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2026 Quick Insight

# Connecting Data Center Growth to the Distribution Grid

# OVERVIEW

Rapid growth in data center demand is increasingly intersecting with distribution systems. Long transmission development timelines, siting constraints, and evolving application requirements are driving some projects to consider interconnection below the transmission level. As a result, data centers in the roughly 1–30 MW range are being proposed and interconnected at medium-voltage distribution levels across many jurisdictions. While this trend is already underway, distribution-connected data centers (DxDCs) do not fit neatly within existing transmission-oriented large-load frameworks or traditional distribution planning assumptions, creating uncertainty for utilities, developers, regulators, and other stakeholders.

# THE WHY

Distribution-connected data centers (DxDCs) offer a practical release valve while long-lead transmission upgrades proceed.

## Not All Data Centers Require Transmission Interconnection

While hyperscale development dominates public attention, a substantial pipeline of small- and mid-scale data centers continues to move forward, with more than 2.5 GW of sub-30 MW facilities planned or already under construction over the next decade.[1] By count, 76% of operational data centers in North America fall below 30 MW, collectively accounting for roughly 18% of total compute capacity.

## Not All Workloads Require Hyperscale Facilities

A significant share of IT workloads does not require the scale, latency tolerance, or geographic flexibility of hyperscale architectures. These include latency-sensitive applications that benefit from physical proximity to users or devices, workloads constrained by data-sovereignty or regulatory requirements, edge and AI inference workloads focused on real-time processing rather than centralized training, and use cases characterized by incremental or phased growth, many of which are often well suited to data centers below roughly 50 MW.

## Regulatory Attention at the Distribution Level is Increasing

As larger and more complex loads increasingly seek service at distribution voltages, utilities and regulators are paying closer attention to how distribution systems accommodate large customers.[2, 3] Tariffs, planning criteria, cost-allocation rules, and approval thresholds are being updated or reinterpreted to address load size, clustering, and long-term system impacts. In parallel, FERC has initiated Notice of Proposed Rulemaking (NOPR) activity focused on addressing gaps in large-load interconnection at the transmission level, while distribution-level practices continue to evolve on a state-by-state and utility-specific basis.

1 Based on S&P Global dataset.

2 For example, in Virginia, recent SCC orders approving Dominion Energy Virginia large-load service agreements (e.g., Case No. PUR-2023-00017) require enhanced regulatory review and customer-funded upgrades for data centers served at distribution and sub-transmission levels.

3 In Europe, regulatory influence is often more centralized. For example, in the United Kingdom, Ofgem's Electricity Distribution Connection Charging Methodology governs how large customers connect at the distribution level, defining reinforcement cost responsibility and enabling firm or flexible connection options.

# WHAT 'DISTRIBUTION-CONNECTED' MEANS

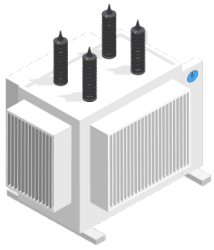
Distribution-connected does not necessarily mean "small," and its definition can vary by jurisdiction—across countries, across states, and even across utilities—depending on how voltage classification, planning responsibility, and regulatory oversight are defined.

## Distribution Voltage Levels



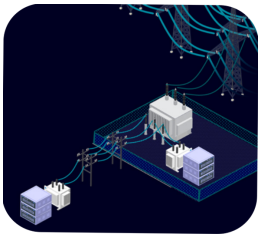
- Common distribution primary voltage includes: 4.16kV, 12.47kV, 13.2kV, 22.9kV, 24.9kV, 34.5kV.
- Sub-10 kV systems are more common on legacy networks and are less frequently used for new large-load connections.
- 10–15 kV systems represent the most common voltage class for new medium-voltage services, with higher distribution voltages used where feeder length, load magnitude, or system design warrant.
- Voltage classification boundaries vary by utility; in some jurisdictions, voltages up to ~69 kV may still be treated as distribution for planning and tariff purposes.

## Requested Power



- At the distribution level, "large load" requests typically begin around 0.5 MW, with some projects approaching 20–30 MW depending on system capability.
- Sub-1 MVA services are common for commercial development and generally follow standardized distribution service practices.
- 1–3 MVA services often require large pad-mounted service transformers and may trigger dedicated feeders or enhanced studies.
- 3+ MVA services typically involve custom designs, multiple service transformers, and may require dedicated feeders, feeder reconfiguration, or distribution substation modifications

## Connection Location



- Substation-collocated: The data center connects directly at a distribution substation, often using dedicated infrastructure.
- Dedicated feeder: The data center is served by a feeder originating at a distribution substation, typically within a limited radius depending on voltage level and system constraints.
- Existing feeder: Smaller or lower-impact data centers may, in some cases, connect to an existing feeder serving other loads, subject to capacity, voltage, and power-quality limits.
- Behind-the-meter: Enterprise or campus data centers may be served behind an existing customer meter, with impacts evaluated through retail service and facility expansion processes.
- Cross-jurisdiction configurations: Some data centers are served via dedicated substations or facilities supplied from sub-transmission or transmission networks, often with downstream distribution infrastructure. These configurations sit in a gray area between distribution- and transmission-connected service, with planning, interconnection, and regulatory treatment varying by utility structure, jurisdiction, and system design.

## Regulatory and Planning Treatment



- Distribution-connected data centers are governed primarily by state or local regulatory authority, with interconnection, planning, and cost recovery handled outside of FERC jurisdiction.
- Regulatory treatment reflects how utilities are organized and overseen, with vertically integrated utilities coordinating distribution and transmission considerations internally, and ISO/RTO-governed markets applying distribution-specific review and planning processes.
- Infrastructure upgrades and cost responsibility are determined through jurisdiction-specific tariffs, commission guidance, or approved agreements, which define how distribution investments are triggered, funded, and approved for large loads.

# WHEN DOES DISTRIBUTION MAKE SENSE?

### Time-to-Power

- Distribution-level interconnection can enable earlier access to power by reducing dependence on long-lead transmission upgrades, particularly where feeder or substation capacity already exists. In some cases, this can materially shorten development timelines or reduce schedule uncertainty, even if additional infrastructure is required over the longer term.
- Phased or conditional service arrangements can enable earlier initial operation while longer-term infrastructure is completed.

### Grid Utilization

- In some locations, distribution feeders or substations operate well below their thermal or voltage limits. Adding a large, steady data center load can improve utilization of existing assets, particularly where feeder load factors are modest or demand growth has lagged prior expectations.
- Using available distribution capacity can support near term growth while longer term system upgrades are planned.

### Latency, Data Gravity, Data Sovereignty, and Edge Economics

- Some applications require close proximity to users, data sources, or enterprise systems, making siting closer to load a primary driver to reduce latency.
- High-volume or continuously generated data can be expensive or operationally inefficient to move over long distances, creating data-gravity effects that favor processing near where data is produced or aggregated.
- Data sovereignty, security, or sensitivity requirements can limit where data is processed, favoring regional or in-market facilities.
- Edge, AI inference, and regional workloads often align better with distributed facility footprints than with large, centralized campuses, particularly where fiber network congestion or backhaul constraints make it more efficient to place compute closer to access networks.

### System-Resilience and Risk-Dispersion

- Distributing capacity across multiple 2–30 MW sites can reduce reliance on any single facility or interconnection point.
- Geographic and electrical diversity can limit exposure to localized outages, permitting delays, or construction risks.

# FLEXIBILITY AT THE DISTRIBUTION LEVEL

Distribution-connected data centers can introduce several forms of flexibility that influence how projects are designed, interconnected, and operated. These forms of flexibility often matter even when participation in formal demand response programs or grid services is not an explicit project objective.

## Operational Flexibility

Operational flexibility refers to the ability of a data center to adjust how load is realized over short periods without compromising core performance requirements. This can include temporarily reducing demand, deferring non-urgent processes, or sequencing equipment energization during startup or recovery.

The extent to which this flexibility is available depends on workload characteristics, redundancy and resilience design, and the commitments embedded in service-level agreements. From a distribution system perspective, operational flexibility is most relevant during contingencies, restoration events, or periods of localized constraint, rather than as a source of continuous or predictable load shaping.

## Interconnection and Timeline Flexibility

Flexibility can also arise in how and when data center load is brought online, independent of how the facility ultimately operates once fully built. Many projects are developed in phases, with capacity added incrementally as demand materializes.

Phased interconnection, staged energization, or temporary capacity limits can allow initial operation to proceed ahead of full infrastructure build-out. In practice, this type of flexibility is often negotiated during the interconnection process and is closely tied to distribution planning assumptions, capital timing, and risk management on both the utility and customer side.

## Spatial Flexibility and Workload Placement

Some data center operators can have the ability to route or shift portions of their workloads across multiple geographically distributed sites. This spatial flexibility can influence where new facilities are sited, how expansions are sequenced, and how capacity is allocated across constrained and unconstrained portions of the grid.

From a distribution planning perspective, spatial flexibility can reduce pressure on individual feeders or substations by allowing growth to be dispersed rather than concentrated. However, its relevance varies widely depending on network architecture, latency tolerance, and application requirements, and is not uniformly available across all data center types.

## Implications for Distribution Systems

Flexibility at the distribution level is highly location-specific and varies by project, site, and operating model. Where it exists, it can influence interconnection feasibility, study outcomes, and the timing or scale of required upgrades, even if it is not formally monetized or relied upon in planning criteria.

Clear articulation of which forms of flexibility are inherent, optional, or infeasible is critical to avoiding misalignment between utility expectations and data center capabilities. This distinction is especially important early in the interconnection and planning process, where assumptions about flexibility can materially affect outcomes.

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## EPRI's DCFlex Initiative

EPRI's DCFLex initiative is working with stakeholders to demonstrate how data centers can play a vital role in supporting and stabilizing the electric grid while enhancing interconnection efficiency: https://dcflex.sf.epri.com

This Quick Insight is not intended to prescribe specific interconnection approaches or regulatory outcomes. Instead, it highlights why distribution-connected data centers are emerging, how they differ from traditional large-load assumptions, and where existing planning and regulatory frameworks may experience friction. As data center development continues to diversify in scale, location, and operating model, distribution-level considerations are likely to play an increasingly visible role in system planning discussions.


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