

ENTSO-E Position on Urgent Connection Requirements for Power-to-Gas Demand Facilities

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From: System Development Committee

ENTSO-E Mission Statement

Who we are

ENTSO-E, the European Network of Transmission System Operators for Electricity, is the association for the cooperation of the European transmission system operators (TSOs). The 40 member TSOs representing 36 countries are responsible for the secure and coordinated operation of Europe's electricity system, the largest interconnected electrical grid in the world. In addition to its core, historical role in technical cooperation, ENTSO-E is also the common voice of TSOs.

ENTSO-E brings together the unique expertise of TSOs for the benefit of European citizens by keeping the lights on, enabling the energy transition, and promoting the completion and optimal functioning of the internal electricity market, including via the fulfilment of the mandates given to ENTSO-E based on EU legislation.

Our mission

ENTSO-E and its members, as the European TSO community, fulfil a common mission: Ensuring the security of the interconnected power system in all time frames at pan-European level and the optimal functioning and development of the European interconnected electricity markets, while enabling the integration of electricity generated from renewable energy sources and of emerging technologies.

Our vision

ENTSO-E plays a central role in enabling Europe to become the first climate-neutral continent by 2050 by creating a system that is secure, sustainable and affordable, and that integrates the expected amount of renewable energy, thereby offering an essential contribution to the European Green Deal. This endeavour requires sector integration and close cooperation among all actors.

Europe is moving towards a sustainable, digitalised, integrated and electrified energy system with a combination of centralised and distributed resources.

ENTSO-E acts to ensure that this energy system keeps consumers at its centre and is operated and developed with climate objectives and social welfare in mind.

ENTSO-E is committed to use its unique expertise and system-wide view – supported by a responsibility to maintain the system's security – to deliver a comprehensive roadmap of how a climate-neutral Europe looks.

Our values

ENTSO-E acts in solidarity as a community of TSOs united by a shared responsibility.

As the professional association of independent and neutral regulated entities acting under a clear legal mandate, ENTSO-E serves the interests of society by optimising social welfare in its dimensions of safety, economy, environment, and performance.

ENTSO-E is committed to working with the highest technical rigour as well as developing sustainable and innovative responses to prepare for the future and overcoming the challenges of keeping the power system secure in a climate-neutral Europe. In all its activities, ENTSO-E acts with transparency and in a trustworthy dialogue with legislative and regulatory decision makers and stakeholders.

Our contributions

ENTSO-E supports the cooperation among its members at European and regional levels. Over the past decades, TSOs have undertaken initiatives to increase their cooperation in network planning, operation and market integration, thereby successfully contributing to meeting EU climate and energy targets.

To carry out its legally mandated tasks ENTSO-E's key responsibilities include the following:

- Development and implementation of standards, network codes, platforms and tools to ensure secure system and market operation as well as integration of renewable energy;
- Assessment of the adequacy of the system in different timeframes;
- Coordination of the planning and development of infrastructures at the European level (Ten-Year Network Development Plans, TYNDPs);
- Coordination of research, development and innovation activities of TSOs;
- Development of platforms to enable the transparent sharing of data with market participants.

ENTSO-E supports its members in the implementation and monitoring of the agreed common rules.

POSITION

In response to national and European initiatives for the green transition, Europe anticipates a significant expansion of Power-to-Gas demand facilities (e.g., electrolysis) to reach a capacity of up to 30 gigawatts by 2028. Connection agreements for these new capacities are usually signed a few years before the realisation of the projects. Therefore, by the end of 2024 Transmission System Operators (TSOs) should be in the position to define technical requirements for the connection of these capacities.

While the Network Code on Demand Connection (NC DC) 2.0¹ aims to introduce minimum system-supportive technical requirements for connecting large-scale Power-to-Gas demand facilities, it will only apply from three years after its publication in the Official Journal of the European Union.

Until then, Power-to-Gas demand facilities shall comply with the existing NC DC² which provides insufficient technical requirements for large-scale integration, lacking necessary provisions for immunity and system-supportive behaviour, crucial for stability of the interconnected European Power system.

To avoid the potential future need for retroactive application of requirements, which would lead to unreasonable technical and economical efforts, ENTSO-E recommends the Member States and/or relevant TSOs already implement a certain level of robustness capabilities for transmission-connected Power-to-Gas demand facilities. While ensuring the security of supply and guaranteeing safe operation until the application of NC DC 2.0, these measures should facilitate the green transition in Europe. The absence of such technical requirements as of today, given the rapid increase and size of connection requests from Power-to-Gas demand facilities, will have adverse cross-border impact.³ The inclusion of such requirements for transmission connected power to gas demand facilities is aligned with the proposal made by The European Union Agency for the Cooperation of Energy Regulators (ACER) to the European Commission (EC) for the amendment of the NC DC.

Indeed, as the requests for grid connection of these Power-to-Gas demand facilities are already ramping up in the Member States, national requirements preserving system stability have already emerged, notably in Denmark and Germany. Such a lack of harmonised approach in the implementation of system-supportive requirements for Power-to-Gas demand facilities may disrupt level playing field and create a risk to the overall security of the European power system. A serious risk is the cascade effect of protection tripping. Nowadays high load factors of transmission lines are not unusual in the European transmission grid. High load factors facilitate higher transferable power

¹ The Agency for the Cooperation of Energy Regulators (ACER) on December 2023 submitted to the European Commission its Recommendation on the amendments to the Network Codes on Requirements for Grid Connection of Generators (Commission Regulation (EU) 2016/631) and on Demand Connection (Commission Regulation (EU) 2016/1388). ([link](#)). The entry into force of amended legal texts is the responsibility of the European Commission.

² Commission Regulation (EU) 2016/1388.

³ For example, the concentration of Power-to-Gas demand facility of a region (coast) that would trip to any single grid disturbance would create severe load flow contingency, trigger frequency and voltage stability risks.

in accordance with a growing European electricity market by saving grid expansion costs in the first instance. But in case of faults and the uncontrolled behaviour of big loads like the Power-to-Gas demand facilities with a significant and rising share of demand capacity there is also a rising risk of congestion of transmission lines. This can lead to protection tripping and jeopardises the whole European transmission grid. Therefore ENTSO-E recommends at least certain technical requirements for Power-to-Gas facilities which are introduced in the following section. By fulfilling the requested requirements, the Power-to-Gas facilities can indirectly improve dynamic stability reserves of the connected grid lines and really can contribute to overall European transmission system stability.

Additionally, given that Power-to-Gas facilities are outside of the scope of the current Demand Connection Code, the Members States may introduce more detailed provisions, provided that those measures are compatible with Union law as per Article 62 of the Electricity Regulation⁴.

RECOMMENDATIONS

Therefore, to ensure secure operation during the planned rapid expansion of Power-to-Gas capacities, ENTSO-E recommends the introduction of technical requirements at national level for all Power-to-Gas demand facilities with a connection point of 110 kV and above in Europe as soon as possible. These requirements should at a minimum address the following:

- Rate of Change of Frequency robustness;
- Fault-Ride-Through capability; and
- Active power recovery after faults.

To ensure security of supply and a level playing field, all Member States, competent entities, and system operators are encouraged to take the appropriate steps at national level to implement these requirements considering the national legal frame.

⁴ REGULATION (EU) 2019/943 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 June 2019 on the internal market for electricity.