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When Investment Outruns Infrastructure

Grid access, AI, industry and the global test of System Readiness



THE CENTRAL QUESTION

> **Is the investment ready - and is the infrastructure around it ready as well?**

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IN-DEPTH ANALYSIS

AI, industry and electric mobility are accelerating. The infrastructure that must support them is moving on a different clock. The next global competitiveness question is not simply how much electricity we can produce, but where, when and under what conditions power becomes available.

The world is planning its next industrial transformation at extraordinary speed.

Artificial intelligence is attracting unprecedented investment. Governments want sovereign computing capacity. Manufacturers are electrifying production. Ports are automating operations.
Logistics companies are preparing electric fleets. Cities are investing in cleaner public transport.

Each sector has its own strategy, investment targets and political priorities.

But they cannot each build a separate electricity system to match their ambitions.

And this creates an increasingly consequential question:

Who gets access to the next available megawatt - when, where, and on what grounds?

It sounds like a technical question.

It is becoming an economic, regulatory and infrastructure-planning question with consequences for national competitiveness.

The digital economy has a physical problem

Artificial intelligence may operate in the digital world. Its infrastructure does not.

Data centres require land, cooling, transformers, substations, transmission and distribution infrastructure, and dependable electricity supply.

The International Energy Agency estimates that global data-centre electricity consumption reached approximately 485 terawatt-hours in 2025. In its central projection, consumption rises to around 950 TWh by 2030.

AI-focused data centres are expected to grow even faster. [1]

These projections are not guarantees. AI efficiency improvements, investment conditions, technological changes and project cancellations may alter the trajectory.

But one conclusion is already difficult to dispute:

The ability to finance computing capacity is no longer sufficient to guarantee the ability to operate it.

Electricity has to be physically available at the required location, in the required quantity, with the appropriate power quality and reliability.

The same applies to an electric truck depot, an industrial plant or an automated logistics terminal.

The projects are different. Their infrastructure dependencies are not identical.

Yet each relies on an electricity system that cannot necessarily expand at the speed of its investment pipeline.

The world has a connection problem - not simply an electricity problem

The IEA estimates that more than 2,500 GW of renewable generation, electricity storage and major demand projects are stalled in grid connection queues worldwide. [2]

This figure needs careful interpretation.

It includes proposed supply, storage and large electricity-consuming projects. It is not a forecast of additional demand, nor a measurement of electricity consumption.

A gigawatt in a connection queue is not automatically a gigawatt that will be built.

Some applications represent mature investments. Others are preliminary. Some projects may be duplicated, oversized, delayed or ultimately abandoned.

And even where capacity exists elsewhere in the electricity system, it may not be transferable to the location where a project needs it.

> **A megawatt available in one region is not necessarily a megawatt available in another.**

Voltage levels, transmission constraints, transformer capacity, local network topology, system security and demand profiles determine what can actually be connected.

That distinction matters enormously.

Treating every connection request as firm future demand risks unnecessary investment.

Allowing speculative reservations to block viable projects risks a different kind of economic damage.

The real challenge is not simply to shorten the queue.

It is to establish what the queue actually represents.

Governments are already changing the rules

This is no longer a hypothetical debate.

Across different regulatory systems, policymakers and grid operators are reconsidering how large electricity-consuming projects gain access to infrastructure.

The approaches differ, but the underlying question is remarkably similar.

United Kingdom: Strategic value enters the connection debate

On 28 October 2026, the British government published its *Data Centre Covenant*.

The policy establishes conditions under which strategically important data centres may receive additional government support to accelerate infrastructure delivery and access grid capacity.

The measures include reserving future capacity, reallocating capacity released from connection queues and, in particular circumstances, facilitating transfers of existing data-centre connection contracts scheduled before 2030.

These measures are conditional. They are not an automatic entitlement for the entire data-centre industry.

The government also places emphasis on energy-system costs, local economic benefits, environmental performance, national security and credible project commitments. [3]

Implementation remains subject to further regulatory decisions. Ofgem's final decision on proposed data-centre commitment fees and strengthened queue-management requirements is expected in the first quarter of 2027. The government has also clarified that grid connections remain subject to the existing regulatory framework and that data centres should not receive capacity at the expense of other users. [3a]

The significance extends beyond digital infrastructure.

Grid capacity is increasingly being considered in the context of wider strategic objectives.

That raises an unavoidable governance question:

How should the claimed strategic value of a project be assessed - and how can that assessment remain transparent, technically defensible and fair to other grid users?

United States: Speed must coexist with reliability and consumer protection

The United States is addressing the issue through electricity-market regulation.

In June 2026, the Federal Energy Regulatory Commission directed six regional grid operators to justify or reform their rules for connecting major electricity consumers, including data centres and manufacturing facilities.

The proceedings address connection processes, reliability, transparency and the allocation of costs. [4]

On 28 October, the California Independent System Operator approved a proposal for improved large-load connections.

Its approach includes better operational visibility, coordination with transmission owners and the possibility of accommodating large loads under defined operational conditions.

The proposal still requires federal regulatory review. [5]

The underlying dilemma is clear.

New industrial and digital investments should not be delayed unnecessarily.

But faster connections cannot be achieved by ignoring system security or transferring unjustified costs to existing customers.

Speed to power has economic value. Reliability and cost responsibility do too.

Australia: A project pipeline is not a demand forecast

Australia illustrates another critical aspect: the difficulty of forecasting large new loads.

The Australian Energy Market Operator reported that, at the end of March 2026, eleven large data-centre projects were progressing through the National Electricity Market's transmission-connection process.

Together, they represented approximately 5.4 GW of maximum demand.

Most were still at relatively early stages. [6]

AEMO therefore distinguishes between proposed developments and the demand likely to materialise, taking account of project maturity, staged commissioning and uncertainty.

This is not merely a forecasting detail.

Transmission and generation investment decisions have long economic lives. Overestimating future consumption can misallocate capital. Underestimating viable projects can delay industrial development.

Good infrastructure planning must manage both risks.

Singapore: Digital ambition meets physical resource constraints

Singapore provides a particularly instructive example because it explicitly connects digital development with physical infrastructure planning.

On 26 October 2026, its Energy Market Authority announced a five-year infrastructure plan to address rising electricity demand.

Peak demand, measured at 8.6 GW in August 2026, could reach between 9.9 and 13 GW by 2031.

The authority identifies semiconductor manufacturing, data centres and electric transport among the drivers.

Its response includes new generation capacity, additional substations, transmission upgrades, storage and electricity-import infrastructure. [7]

Singapore has also adopted a calibrated approach to new data-centre capacity, considering energy and water constraints alongside resource efficiency and economic development. [8]

This is a useful reminder:

The digital economy does not exist outside physical geography.

Land, electricity, water, connectivity and network infrastructure ultimately shape where digital investment can operate.

And in rapidly developing markets, the same challenge is emerging on a different scale.

India's Central Electricity Authority has estimated that data-centre power demand could reach approximately 17 GW by the 2031–32 financial year. Such projections reinforce the importance of coordinating digital expansion with electricity-system planning rather than treating the two as separate investment programmes. [9]

The transport sector exposes the same structural weakness

The connection between AI infrastructure and transport infrastructure is not immediately obvious.

Their operating characteristics are different. Their connections may involve different voltage levels, networks and regulatory regimes.

They are not necessarily competing for the same megawatt.

But they are confronting the same fundamental requirement:

> **An investment becomes operational only when the infrastructure around it is ready.**

Consider an electric bus depot.

The vehicles may be purchased. The charging equipment may be delivered. The operator may have a fully developed fleet transition programme.

Yet commissioning can be delayed because a substation needs reinforcement or the required grid connection is unavailable.

The IEA identifies multi-year delays in larger depot-electrification projects resulting from network constraints, permitting and infrastructure upgrades.

At the same time, it reports that, under certain operating conditions, charging optimisation can reduce maximum depot power demand by up to 60%. [10]

That figure is not universally applicable. It depends on route schedules, vehicle availability, charging windows, battery capacity and operational requirements.

Its significance lies elsewhere.

Before deciding how much additional infrastructure to build, we need to understand how much capacity the operation actually requires - and when.

A fleet that charges every vehicle simultaneously creates a different peak-load requirement from one that can distribute charging across available windows.

A data centre with critical continuous workloads has different flexibility characteristics from one able to defer selected computing tasks.

An industrial site, a container terminal and a freight-charging hub each present different operating constraints.

None can be treated as a generic block of electrical demand.

And none should be assessed solely by its requested maximum connection capacity.

The difference between building capacity and making capacity useful

The obvious response to growing electricity demand is to build more infrastructure.

That response is necessary.

Electricity networks must expand. Generation capacity must evolve. Transformers, substations and transmission corridors must be delivered.

But infrastructure expansion takes time.

According to the IEA, major new grid infrastructure can require five to fifteen years from planning to completion, depending on the project and jurisdiction.

New data centres can often be developed in one to three years. EV charging infrastructure can have similarly shorter development cycles. [2]

This creates a structural mismatch between investment speed and infrastructure-delivery speed.

Yet the solution is not simply to wait.

The IEA estimates that grid-enhancing technologies and regulatory measures could potentially unlock enough capacity to connect approximately 1,200–1,600 GW of advanced-stage projects worldwide.

That is an assessed technical opportunity, not a guarantee of immediate connection. It includes options such as conditional non-firm connections, improved power-flow control, dynamic line rating and network upgrades. [2]

Demand flexibility, storage and local generation may also offer value at suitable sites.

But none is universally applicable.

A battery cannot create unlimited energy. A flexible connection is not equivalent to unconditional firm capacity. A critical industrial process cannot necessarily be interrupted when the grid is constrained.

And a local generation project does not automatically eliminate the need for network services or dependable backup supply.

> **The correct intervention depends on the binding constraint.**

Sometimes that means a major network reinforcement.

Sometimes it means better demand management.

Sometimes storage, local generation or changes to the operating model can reduce the required connection capacity.

And sometimes the responsible decision is to defer or redesign the project.

The essential point is to establish the evidence before committing capital.

Five questions that should precede a strategic connection decision

Across countries and sectors, we see a need for a more consistent approach to evaluating infrastructure readiness.

The following five questions are not a substitute for national regulation or grid-operator engineering procedures.

They are a practical framework for examining whether a proposed investment is credible, technically aligned and economically justified.

1. Is the project demonstrably real?

A large announcement does not establish project maturity.

Land rights, permits, financing, procurement commitments, construction milestones and credible commissioning dates should distinguish viable developments from speculative applications.

A project should not gain undue influence over long-term infrastructure planning merely because its proposed investment value is impressive.

2. What electrical capacity is actually required - where and when?

A headline connection request provides only part of the picture.

The assessment should examine maximum demand, expected utilisation, load factor, ramp-up stages, coincidence with existing system peaks and location-specific network conditions.

Annual electricity consumption, expressed in MWh or TWh, must not be confused with instantaneous power requirements, expressed in MW or GW.

The distinction is fundamental to sound investment decisions.

3. What operational flexibility can the project genuinely provide?

Not every load can move. Not every process can be curtailed.

Where flexibility exists, it should be demonstrated through measurable technical and operational commitments.

Charging schedules, demand response, storage, local generation and non-firm connection arrangements can be valuable.

Their contribution must be assessed against the actual duty cycle and reliability requirements of the facility.

4. What costs and risks does the project impose on the wider system?

A connection may be commercially attractive for its developer while triggering substantial investment elsewhere in the network.

Equally, well-located additional demand may improve asset utilisation and help distribute fixed system costs across more customers.

Both possibilities deserve examination.

Connection charges, network reinforcement, reliability impacts, system-service requirements and potential cost transfers to other users must be understood before the final investment decision.

5. What strategic value is being claimed - and how can it be verified?

Job creation, industrial productivity, digital sovereignty, public-service provision, supply-chain resilience and regional development may all be legitimate considerations.

But they are not interchangeable.

Nor can they necessarily be reduced to a single universal ranking.

Governments and regulators operate under different legal mandates and policy objectives.

The appropriate requirement is therefore not a simplistic global hierarchy of industries.

It is a transparent, evidence-based process in which claimed benefits, technical requirements and wider economic consequences can be examined.

These five questions lead to one larger test: Is the project ready - and is the system around it ready as well?

From project approval to System Readiness

Traditionally, infrastructure investment assessments often concentrate on the individual asset.

Is the technology proven?

Is the project financed?

Are the permits in place?

Will the expected revenues justify the investment?

These questions remain essential.

But they are no longer sufficient on their own.

A technically complete data centre without the required connection is not fully operational infrastructure.

An electric bus fleet without adequate depot power cannot deliver its planned service.

A new industrial facility facing prolonged grid delays may lose part of its commercial advantage before production begins.

At the **Modern Mobility Institute**, we approach this wider question through the concept of *System Readiness*.

It asks whether the surrounding infrastructure, capacity, operating conditions and institutional arrangements are sufficiently developed for an investment to perform its intended function.

In transport, our research examines the interdependence of mobility demand, energy availability and infrastructure investment under the framework of *Transport Energy Infrastructure (TEI)*.

This does not imply that every project requires a new technology, a new source of generation or a new infrastructure category.

Quite the opposite.

The starting point must be the identification of the actual constraint.

> **Capital should follow infrastructure clarity - not the other way around.**

The real measure of infrastructure competitiveness

Countries will continue competing for AI investment, advanced manufacturing, logistics facilities and industrial transformation.

That competition is economically significant.

But announcements, investment commitments and published megawatt targets are imperfect measures of progress.

What ultimately matters is whether projects become operational at the intended location, within a credible timeframe and under technically reliable and economically sustainable conditions.

That requires more than accelerating permitting or expanding generation.

It requires credible project pipelines, coordinated network planning, appropriate flexibility mechanisms, transparent cost allocation and investment decisions grounded in actual operating requirements.

It also requires acknowledging that not every proposed project can be treated as equally mature, equally urgent or equally demanding of the electricity system.

The next phase of global infrastructure development will test our ability to make those distinctions.

Because the real objective is not to allocate impressive amounts of capacity on paper.

It is to turn electricity-system capability into productive activity.

The world does not need another race to announce the next gigawatt.

It needs the ability to deliver the next megawatt where it can actually be used.

That is where digital ambition, industrial investment and infrastructure reality finally meet.

Sources & further reading

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[3a] **UK Government.** Accelerating Electricity Network Connections for Strategic Demand – Government Response. 28 October 2026.

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