Salas O'Brien

Power guide for data centers

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At-a-glance guide to on-site and grid-connected power strategies

This guide outlines the power options data center developers are actively evaluating. The goal is to clarify what's practical, what's conditional, and what requires long-range planning. Developers already know:

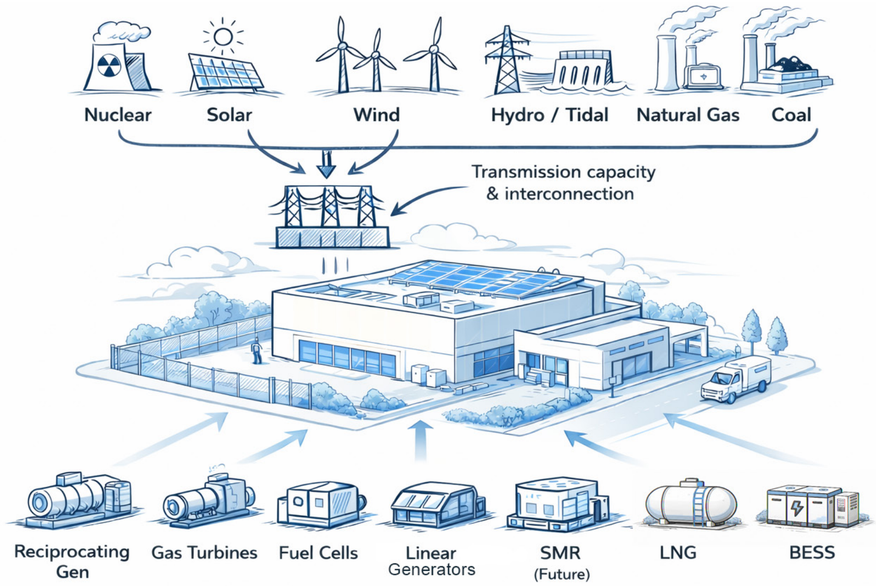
Power is the gating issue.

Load growth is outpacing transmission upgrades, interconnection queues are stretching timelines, and the availability of firm capacity increasingly drives where a project can even break ground. What used to be a downstream engineering decision now shapes site selection, deal structure, and construction sequencing from day one.

The question is how projects move forward inside those constraints. Strategies fall into two broad categories: 1) generation that can be colocated with the data center; and 2) power delivered through the grid.

Selection of on-site power generation sources or grid connectivity bring different implications for schedule, capital planning, operational control, emissions, and long-term flexibility.

Some options are available now while others are emerging and being deployed based on geography, utility posture, and regulatory context. Power strategy shapes not only schedule, but the life of the facility.



Colocated and grid-delivered power solutions

Power decisions are system decisions.

There is no single right answer for data center power; this comparison explores the practical advantages and constraints of each option to support layered and evolving approaches.

SOURCE	TYPICAL ROLE	RELIABILITY	CARBON PROFILE	KEY ADVANTAGES	KEY CONSTRAINTS
NATURAL GAS combined cycle/steam turbines	Regional or on-site primary power	Highly reliable	↑	High efficiency & proven technology	Fuel price volatility, permitting, water usage, & emissions
NATURAL GAS simple cycle combustion turbines	Peaking or fast-response support	Highly dispatchable	↑	Fast start & grid support	Lower efficiency, limited asset availability, & emissions
NATURAL GAS reciprocating generators	On-site resilience and supplemental power	Highly reliable when paired with stabilizing assets	↑	Rapid response & scalable	Emissions, fuel dependency, & maintenance cycle
FUEL CELLS natural gas	On-site primary or supplemental power	Highly reliable when paired with stabilizing assets	Reduced	Scalable, quiet, high efficiency operation	Fuel supply dependency & carbon-emitting
FUEL CELLS hydrogen	On-site low-carbon where fuel is available	Highly reliable when paired with stabilizing assets	↓	Zero-emission at point of use	Limited hydrogen & infrastructure constraints
NUCLEAR traditional	Primary on-site or regional baseload	Highly reliable, continuous	↓	Long-term reliability & high output	Long permit timelines, waste handling, & labor requirements
NUCLEAR SMR	Future on-site baseload option	Designed for continuous operation	↓	Scalable with strong reliability potential	Not commercially available & supply chain maturity
GEOTHERMAL POWER	Niche primary or supplemental power	Continuous where viable	↓	Stable output & low operating emissions	Limited geographic & capital feasibility
SOLAR	Supplemental on-site or off-site power	Intermittent	↓	Clean energy & scalable	Intermittency & land requirements
WIND	Supplemental off-site power	Intermittent	↓	Clean energy & mature technology	Intermittency & sitting constraints
TIDAL POWER	Experimental supplemental power	Predictable but limited	↓	Predictable cycles	Early-stage, limited deployment, & corrosive environment
HYDROELECTRIC	Off-site legacy baseload	Highly reliable	↓	Proven baseload generation	New permitting unlikely & limited expansion
LINEAR GENERATORS multi-fuel	Flexible on-site generation	Highly reliable when paired with stabilizing assets	Fuel dependent	Fuel flexibility & favorable emissions	New technology, fuel sourcing, & maintenance cycle

How hyperscalers evaluate power strategy early

At hyperscale, power decisions shape portfolio velocity and capital deployment. The question is which tradeoffs remain acceptable when repeated across dozens of sites.

What drives the decision

Time to capacity dominates. The ability to deliver large, predictable load blocks on schedule outweighs most other variables, especially when paired with solutions that can be replicated across regions without introducing operational variance.

Where programs break down

Risk concentrates when portfolios depend on future transmission upgrades, overestimate the scalability of emerging technologies, or defer power decisions too late in site sequencing. Each of these introduces friction that compounds across markets rather than remaining isolated to a single project.

What works at scale

Successful programs screen sites by viable power pathways, plan for phased power models that preserve long-term optionality, and manage risk at the portfolio level to avoid shared dependencies that can stall multiple sites at once.

How Salas O'Brien can help

We can help enterprise clients, developers, colos, and hyperscalers find the right mix of power strategies for their context and make a plan for speed-to-market or transitions over time.

For more information, reach out:
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Why Salas O’Brien for data center power options?

Everyone knows that power is an issue. The hard part — where most projects stall — is finding a power mix that doesn’t blow the schedule, and turning it into a plan that utilities, capital partners, and leaders can commit to.

Salas O’Brien can help you get there.

Our team understands generation technologies, interconnection processes, and the realities of site sequencing, so we identify constraints and recommend strategies that protect schedule. We also evaluate how solutions like ground-source systems can reduce cooling-related energy demand, improve power usage effectiveness (PUE), and preserve more available power for computing loads.

We map the viable power options for your site and set a defensible plan—surfacing tradeoffs across schedule, capital, emissions, and flexibility while identifying phased strategies that keep your options open as demand grows.

The result: a clear answer to which power options are viable, what they’ll cost you in schedule, and what to do next. Ranked by speed to capacity.

Reach out to us: datacenters@salasobrien.com