Industrial Electrification in the EU – Blocked by the Grid?

OPTIONS FOR MEMBER STATES TO UNLOCK GRID ACCESS FOR INDUSTRIAL CONSUMERS

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Across the EU, new industrial projects are waiting for the opportunity to connect to the grid – sometimes for years. The stalled investments are a threat to Europe's competitiveness, while the connection bottlenecks are slowing progress on what is in the long term the most cost- and energy-efficient pathway to industrial decarbonisation. Tackling this challenge is high on the EU's agenda, but it is member states who can unblock the bottlenecks by effectively implementing existing EU regulations.

In countries across the EU, the lack of available grid capacity is leading to delays and cancellations affecting thousands of businesses and putting billions in investment at risk.[1] This issue is increasingly recognised, though not yet well characterised: Europe-wide comprehensive data on demand connection queues is not available.

From interviews with industry representatives, we have learnt that regional conditions and individual project characteristics together shape whether an industrial project can secure access to the grid (Figure 1). A particular factor is the ability of an industrial installation to reduce load on the network through flexible electricity usage.

Our findings underscore that only effective national implementation of EU regulations can unlock stalled investment. Member states, network operators and national regulatory authorities need to robustly and speedily implement the Electricity Market Directive and the Grid Package, including the Guidance on efficient and timely grid connections.

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[1] €60bn in 2024 in Spain alone, according to Aelec, September 2025, **Conectando el future: Redes eléctricas para una España más competitiva** (PDF); Solarbe Global, 31 July 2025, **Over 9,000 Dutch companies await grid connection as energy storage grows by 60% annually**

Factors affecting industrial grid access

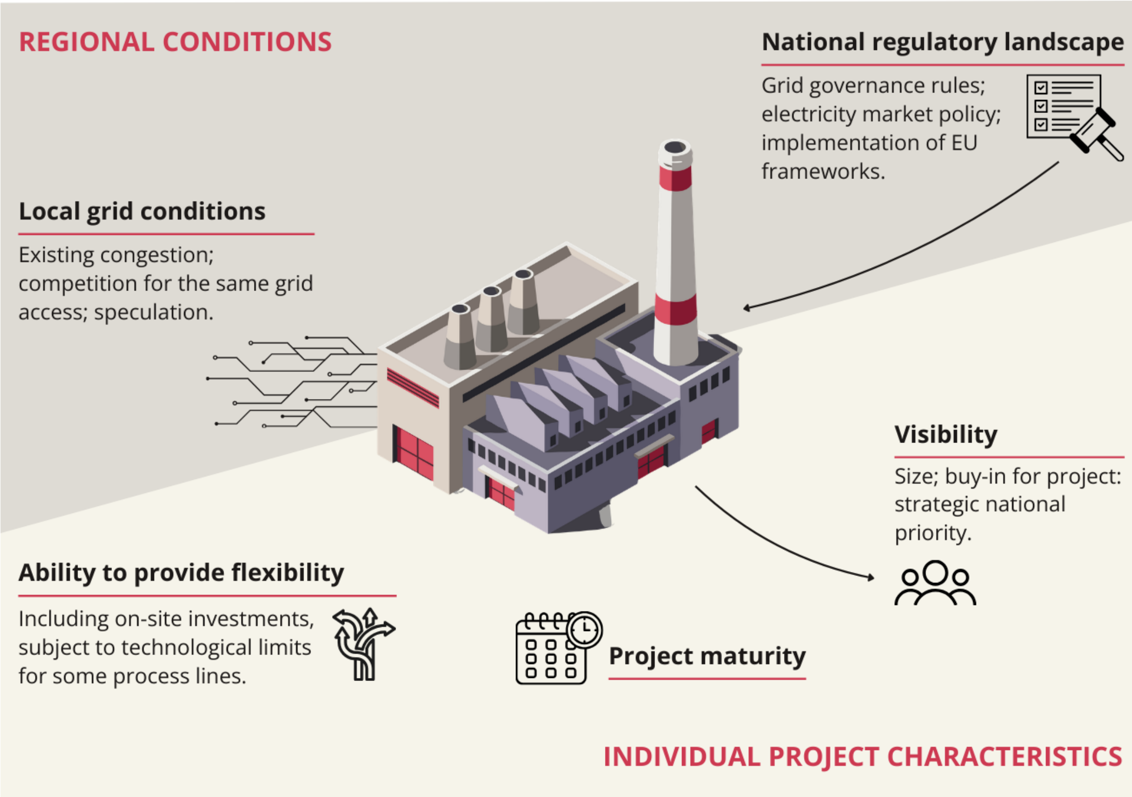

Figure 1: Queues for grid access to electrify industrial projects are increasing, but what determines whether a project secures access? Often, a combination of regional conditions and individual project characteristics is at play.

Recommendations for member states

Urgently implement the Electricity Market Directive[2]

- **Flexible connection contracts:** National regulatory authorities (NRAs) should design rules for non-firm connections or phased grid access to reduce upfront barriers for network users. System operators should implement these.
- **Flexibility remuneration schemes:** NRAs should design schemes that compensate industrial flexibility providers based on market outcomes, with clear, transparent baselines for performance and settlement. These should be easily accessible to SMEs. In particular, enable participation via independent aggregators that bundle services for market access and enable revenue stacking across different market timeframes. Specify clear rules for how gains are shared between providers and aggregators to avoid misaligned incentives.

[2] E3G, March 2025, How EU Market Design Can Make Power Clean and Affordable

- **Dynamic grid tariffs:** NRAs should introduce dynamic tariffs to incentivise flexible operation for industrial consumers.
- **Flexibility incentives for operators:** NRAs should ensure regulatory incentives exist also for grid operators to invest in flexibility.

Implement the Clean Industrial State Aid Framework

- **Design targeted state aid schemes for industrial flexibility:** Develop transparent, competitive support programs to de-risk investments in onsite non-fossil flexibility technologies such as storage, demand response systems.

Implement the Guidance on efficient and timely grid connections

- **Connection queue structuring:** Ensure that NRAs introduce rules for connection queue management based on merit. In particular, they should consider inclusion of social or economic criteria, upon assessment of local conditions and consultations with local stakeholders. Add requirements to exclude speculative projects, or sunset clauses for grid access permits.
- **Data transparency:** Operators should publish connection queue data and studies with more detailed sectoral breakdowns to reveal structural bottlenecks and sector pressures, for example breaking down by manufacturing industry subsectors and comparing against data centres.

Ramp up investments in grids and plan grid upgrades to meet forecasted industrial demand and enable economic policy objectives

- **Anticipating infrastructure needs:** Member states should link up inter-institutional mechanisms to align spatial energy plans with projected industrial energy needs. Coordinate planning across electricity, hydrogen and CO_2 networks to “right-size” future infrastructure needs. The EU’s proposal for a European Central Scenario under the Grid Package could be leveraged to do so.
- **Monitoring progress:** Governments should include harmonised reporting and indicators in updates to National Energy and Climate Plans to capture data on distribution grid reinforcement, projected industrial electricity demand and infrastructure needs, and measures to enhance network flexibility. This reporting should enable the European Commission and NRAs to monitor grid readiness for electrification of industry and inform future funding and regulatory support.
- **Transparency and data availability:** Member states should require network operators to publish substation-level hosting-capacity maps, to give planners and investors the information they need to make timely and informed decisions.

Available grid capacity is a key enabling factor for industrial electrification

Industrial electrification is a priority for decarbonisation and competitiveness

Prioritising industrial electrification in the energy transition is expected to bring billions in investment savings in the long term, given the relatively low abatement cost of direct electrification technologies compared to other solutions.[3] Benefits to businesses from electrification include savings on direct energy costs – for example through introducing industrial-scale heat pumps[4] – and remuneration from participation in electricity markets, for example through providing flexibility services.[5]

The European Commission and some individual member states are increasingly recognising electrification as a preferred, cost- and energy-efficient route to industrial decarbonisation, with more and more novel technological solutions rapidly approaching commercial maturity. Accordingly, industrial electrification is rapidly rising up the political agenda, visible for example in the upcoming Electrification Action Plan and new funding pockets, most recently via a pilot auction under the future Industrial Decarbonisation Bank. As a result, many companies can receive financial support to implement electrification projects.

Well-planned grids are the backbone of an electrifying energy system

Whether a business is able to electrify their processes depends on a range of factors (Figure 2). With technologies maturing and more public support available for both capital and operational expenses, one of the key determinants of the success of an industrial electrification project is now whether it is physically able to connect to a source of electricity. In fact, available grid capacity is emerging as the next key competitiveness factor for countries seeking to establish themselves as industrial powerhouses in the electrification era.[6]

> *"If a project can't move ahead in terms of connection, they hesitate to go public and obtain final investment decision."*
>
> **Nicolai Romanowski**
> **Senior Energy Manager, Cefic**

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[3] E.ON, March 2025, The Energy Playbook – **How to save 1.5 trillion € until 2050**
[4] Agora Industry, February 2026, **The Business Case for Electrifying Industrial Heat**
[5] SmartEn, September 2025, **The Business Case for Flexibility Provision in Energy-Intensive Industries**
[6] European Council on Foreign Relations, 4 December 2025, **A brighter future: Why upgrading the grid is vital for Europe's competitiveness**

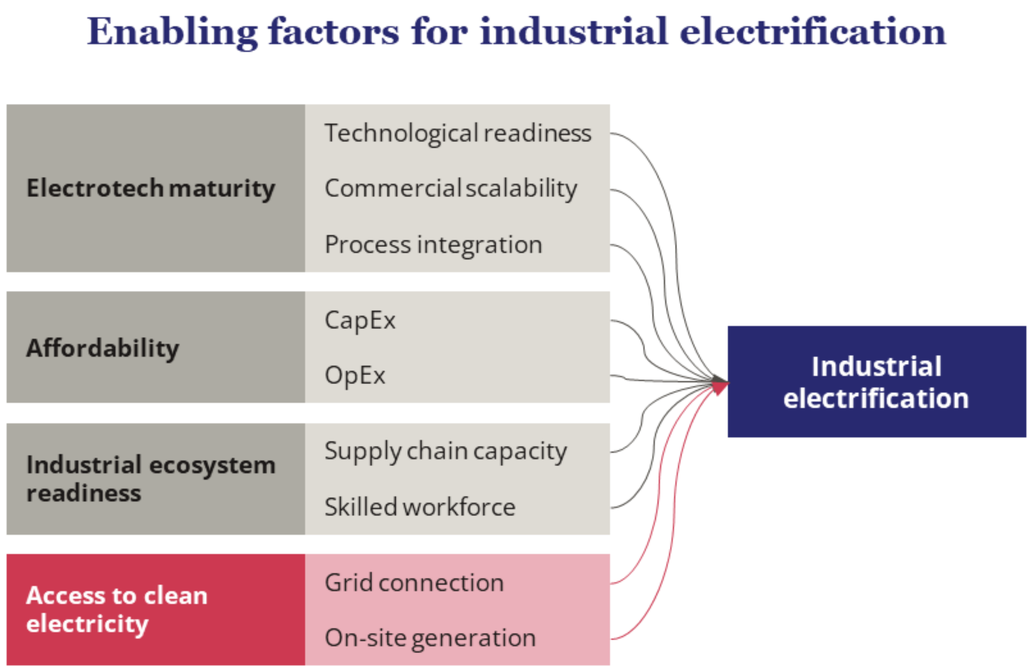

Figure 2: Numerous factors contribute to whether an industrial process can be electrified. The availability of a grid connection, or alternative on-site generation, is increasingly the determining factor.

According to European Commission projections, the power grid will need to accommodate a near doubling of the current industrial load by mid-century.[7] One recent study finds that fully electrifying just the energy-intensive basic materials industries in Europe could increase electricity demand by around 44% from current levels – equivalent to roughly 1,200 TWh per year.[8] The Commission has recently weighed in on this in its comprehensive Grid package, including the Guidance on efficient and timely grid connections,[9] acknowledging rising power demand across economic sectors, and urging member states to implement existing best practices in this area.

While large-scale renewable projects connected to the grid will provide the bulk of future electricity supply, industrial electrification will also rely on decentralised solutions,[10] which

[7] E3G, October 2024, **An Electrification Action Plan to Secure EU Industry's Future**. This covers both direct electrification of processes, and indirect electrification through the use of intermediate energy carriers such as hydrogen.

[8] Toktarova, A., Göransson, L., Johnsson, F., 2025, **Electrification of the energy-intensive basic materials industry – Implications for the European electricity system**, *International Journal of Hydrogen Energy*, vol. 107, p. 279

[9] European Commission, 19 December 2025, **Commission Notice: Guidance on efficient and timely grid connections** (PDF)

[10] And in so-called "microgrids", for instance Virtual Power Grids. These are localised energy systems at an industrial site or cluster that combines generation, storage and controllable loads. For instance: Joulz, **Virtual Power Grid** (last accessed: March 2026)

will play a crucial role in enhancing system flexibility. Many industrial consumers are increasingly investing in onsite renewable generation[11] and storage to complement grid supply. While not a solution for all industrial electricity consumers,[12] these decentralised solutions can enhance system flexibility by allowing industrial sites to adjust their consumption, store electricity, or generate power locally during periods of high demand or limited grid capacity. This can help balance supply and demand, reduce pressure on the grid, and facilitate smoother integration of both supply and demand.

Grid congestion is geographically widespread but needs to be better mapped

While many reports highlight significant connection delays for new renewable generation, there is less understanding of the scale and nature of the issue of delayed demand connections.[13] Anecdotal examples of connection delays for industrial installations can be found all around Europe. For instance, at the time of writing, more than 9,000 businesses[14] are waiting for higher capacity grid connections in the Netherlands. However, detailed data on industrial connection queues is not always collected or published.

Ease of grid access appears related to geographical factors, including local grid conditions and competition for access. Regulatory conditions, such as market design and grid governance rules, necessarily also affect outcomes. Regions with high industrial activity, such as in Germany, Spain, Poland and the Netherlands, facing large new loads coming online from electrifying an existing industrial base, but these are frequently not in locations where large supplies of renewable energy are or will be available.[15] Ireland, on the other hand, is experiencing ballooning demand from greenfield investments in data centre activity.[16] Some industrial installations are part of industrial clusters, while others are located in mixed-use zones, competing for energy demand with cities.[17] In many parts of Europe, the queue is also blocked by many speculative generation applications, which prevent both new renewable energy and electrified demand from coming online.[18]

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[11] 40% of electricity in industry is currently self-produced, although only one-quarter of that is generated from renewables. E3G, October 2024, **An Electrification Action Plan to Secure EU Industry's Future**

[12] Due to space considerations, for example.

[13] E3G, May 2025, **Outdated grid planning and weak governance stalling Europe's transition away from fossil fuels**

[14] Solarbe Global, 31 July 2025, **Over 9,000 Dutch companies await grid connection as energy storage grows by 60% annually**

[15] Bruegel, November 2021, **A new economic geography of decarbonisation?**

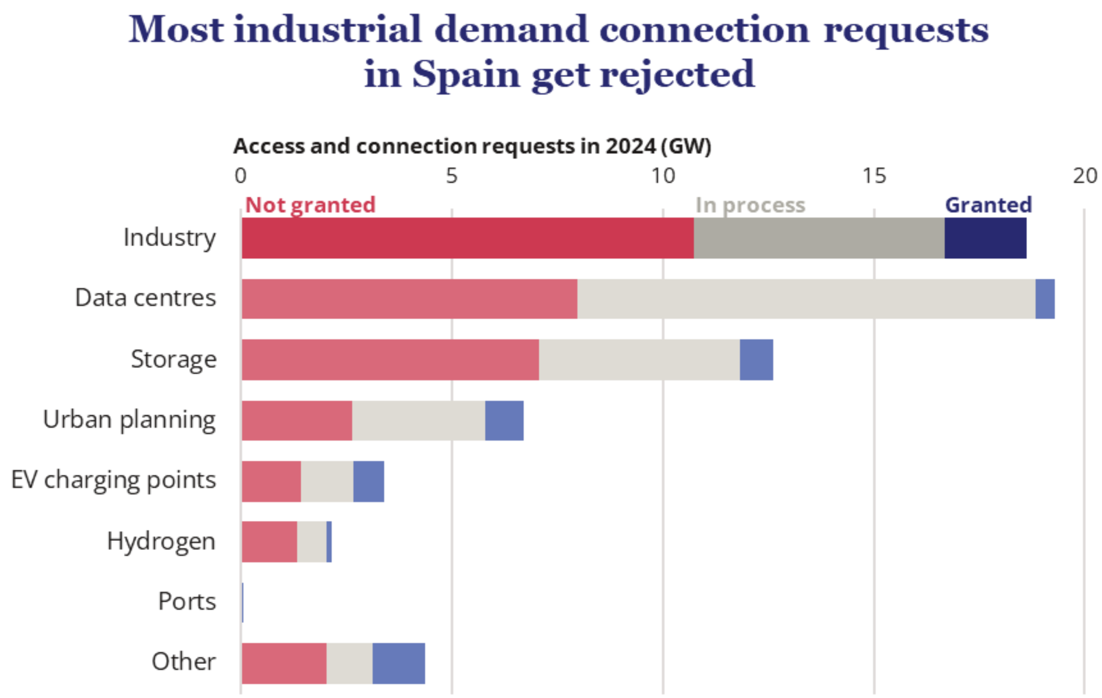
[16] The Institute of International and European Affairs, December 2025, **Data Centers in Ireland: The State of Play**

[17] C. Grodach et al., November 2023, **A productive mix? Urban Manufacturing in Planned Industrial Zones and Mixed-Use Districts**. For instance, many installations in the paper & pulp sector are located in such zones.

[18] Reuters, February 2026, **Power grid delays challenge Amazon's data center expansion in Europe**

Recognising and tackling the issue: an example from Spain

Spain has fundamentally changed its grid planning framework to incorporate growing industrial loads, in a major shift from its previous generation-driven model. It is responding to severe grid congestion: 83.4% of distribution grid nodes currently do not have available capacity for new demand connections. In 2024, over 50% of all industrial connection requests were rejected or delayed, and only 10% were awarded a connection (Figure 3). Aelec, the Spanish power utilities association, calculates that **industrial connection requests that could not be accommodated represent €60 billion in unrealised investment**.[19]



Source: *Spanish distribution system operators; data retrieved from Aelec & Deloitte, September 2025,* ***Conectando el futuro: Redes eléctricas para una España más competitiva***

Figure 3: Requests for connection to the Spanish grid have increased significantly in recent years, totalling over 67 GW of capacity in 2024, a more than tenfold increase from 2022. Industry was one of the most significant sectors requesting connections, along with data centres. Only 10% of the industrial connection capacity requested was awarded a connection.

Spain's 2030 grid-planning package explicitly allocates 27.7 GW of new demand connections, of which 9 GW is meant for industrial projects.[20] Further changes include national transmission system operator REE's requirements to integrate industrial demand in technical planning studies. Industrial projects therefore enter planning through formal

[19] Aelec, September 2025, **Conectando el future: Redes eléctricas para una España más competitiva** (PDF)

[20] Red Electrica, **Network Development Plan Public Consultation Process** (last accessed: March 2026)

consultation and technical validation. Supply to mature projects must be guaranteed, ensuring that grid development aligns with the policy goal of industrial decarbonisation.

To support industrial projects trying to connect in the short term, Spain has also introduced flexible connection contracts, making grid access possible where grid expansion is slow. It has also developed dedicated standardised criteria for assessing industrial applications – for instance, dividing them into firm and non-firm.[21] Finally, REE is obliged to publish monthly demand capacity maps, which results in less saturation in already congested areas. Best practices like these should be followed across all member states.

The solutions available depend on project characteristics

Examples from the ground

We conducted interviews with representatives from a range of industrial sectors to gain more qualitative information about barriers to industrial connections.[22] Observations include:

- Installations across all manufacturing sectors can struggle with obtaining grid connections.
- Connection delays can be as long as 2–10 years, even for small projects.
- Projects planned close to significant industrial clusters, especially with nationally recognised strategic economic value, have higher visibility. This gains them better access to the grid planning process, which can lead to fewer issues in securing the envisioned capacity. However, these projects are in the minority.
- Some installations find it easier to self-mitigate by introducing decentralised solutions or flexibilising their load, especially if the national regulatory framework incentivises these solutions. However, not all consumers can make use of such solutions to the same extent.

Figure 4 illustrates how different types of projects may find themselves in different situations when seeking grid connection, based on the picture that emerged from our conversations.

[21] Spanish National Commission for Markets and Competition (CNMC), October 2024, **Circular 1/2024**

[22] We interviewed 15 manufacturing industry representatives (association or company-level) from the following sectors: paper & pulp, food & beverages, chemicals, iron & steel.

Examples from the ground: how different projects access the grid

Projects with strategic relevance and high visibility may face fewer barriers

Projects with large capacity or **strategic relevance may find it easier to forecast** and access dedicated capacity, for example in the form of new transmission lines.

Example: a new electric arc furnace or direct reduced iron iron- and steelmaking facility in a significant industrial cluster.

Delays are related to permitting and stakeholder consultations, rather than in securing the physical connection into grid planning assumptions.

SME projects can face financial and technical barriers in particular

Batch-processes in low- to medium temperature ranges can benefit from **non-firm connections, behind-the-meter storage** or on-site renewables.

Examples: paper or food manufacturing sites seeking to install a heat pump / electric boiler.

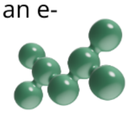
Barriers may include:

- Insufficient or overly complex financial incentives for flexbility provision.
- Limited affordability of renewable PPAs.

High-temperature, continuous processes face technological limits on flexibility

Processes with rigidly continuous production lines are more difficult to integrate. This can particularly affect brownfield electrification in severely congested areas. Solutions must involve **dialogue between consumers in the local area, and grid connection rules** based on social or environmental criteria.

Example: a chemicals manufacturing facility seeking to install an e-cracker.



Barriers may include:

- Physical limits on operational flexibility; insufficient technological maturity of thermal storage solutions.
- Large size of new load

Source: *Stakeholder interviews with 15 manufacturing industry representatives (association or company-level) from the following sectors: paper & pulp, food & beverages, chemicals, iron & steel.*

Figure 4: Resolving connection queues requires understanding what factors may lead to some projects acquiring connections more easily than others, and the barriers that different types of projects face.

Emerging solutions

Flexible loads can connect faster and decongest the grid for other users

Demand-side flexibility could be a viable solution for many projects. In a world with congested grids and limited interconnection, flexible connections that can quickly ramp demand up or down become the most attractive projects. Projects able to demonstrate flexibility (by investing in modulating technologies like variable speed motors, improvements in operational flexibility or thermal energy storage[23]) will therefore gain a strategic advantage in congested regions, and interventions to incentivise flexibility can unlock significant grid capacity in the short term.[24]

Policymakers need to ensure that flexibility provision is duly incentivised, including through:

- non-firm connection contracts
- dynamic pricing to incentivise load-shifting
- transparent, fair and accessible flexibility remuneration schemes
- targeted support or state aid to de-risk investments in flexibility-enabling technologies.

Changes to grid connection rules can unlock the current wave of stalled electrification investments and enable a fairer approach to connections more in line with national priorities

Industrial consumers with the most continuous demand needs and rigid plants with little flexibility become the least attractive grid users. They could consequently either face long queues or pay higher network charges to secure firm grid capacity. While hybrid systems – partly thermal, partly electric – can serve as a transitional solution,[25] they do not come without risks. If policymakers rely on them too heavily, grid congestion risks becoming "manageable" rather than solved. Therefore, more regulatory action to unlock grid capacity is still urgently needed.

Addressing the issue in the short term will require well-developed rules for grid connection queue structuring. These could potentially consider economic or social criteria, such as how a project contributes to policy objectives (for instance, prioritising climate-friendly uses, grid-friendly uses or whether the project forms part of a pre-defined priority value chain).

These rules should be designed with careful consultation of stakeholders to ensure transparency, clarity and fairness. SMEs in particular need to be considered, as they are

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[23] Kyoto, 9 October 2025, **World's largest thermal energy storage unit inaugurated by Kyoto Group at KALL Ingredients in Hungary**

[24] Reuters, 7 April 2025, **Dutch power grid operator allocates 9 GW via off-peak contracts**

[25] FfE, April 2019, **Electrical flexibility potential of hybrid industrial heat networks in Germany (PDF)**

often less visible and have fewer resources (financial or in-house technical expertise) to support direct engagement with regulatory frameworks or actors.

Well-planned grid reinforcement is a necessary long-term step to attract future investment

Even with the above policies, the constraining factor in many areas is simply that industrial electrification is accelerating much faster than the planned grid upgrades. Governments therefore need to meticulously plan required grid upgrades, in line with their industrial policy priorities and in dialogue with different types of consumers to be able to anticipate where and when additional capacity will be required. This planning will need to be followed by investment in grid reinforcement and modernisation, but this is essential to be able to continue attracting competitive industrial electrification investments in the long term.

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