

BRIEFING

Grid connection at European ports and airports: Bottleneck and solutions to accelerate transport electrification

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Lead author: Juliette Desoubieux, juliette.desoubieux@transportenvironment.org

Contributors: Geert Decock

Imagine buying an electric van for your business, then discovering the cable connecting it to the grid won't be installed for another ten years. That, roughly, is the position Europe's ports and airports are in today. Brussels has told them, by law, to electrify but the grid needs to follow.

1. Why this matters

While the EU has reduced its overall greenhouse gas emissions by 30 percent since 1990, emissions from international aviation and shipping have moved in the opposite direction, rising by [29 percent and 26 percent](#) respectively. No other economic sector has grown its emissions as much. Those two sectors are hard to decarbonise because direct electrification is currently challenging due to the massive energy density required for long-distance travel. Today's batteries are too heavy and bulky to match the energy density of fossil fuels on long-distance voyages and flights.

Nevertheless, the EU has finally taken the lead by requiring direct electrification of shipping and aviation, where possible: at berth and at the gate.

In shipping, AFIR and FuelEU Maritime require container and passenger ships calling at EU ports to plug into Onshore Power Supply (OPS) by 2030, instead of using their auxiliary engines at berth. Less ship exhaust means cleaner air for the dockworkers and residents near the port. Ferries and short-sea vessels, meanwhile, are also going [hybrid and fully electric](#). Soon, electricity at ports won't just be powering ships at berth but they'll also be refuelling their batteries.

In aviation, AFIR obliges TEN-T core and comprehensive network airports (excluding the ones under 10,000 commercial flight movements a year) to supply electricity to stationary aircraft at contact stands from 2025 and at remote stands from 2030. In other words, all major European airports will need to supply electricity to stationary aircraft at the gate thereby retiring the diesel-powered ground power units (GPU). Ground Support Equipment (GSE) - baggage tractors, pushback tugs, belt loaders - are [electrifying just as fast](#). Electric and hybrid-electric aircraft for short regional routes are already in the [prototype stage](#). The terminal decisions airports make today will decide whether those aircraft have anywhere to plug in tomorrow.

Whenever feasible, ships and planes need to be enabled to be electrified. Both shipping will need more electricity, delivered where and when it's needed.

2. A grid built for a different century

Here's the problem: On the one hand, [375 gigawatts \(GW\) of clean energy projects and 455 GW of battery storage projects](#) are sitting in a queue, waiting for permission to connect to the grid. On the other hand, electricity consumption sites like factories, data centres, ports and airports are stuck in a similar queue. The two queues are technically separate - one for generation, one for demand - but they face the same difficulty to connect to the grid. The reason is that the

[construction time of new infrastructure is slower](#) than the demand or generation connection. This creates a lack of physical grid capacity; i. e. a grid congestion.

The connection queue is a meaningful indicator to estimate the electrification speed. It is the backlog of projects waiting for their Distribution System Operators (DSO) or Transmission System Operators (TSO) to confirm how much power they can deliver, where and when. The longer the queue, the longer projects must wait to access the grid, and they often have no way of knowing in advance how long that wait will be.

Why has it come to this? Partly because Europe's grid is aging and was built for a world of a few large power stations and slow, predictable demand growth not distributed renewable power generation; and not for hundreds of ports, airports, factories and car fleets all switching to electricity. Partly because building a new connection or reinforcement takes [4 to 10 years](#), and roughly half of that time disappears into permitting, before a single cable is laid. And partly because the system rewards the wrong behaviour. Many developers apply for more capacity than they will ever use, "just in case." Most countries still allocate that capacity strictly on a 'first-come, first-served'-basis, with no way to move a strategically vital project in a TEN-T port or airport ahead of a "zombie" project; i. e. a stalled, speculative application that filed its paperwork years ago but never progressed.

3. The shipping case

The types of electricity demand at ports vary widely. This has significant implications for grid planning. Supplying electricity to a ship at berth - lighting, cooling, and onboard systems - constitutes a modest and relatively predictable draw. Fast-charging a hybrid or battery-electric ferry between crossings represents a fundamentally different demand profile, and can require several times more grid capacity than powering the same vessel at berth. This is not a marginal concern: up to [52% of existing ferries](#) could rely on battery-electric propulsion by 2035, meaning this higher-capacity charging demand can be expected to increase in the coming years.

[A study by T&E](#) showed that Dover and Calais alone would need an estimated 379 GWh and 284 GWh of electricity a year respectively to electrify their ferry fleets. This will represent 14% of all energy demand from ferries by 2035 despite serving just 12 vessels between them. The demand is so concentrated that even these short crossings will require tens of megawatts of peak charging capacity at a single berth which is equivalent to more than 67 DC fast chargers (150 kW each) running at once.

Layer seasonality on top and the sizing problem gets worse still. Cruise and ferry traffic peaks sharply in summer whereas container terminals have their own rhythms. DSO must design for the worst day of the year, not the average one, which inflates both the capacity ports have to request and the cost of building it.

4. The aviation case

The aviation sector is facing the same kind of issues as the shipping sector. We need to electrify the GPU and GSE but the grid needs to be built for the highest peak demand that could occur and the current grid connections are not sized for that. It means grid operators, regulators and airports need to start planning ahead of the actual rollout of electric GPU and GSE fleets. Anything less risks leaving airports with electric assets they can't actually charge.

Heathrow, Europe's busiest airport, already [needs twice the power](#) it did a decade ago just to decarbonise its existing operations. Yet the airport now faces a nine-year wait for a direct connection to the National Grid. The queue was originally quoted at 18 years. Even that "improved" nine-year offer was seen as "not satisfactory" by Heathrow's own CEO, Thomas Woldbye, who is calling for clear prioritisation of the grid connections.

Key recommendations to regulators and TSO/DSO

- **Map and plan the ports and airports electrification at TSO and DSO level.**
Policymakers currently have no map of where the grid connection queue is worst, or which ports and airports are most at risk of missing their 2030 obligations. TSO and DSO should have an understanding of their national/regional port and airport electrification needs to provide them the necessary grid connection capacity. This should be made through the coordination of the port/airport authorities, TSO, DSO and national energy regulators to align infrastructure timelines and avoid electrification bottlenecks.
- **Adopt flexible solutions (on-site production, storage and smart charging) in ports and airports to lower the new grid capacity needs.** Co-locating and hybridising port and airport infrastructure with nearby renewables and storage, behind a shared connection point, can cut the net new capacity that has to come from the public grid. Moreover, the adoption of smart charging in all predictable EV charging infrastructure will flatten the peak load and decrease the additional grid capacity needed to electrify. This can be used for ground support equipment, terminal shuttles, drayage trucks and staff fleets.
- **Give grid prioritization and benefits to flexible connection at TSO and DSO level.**
'First-come, first-served' made sense when demand was low and predictable. This approach no longer makes sense when strategic investments in key infrastructure like ports and airports are not prioritised. Flexible Connection Agreements should let ports and airports connect sooner, at a capacity that flexes up or down, rather than waiting years for a "firm" full-capacity slot. This flexible connection is an added value for the network operator as it provides balancing services to the grid. It should then be

rewarded with flexible tariffs - lower electricity prices when the port/airport consumes electricity when the production is greater than the consumption. [Germany](#) and [Belgium](#) are already piloting exactly this kind of reform. The EU should learn from them fast and scale what works.