DATA CENTRES AND ENERGY: THE ENVIRONMENTAL COST OF A FAULTY PRICE SIGNAL

By Josef Nasr, graduated from Sciences Po Paris and HEC, and Thaddée Toulouse, graduated from Sciences Po Paris and Bocconi University.

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The proliferation of AI-related data centres will lead to a sharp increase in electricity demand in Europe by 2030. Given the grid's inflexibility, their concentration in saturated metropolitan areas risks exacerbating reliance on gas or pushing out decarbonising industries. Zonal electricity prices would encourage a more optimal spatial distribution.

Chart 1: Data centres under construction vs. current capacity of the main European hubs



Source: Baxtel, CBRE, JLL, authors' calculations. Note: The inventory of 118 data centres under construction in the main European hubs shows the concentration of growth in existing hubs, despite the saturation of the electricity grid.

Data centres continue to concentrate in the saturated "FLAP-D" cities

With the large-scale adoption of artificial intelligence, annual electricity demand from data centres is expected to rise by 45 TWh in Europe and by 240 TWh in the United States by 2030. Under the

US scenario, this is expected to entail a sharp increase in the use of natural gas (IEA, 2025). Conversely, the rise in electricity demand in the European Union should be largely offset by the expansion of renewable capacity, forecast at 440 GW over the period according to the International Energy Agency (IEA). We are already seeing instances that buck this trend: Ireland has announced that it will produce an additional 2 GW of natural gas-fired electricity for data centres by 2030 (EirGrid, 2024), and some German constructors are favouring the use of fossil fuels (Algorithm Watch, 2025).

These choices result from the concentration of data centres around the historical "FLAP-D" hubs – Frankfurt, London, Amsterdam, Paris and Dublin – which account for three-quarters of the compute capacity installed in Europe and continue to attract the majority of construction projects (see Chart 1). This is already causing problems: data centres in Dublin consume 20% of national electricity production, while the waiting time for connection to the electricity grid is up to 10 years in Frankfurt and London. Expanding the grid will not suffice in the short term, given construction lead times and costs estimated at EUR 584 billion by the European Commission.

New sites – in Scandinavia and the Iberian Peninsula, for example – are becoming more appealing due to their abundant renewable electricity capacity and rapid grid connections. However, the shift remains modest: secondary hubs account for only 30% of the growth forecast for 2026, and progress on the development of projects in more remote regions has been cautious. Microsoft's announcement of a huge 1.2 GW data centre campus in Sines in Portugal has so far resulted in only 36 MW of operational capacity with 180 MW under construction.

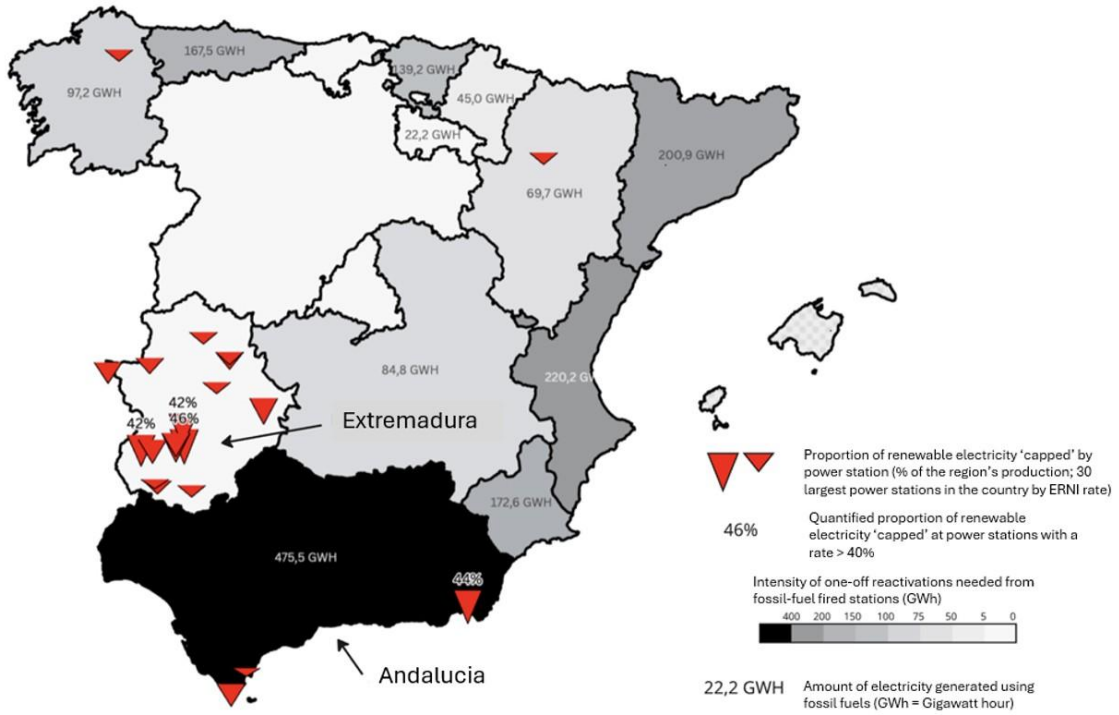
Persistently turning to areas under strain from grid congestion poses a greater threat to the energy transition than a lack of renewable electricity capable of meeting the demands of growth in AI in Europe. These saturated areas ration green electricity, squeeze out industries in transition and encourage localised use of fossil fuels.

The role of price signals in sub-optimal matching of enterprises' demand

While there are a number of reasons behind the slow pace of the market's geographical restructuring, it is structurally driven by single national market electricity pricing. Unlike prices between countries, which vary, the majority of EU Member States impose a single price zone on their territory, deeming it a sole distinct market within which the national aggregation of demand and supply produces a standardised price. Choosing this approach meets the need for territorial cohesion, but it directly influences decisions on the location of AI-dedicated data centres, whose electricity consumption accounts for as much as 60% of their operating costs.

Economically, a single national price for electricity is justified when national supply and demand are perfectly mobile. However, if this pricing system conceals variable local availabilities of electricity, it conveys inaccurate information to enterprises – a distorted price signal – about the real costs borne by society for a facility in a given location, resulting in participants coming to sub-optimal economic decisions.

Chart 2: Capped renewable electricity vs. increased carbon-based electricity generation



Source: RED Eléctrica. Note: The massive capping of renewable electricity in Extremadura (minimum 402.6 GWh) in August 2025 due to grid congestion, necessitated the temporary reactivation of fossil fuel capacity to balance the national grid.

In practice, national electricity grids are fragmented due to limited transmission capacity. In Spain, Extremadura consumes only 6% of the abundant renewable electricity that it generates. Channelling the surplus towards metropolitan areas would help to massively decarbonise the national economy, but the amount that can be transmitted is capped by limited electricity interconnections, with only three 400 kV transmission corridors to Madrid, three to Portugal and three to Andalusia, in addition to some other lower-capacity lines.

When the solar electricity generated in Extremadura exceeds the grid's transmission capacity, the operator is forced to cap the surplus production, while to compensate, and in order to honour sales contracts in the rest of the country, natural gas-fired power stations are reactivated on the other side of the congestion point (see Chart 2). While this redistribution maintains the illusion of a mobile supply, it creates a deadweight loss: electricity with a zero marginal economic and climate cost is lost, while more expensive and more carbon-intensive electricity is overexploited to meet a demand that does not pay the price for its location.

Price granularity to support the energy transition

The idea of zonal electricity pricing is gaining traction (ENTSO-E, 2025). In Germany, the redistribution of electricity represented an estimated hidden annual cost of EUR 4.2 billion in 2022, due to grid saturation in the south of the country. By contrast, Sweden's division into four price zones since 2011 has created an effective price signal for new industrial projects, which have

increasingly gravitated towards the north of the country and its abundant hydropower resources (Bălașa and Pollitt, 2026).

A zonal electricity price that reflects the cost of production and transmission would force data centre constructors to internalise the externality created by their concentration in saturated areas. Attractive prices in other regions would incentivise the relocation of new projects and thereby relieve the pressure on the main hubs.

The operations of data centres could accommodate a certain degree of flexibility, allowing some of the tasks related to AI to be relocated away from the FLAP-D hubs. According to McKinsey, in 2030, 28% of data centre electricity demand will relate to training AI models, 43% will be linked to inference (AI model operational phase) and 29% will be associated with non-AI activities. Of these uses, there is no need for AI models to be trained near users, while fibre-optic cables make latency imperceptible for the majority of AI applications. Only certain specific cases, such as the demand for a "sovereign cloud" or demand from sectors requiring near-zero latency (finance, healthcare, certain industries), could impose the choice of a particular geographical location. Overall, based on McKinsey's projections for data centre electricity consumption, we estimate that 54% would correspond to uses that could be relocated.

Reforming the price signal in this manner could form part of a broader spatial planning initiative involving public sector bodies and constructors within the framework of the "Cloud and AI Development Act" proposal. The aim for government would be to encourage the construction of data centres where they could play an active role as grid modulators, while freeing up new room for manoeuvre for less mobile activities.

Other factors should be taken into consideration in this planning effort. The availability of water for cooling, political and social constraints, and energy efficiency all contribute to an optimal and realistic geographical allocation of data centre capacity (Hemmati, Oluleye and Charitopoulos, 2026). This field still lacks comprehensive, up-to-date and location-specific data, which will be essential for informed public policy.