INTELLIGENCE UPDATE

EU power providers urged to protect grids from data centers

Peter Judge 16 Jan 2026

The coordinating body for grids across Europe (The European Network of TSOs for Electricity, ENTSO-E) has urged transmission system operators (TSOs) to take action against two threats: the policy gap created by the European Commission's failure to formally adopt a defined set of new grid connection codes, and the risk of blackouts caused by data center operations.

TSOs are being advised to ignore the Commission's administrative roadblock and implement the new grid codes directly — along with a significant addition: a minimum set of connection requirements designed to address emerging risks caused by the dynamic behaviour of data centers.

Facilities that simultaneously switch to island mode can destabilize grids, as can the highly variable demand profile associated with new AI data centers. ENTSO-E's proposals largely reflect industry input, but there are concerns that they could grant TSOs too much discretion, and that certain recommendations may conflict with existing grid stability provisions.

New grid codes in limbo

Electrical TSOs in Europe are in a bind. They face unprecedented change, including a drive to reduce emissions set out in the European Green Deal of 2019, a shift to intermittent renewable energy sources that need to be firmed, and the arrival of new energy demand patterns, which include widely distributed electric vehicle charging and data center campuses with power demands of a small city.

Legally mandated grid codes give TSOs control over new loads and sources, to ensure grid stability and fair access. To address the changing needs of the grid the Agency for the Cooperation of Energy Regulators (ACER) has defined updates for the three code standards that have been in place since 2016:

- **Network Code on Requirements for Generators (NC RfG)**: EU Regulation 2016/631.
- **Network Code on Demand Connection (NC DC, also referred to as DCC or DC3):** EU Regulation 2016/1388.

- **Network Code on High Voltage Direct Current Connections**. EU Regulation 2016/1447.

These standards were due to be approved by the Commission in 2016, and implemented by national TSOs, but in September 2025 the process stalled abruptly. The Commission postponed the implementation of the Connection Network Codes (CNC) 2.0 indefinitely, blaming “resource constraints.”

European standards bodies including Germany’s VDE, and TSOs including TenneT in the Netherlands and Germany called for the process to be reinstated. ENTSO-E, which represents 40 TSOs, has now called for TSOs to adopt the new codes regardless of progress. ENTSO-E was involved in the creation of CNC 2.0 and its influence extends beyond the EU to include former member states, such as the UK, and energy trading partners, such as Norway.

ENTSO-E called for swift action by TSOs in a December 2025 position paper (see *ENTSO-E position on the need for national connection requirements to ensure EU power system stability*). The paper also added a substantial new element: ACER’s proposed new network code on demand connection (NC DC 2.0), which covers electric vehicles (EVs), heat pumps and electrolyzers. ENTSO-E has added data centers to this list in response to concerns (which have emerged since the NC DC 2.0 proposal was drafted) that large data centers could destabilize the grid.

Data center-induced blackout prevention

Data center energy demand is growing rapidly, with ENTSO-E projecting an increase in local annual demand from 76.4 TWh in 2019 to 219.5 TWh in 2030, and 304.3 TWh by 2035). Beyond their sheer size, the evolving nature of data center power demand has become increasingly challenging in recent years.

Specific issues that are problematic for TSOs include:

- **Dynamic load**. For example, sudden spikes, drops, and oscillations in demand, often associated with AI training.
- **Limited visibility**. TSOs require real-time view of data center operations to anticipate their actions and maintain grid stability.
- **Switching to island mode during fluctuations**. This can potentially trigger a near instantaneous and difficult-to-manage drop of several gigawatts of load within a grid region.

These issues can cause frequency deviations and voltage instability (including oscillations), as well as overloading of transmission lines and an increased need for reserve and balancing services.

Data centers operating as dynamic loads nearly caused blackouts in Northern Virginia (2024) and Ireland (2022) when grid fluctuations prompted a large volume of data center capacity to switch to UPS systems, worsening grid disturbances.

Around the world TSOs and grid reliability authorities are responding to growing concerns by requiring data centers to ride through certain grid fluctuations instead of switching to UPS (see *Power companies act to stop data center-induced blackouts*).

In addition to ENTSO-E's proposals to address the issues listed above, corresponding governing regulations have been proposed by the Electric Reliability Council of Texas (ERCOT), the North American Electric Reliability Corp (NERC) and the Australian Energy Market Operator (AEMO).

Data centers and TSOs are actively discussing ways to ensure that ENTSO-E's requirements are not too onerous and avoid fragmentation across different locations and providers. ENTSO-E's proposals could be a step toward a unified European approach, but it will need thorough examination since initial reactions have highlighted some potential concerns.

Ride-through (and other) requirements

ENTSO-E's proposals follow the ACER's NC DC 2.0 requirements aimed at new loads including EV chargers, heat pumps and electrolyzers, and add new requirements for data center behaviour during incidents of overfrequency, underfrequency, overvoltage and undervoltage. They also address protocols for data centers to reconnect to the grid smoothly following a fault, as well as measures to avoid induced oscillations in grid voltage. Data centers have also been requested to reduce power consumption during underfrequency events which could cause grid imbalance.

To fully understand the proposals, ENTSO-E's position paper should be read alongside ACER's underlying NC DC 2.0 proposals. The following summary highlights the main points but is indicative only.

Frequency ride-through

ENSTOE-E recommends that data centers should be required to remain connected to the network and continue to operate continuously, through frequency changes of:

- ±4.0 Hz/s (hertz per second) over a period of 0.25 s.
- ±2.0 Hz/s over a period of 0.5 s.
- ±1.5 Hz/s over a period of 1 s.
- ±1.25 Hz/s over a period of 2 s.

ENTSO-E's position paper provides graphs that combine its proposals with those detailed in NC DC 2.0. Recommendations include a requirement for indefinite grid connection for deviations that are less than 1 Hz.

Voltage ride-through

ENTSO-E proposes that data centers should remain connected and operational during undervoltage and overvoltage faults with specific time profiles defined within NC DC 2.0 and ENTSO-E's position paper.

Proposals include a requirement that data centers connected at voltages between 1 kV and 110 kV should remain connected indefinitely during any voltage deviations within 10% of the connection voltage, and remain connected for 1 minute during an overvoltage of up to 20%. These requirements can be extended further by TSOs and regional system operators (RSOs).

Post-fault power recovery

When the network voltage returns to normal parameters, the TSO will set conditions for a data center to return to its normal active power consumption level at the connection point. These conditions will include a percentage (80-100%) of normal load, and a recovery time ranging from 0.5 s to 5 s. Longer recovery times can be specified if needed.

Load-induced forced oscillations

Changes in the load profile can create oscillations in the frequency range of the grid. The relevant TSO is required to define the magnitude and accuracy of the permissible oscillations and may define allowable oscillation levels for multiple frequency ranges between 0.01 Hz to 50 Hz.

Underfrequency control

Limited frequency sensitive mode underfrequency control (LFSM-UC) requires a data center to reduce its active power consumption automatically and proportionally when the grid frequency drops. At a defined threshold, the facility must reduce its power consumption to the lowest level at which its electrical load can safely operate. When the grid frequency recovers, the facility must return to its normal consumption state in a controlled manner.

This means data centers must be capable of:

- Real-time grid frequency detection.
- Automatic reduction of power load.
- Proportional response according to defined characteristics.

These characteristics are set by the TSO in coordination with other TSOs within the same synchronous area, to ensure minimal impact on neighboring areas.

Key concerns

Initial reactions from the industry suggest that the recommendations are broadly in line with early local responses to the issues, but there are concerns with how they will be implemented.

Complying with the new regulations will have an impact on data center design. Facilities with modern centralized UPS systems should be able to reconfigure their systems to meet requirements for fault ride-through and active power recovery, although doing so will require effort. Facilities with older UPS units, with distributed UPS (such as Open Compute Project designs) or without UPS (cryptomines and supercomputers) may have more difficulty.

Early operator reaction expressed concerns that the ENTSO-E paper could unduly expand TSO powers, encouraging a “blanket” approach to requirements (rather than a targeted approach), and granting TSOs too much leeway in defining the details.

The inclusion of limited frequency sensitive mode underfrequency control (LFSM-UC) amounts to a requirement for data centers to assist with fast frequency response (FFR) — a grid stability service currently provided by TSOs. This could be problematic, as the requirement is not fully detailed, and the actions required from data center operators may overlap with those already provided by grid services (e.g., peaker plants) and new grid balancing services (e.g., battery energy storage systems).

> ## The Uptime Intelligence View
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> Operators around the world can expect their TSOs to issue requirements for fault ride through and fault recovery — if they are not already doing so. ENTSO-E’s position indicates the likely requirements that will become prevalent in Europe. As the umbrella group for 40 European TSOs, ENTSO-E is providing a step toward a uniform set of requirements across the region.
> There will be implications for data center design, and for operators’ participation in grid stability measures, including fast frequency response.
> Typical compliance implementation measures can involve UPS and battery systems, automated load shedding of non-critical loads, IT workload migration, and on-site energy generation and/storage.
> Given ENTSO-E’s influence, operators and equipment vendors likely to be affected should assess whether their products and facilities comply (or can comply) with these requirements.

Note: The regulatory analysis provided in this Update is the opinion of Uptime Intelligence. Data center operators should validate the interpretations with their legal staff and any relevant regulatory authorities.

Other related reports published by Uptime Institute include:
[*Power companies act to stop data center-induced blackouts*]

ABOUT THE AUTHOR

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16 Jan 2026

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