



The primary reserve: a solution for stabilising the frequency in the European interconnected system

Elia takes part in controlling the frequency of the European interconnected system managed by UCTE¹. This is essential to ensuring grid stability and avoiding blackouts. UCTE is responsible for defining how the various system operators belonging to the European interconnected system are to achieve this frequency control. Providing primary reserve is a measure required by UCTE for implementing primary frequency control. UCTE determines the overall volume of the European primary reserve and how the volume is distributed amongst the system operators, including Elia. Within a specified time measured in seconds, the primary reserve is activated automatically by the facilities of the grid user providing that primary reserve. Elia pays users for providing this service. Elia also carries out a post-hoc analysis to evaluate the efficiency of the service's operation.

I. The primary reserve: principles

I.1. The background to the primary, secondary and tertiary reserves

The Belgian high-voltage grid is part of a larger European interconnected system. The physical properties of electricity mean that it is essential to keep the frequency of the European system at an appropriate level. Otherwise, uncontrolled frequency levels very quickly cause grid instability, which may degenerate into a blackout.

I.2. Standards drawn up by UCTE

UCTE is the body responsible for co-ordination of the operation and the development of the European interconnected system, otherwise known as the UCTE synchronous area. It demands that each of the interconnected European countries maintains a frequency level within a range from 49.99 Hz to 50.01 Hz. If the frequency deviates substantially from 50 Hz, a substantial proportion of grid users will no longer be able to inject electricity into or take electricity from the system, which would cause balance problems that would be difficult to manage.

I.3. Ongoing frequency control

Since power grids are subject to both injections and offtakes of energy, it is inevitable that there will be imbalances between generation and consumption. Such imbalances have an impact on the frequency level, making ongoing frequency control necessary to avoid the grid becoming unstable. It has to be put in place as quickly as possible because any major variation in the frequency level can very quickly spiral out of control, as the size of the variation has a direct effect on how fast the grid becomes unstable.

I.4. A primary reserve for managing frequency

Obviously, to ensure consistency between the interconnected grids, UCTE defines what resources have to be put in place to maintain the grid frequency at an acceptable level. The first measure that all the transmission system operators must take, in a spirit of solidarity, is primary frequency control. This can only be implemented if primary reserves are set up. According to UCTE, primary-reserve volumes amounting to 3,000 MW are needed for efficient operation of the European interconnected system. This total volume is distributed amongst the countries making up the UCTE synchronous area. This means that the volume of Belgium's primary reserve is around 100 MW. Every transmission system operator undertakes to comply with the obligations set out in UCTE's Operation Handbook and signs a Multilateral Agreement to that end.

I.5. A solution that can be activated automatically to stabilise the frequency

To meet its primary frequency control obligations, Elia continually draws on the primary reserve provided by the users of its grid. The primary reserve is continually activated automatically by the user's facilities.

I.6. Who can offer this service ?

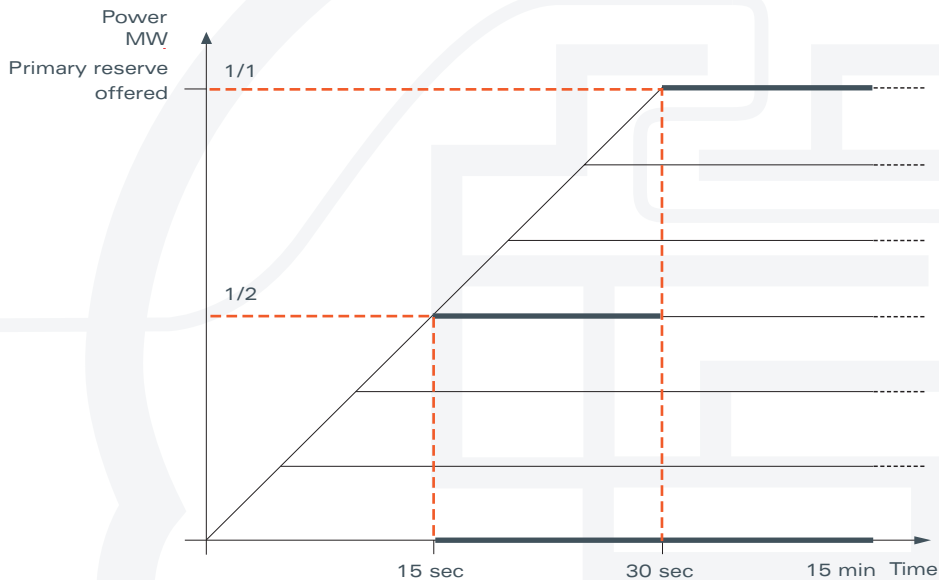
The primary reserve is a service that can be provided by any UCTE grid user, as long as its facilities have the following technical characteristics:

- they are fitted with an automatic speed, rotation and frequency control system. This equipment enables the production units or industrial processes to detect frequency variations in the grid automatically and react to them by activating their primary reserve;

¹ Union for Co-ordination of Transmission of Electricity

- they have a system that is able to read the grid's frequency;
- they are able to provide half of the contractual primary reserve within 15 seconds. The whole of the primary reserve must be deployed after 30 seconds and stay activated for at least 15 consecutive minutes;
- they are available round the clock.

Most of the production units are fitted with automatic speed control, and so the producer only has to make a minimal investment to be able to provide the primary reserve. For industrial players taking energy from the grid, the investment is normally limited to just installing a local unit that handles automatic control and measures frequency. However, an industrial player that wants to take part in the primary reserve must weigh up the impact that providing a primary reserve will have on its process.



I.7. Data exchanges in advance and in real time

For a primary reserve, the grid user and Elia currently have to exchange various data:

- on day D 1, the user supplies Elia with a list of production units that are taking part in primary control, the total power being provided and the amount of the primary reserve provided by each facility on a quarter-hourly basis;
- if requested by Elia, the user specifies in real time which facilities can take part in frequency control and the total primary-reserve power that they can provide.

II. A post-hoc analysis and monitoring

Primary frequency control is evaluated a posteriori: frequency-variation reports are drawn up by Elia and sent to the grid user. Elia times these analyses appropriately, to make sure it can be checked whether the primary-reserve volumes activated are adequate for the frequency variations measured locally.

Specifically, this analysis makes it possible:

- to check whether the primary reserve is actually provided to Elia and is activated correctly;
- for the grid user to benefit from an in-depth analysis of how its facilities handle primary control, and the operation of locally installed measuring devices and other equipment.

III. Payment for the primary reserve

Elia offers a set payment to grid users that provide the primary reserve. The payment covers the costs involved in both providing and activating the primary reserve. This distinguishes the primary reserve from the secondary and tertiary reserves, for which there are separate payments for providing the reserve and activating the reserve.

The primary-reserve volumes agreed between Elia and the grid users must reach the threshold set by UCTE. If the agreed reserves are insufficient to meet this obligation, Elia can ask the grid users for a power reserve that would complement the contractually agreed volumes. This supplementary primary-reserve power is subject to payment, the amount of which is agreed between Elia and the grid user.

IV. Benefits of the primary reserve

A grid user derives major benefits from opting to take part in the primary reserve:

- it takes part in managing the European interconnected system and contributes to it operating efficiently;
- throughout its contract, it is given a set payment for providing its reserve. In all cases, this payment covers at least the costs incurred by the grid users in providing the primary-reserve service.

V. Legal and contractual basis

The primary-reserve service is covered by a contract between Elia and the grid user. The content of this contract (including, for instance, the definition of equitable prices) is based on the stipulations of the federal Grid Code, which are in turn based on the rules and standards set out by UCTE.

Each year UCTE sets the total volume of this European reserve, which is currently 3,000 MW. The volumes to be provided by each of the system operators may vary from one year to the next and are also set by UCTE. In recent years, the primary-reserve amount for the Elia control area was around 100 MW.

Only grid users that have already signed a CIPU contract with Elia can sign a primary-reserve contract (see the CIPU product sheet). Elia organises European tender procedures for the supply of primary reserve. The tenders are selected on the basis of the proposed price and the control requirements. They are ranked from most favourable to least favourable and must comply with operational security requirements.

The primary reserve in 5 key points

- Primary frequency control is essential to ensuring the stability of the European system and avoiding blackouts.
- Grid users providing Elia with a primary reserve take part in controlling the frequency of the European system – this is done in accordance with UCTE stipulations.
- The primary reserve is continually activated. The facilities that the grid user assigns to this reserve detect frequency variations automatically and react to them within a specified period. These facilities must have certain technical characteristics.
- The primary reserve is subject to a payment that covers the provision and activation of the service.
- Elia carries out a post-hoc analysis of how frequency control was handled by the grid user's facilities.