achieve more efficient procurement, a more reliable provision of control energy and lower costs for end consumers. Last but not least, the EB GL is also preparing the European energy system for a future in which renewable energies will form the backbone of energy supply and consumers will play a more active role.

Swissgrid's participation in MARI and PICASSO will help increase system security, as more control energy is available than on a national market. It will also lead to lower costs for control energy. Above all, however, Swissgrid's participation will result in better integration in the European interconnected grid in the operationally critical phase before real-time operation.

6 Reasons for the threat of exclusion

As an electricity agreement is still not in place with the EU, Switzerland's participation in TERRE, MARI and PICASSO is only possible, according to the Electricity Balancing Guideline (EB GL), if the EU Commission agrees to it – since 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» (Dec. 2017) and by ACER (April 2018). Initial operational findings also support this analysis.

However, from the EU Commission's perspective, Swissgrid's participation breaches the Electricity Balancing Guideline (Art. 1.6 and 1.7 EB GL), as there has been no positive decision on this by the EU Commission and the preconditions for such a decision are not in place, despite the aforementioned «All TSO Opinion». The EU Commission argues that Swissgrid's participation in TERRE (and consequently in MARI and PICASSO) is not essential to ensure system security in the region. 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 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 the new European platforms for the joint

requesting of control energy, this would lead to a further increase in unplanned load flows in the Swiss transmission grid.

As there are hardly any instruments left to take corrective action at such short notice, this would in turn jeopardise 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.

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 are increasingly threatened.