BTM Power State of Art

Executive Summary

Behind-the-meter generation is no longer fringe. It is becoming the pressure-release valve for a grid that cannot always deliver large AI loads on datacenter construction schedules.

Why hyperscale power is moving behind the meter — and why most announcements will not deliver on the AI schedule

The decisive finding is simple: **behind-the-meter generation is becoming a standard tool for hyperscale power procurement, but it is not a magic bypass around the grid.** The winning architecture in 2026 is a portfolio: grid service where capacity is real, gas or fuel-cell bridge power where air and fuel constraints are manageable, batteries for ride-through and grid flexibility, nuclear restarts or co-located existing nuclear where tariff treatment is explicit, and advanced nuclear / geothermal as a 2030s clean-firm option. The single biggest risk is not whether any one technology can produce electrons. It is whether generation, transmission deliverability, backup service, fuel supply, permits, public acceptance, and cost allocation can all be made to arrive on the same schedule as the AI load ramp.

This matters because datacenter construction cycles are now colliding with power-system cycles. The U.S. Energy Information Administration expects electricity use to grow 1% in 2026 and 3% in 2027, identifying large computing centers as a driver (EIA press release). EIA also identifies ERCOT and PJM as the highest-growth regions in its 2026 load-growth outlook (EIA Today in Energy). PJM reports that its interconnection reform reviewed more than 170 GW in the transition process, with 30 GW still to process in 2026 and a 1–2 year study-process target for new projects (PJM interconnection reform fact sheet).

The market is responding rationally. Hyperscalers are trying to buy their way out of queue risk, transmission congestion, and capacity scarcity. But public-record precedents show that self-supply still becomes a public infrastructure question once the load wants backup service from the grid, relies on transmission infrastructure, emits locally, or seeks nuclear licensing. FERC's rejection of the Susquehanna co-location amended interconnection service agreement is the key doctrine-forming case: "In this order, we reject the Amended ISA" (FERC Docket ER24-2172 order).

Decisive findings

1. BTM is a schedule hedge, not a replacement for utility planning

Onsite and co-located generation can shorten some parts of the energization path, especially when the alternative is waiting years for new transmission or resource adequacy. But BTM does not remove the need to solve backup service, fault duty, protection schemes, telemetry, reserve obligations, cost allocation, and local emissions. For a 24/7 AI campus, the power plan must satisfy energy, capacity, reliability, fuel, emissions, interconnection, and public-acceptance requirements simultaneously.

Northern Virginia illustrates the distinction. Ashburn has dense transmission infrastructure, including 500 kV and 230 kV assets, but physical proximity to high-voltage lines is not the same thing as deliverable capacity. Virginia's State Corporation Commission has already moved to insulate ratepayers from infrastructure costs tied to large loads such as datacenters, including minimum-payment requirements for certain large-scale customers (Virginia SCC 2025 Dominion Energy Virginia biennial review order). Loudoun County has adopted comprehensive-plan and zoning amendments that place new controls on datacenter development (Loudoun County datacenter page).

2. Gas and fuel cells are the near-term bridge; they are also the highest-reputation-risk technologies

Gas turbines, reciprocating engines, and fuel cells are the only generation classes that can plausibly be deployed on the one-to-three-year timeline demanded by many AI loads. EIA reports 6.3 GW of planned new U.S. natural-gas-fired capacity in 2026, including 2.8 GW of combustion turbine units (EIA gas capacity additions). EIA also reports 18.7 GW of combined-cycle capacity planned by 2028, with 4.3 GW already under construction (EIA combined-cycle pipeline).

But gas is not politically invisible. EPA states that stationary combustion turbines and engines used for primary or backup datacenter power are subject to Clean Air Act regulatory programs, and that state and local agencies issue most datacenter air permits (EPA Clean Air Act resources for data centers). The xAI Colossus / Memphis-Southaven controversy shows how fast "temporary" speed-to-power generation can become an environmental-justice and permitting flashpoint. A U.S. Senate Environment and Public Works release states that xAI operated dozens of unpermitted gas turbines in vulnerable communities and that community members opposed air pollution, water, and electricity impacts (U.S. Senate EPW release).

Fuel cells are a cleaner-looking bridge, but they are not cheap. AEP's public agreement to secure up to 1 GW of Bloom Energy solid-oxide fuel cells for datacenters demonstrates the use case: power operations while the grid is built out (AEP release). The economics depend heavily on gas or hydrogen cost, stack replacement, service contracts, tax qualification, and whether the installation is treated as a bridge or long-term baseload source.

3. Existing nuclear beats new nuclear for this decade

The credible clean-firm nuclear pathway for the late 2020s is not a first-of-a-kind SMR. It is an existing nuclear site, an existing workforce, an existing transmission footprint, and a bankable offtaker. The Microsoft–Constellation Three Mile Island / Crane Clean Energy Center transaction is the clearest template. Public federal material describes the unit as 837 MW and expected to go online in 2028 (Rep. Scott Perry release). NRC states that Constellation expressed interest in returning the plant to operational status and would need NRC approval to restore the licensing basis to operational status (NRC Crane Clean Energy Center page).

That restart model is materially more plausible for this decade than FOAK advanced reactors. NRC has approved NuScale Power's uprated 77 MWe reactor design (DOE / NRC NuScale uprated design), issued a construction permit for Kairos Hermes in December 2023 (NRC Hermes page), accepted Dow's construction-permit application for an X-energy Xe-100 project (DOE X-energy docketing release), and approved a construction permit for TerraPower's Natrium project in Kemmerer, Wyoming (DOE Natrium construction permit release). Those are real milestones. They are not proof that SMRs can serve near-term AI load at scale.

4. Co-location does not escape FERC, PJM, or state commission politics

The AWS–Talen Susquehanna case is the cautionary template. The commercial logic was obvious: connect a datacenter campus to a large existing nuclear station and contract for clean firm power. The regulatory problem was also obvious: if the load relies on grid-connected infrastructure, backup service, reserve capacity, or network facilities, other market participants and customers will ask who pays. FERC rejected the amended ISA in Docket ER24-2172 (FERC order); the public FERC case page identifies the PJM Susquehanna co-location proposal (FERC case page).

Pennsylvania has since moved to a model large-load tariff framework meant to guide electric distribution companies as they serve rapidly expanding datacenter load while protecting existing utility customers (Pennsylvania PUC large-load framework). That is the direction of travel nationally: co-located load will be allowed where it is transparent, studied, reliable, and cost-caused; it will not be accepted as a private exemption from the grid.

5. FOAK economics remain the binding constraint for SMRs

The NuScale–UAMPS cancellation is the reference-class warning. Public analysis of the cancelled Carbon Free Power Project reports that projected VOYGR LCOE rose to $89/MWh before cancellation (Clean Air Task Force analysis). DOE's advanced nuclear commercialization work frames new nuclear economics around overnight capital costs that can span $7,000/kW to $20,000/kW, including a 30% Section 48E investment-tax-credit assumption in the modeled range (DOE advanced nuclear liftoff report).

For hyperscalers, that means SMRs can be strategically valuable as long-term clean-firm options, but they should not be underwriting near-term AI capacity ramps. A high-capex nuclear asset with a six-to-ten-year development path is extremely sensitive to schedule slip. In an illustrative 100 MW advanced-nuclear case using $8,000/kW capex, 90% capacity factor, a six-year build, 15 operating years, $120/MWh offtake value, and a 7.75% nominal discount rate, project value remains negative. A two-year delay plus FOAK overrun pushes the economics materially worse. The implication is not that advanced nuclear is doomed; it is that it must be financed as an infrastructure program with federal support, creditworthy long-term offtake, repeat-build learning, and explicit schedule-risk allocation.

Why now: the grid is no longer keeping pace with load announcements

AI datacenter load is different from ordinary commercial load. It is large, flat, high-utilization, and schedule-driven. A 500 MW AI campus behaves more like a baseload industrial offtaker than a flexible office park. That creates four simultaneous stresses.

First, the interconnection queue is not designed around loads arriving faster than generation and transmission. PJM's reform effort is significant, but a one-to-two-year study turnaround for new generation projects still does not guarantee deliverable capacity for large load in constrained pockets (PJM interconnection reform fact sheet).

Second, load growth is concentrated in the same regions that already host dense datacenter clusters. EIA identifies ERCOT and PJM as the highest-growth regions in its 2026 load-growth outlook (EIA Today in Energy). The public policy fights in Virginia and Pennsylvania are not abstractions; they are the ratepayer and reliability response to concentrated hyperscale demand.

Third, datacenter construction can outrun grid construction. Turbines, substations, transformers, transmission lines, and gas laterals all have procurement and permitting constraints. The ability to build a shell and procure GPUs faster than a utility can expand transmission creates the incentive to self-supply.

Fourth, annual renewable matching is no longer enough for the highest-value AI workloads. Hyperscalers increasingly need firm, dispatchable, low-carbon power that matches hourly operations, not just annual energy accounting. DOE identifies solar, land-based wind, battery storage, and efficiency as rapidly scalable resources for datacenter-driven demand, while also pointing to geothermal and nuclear as clean-firm options (DOE clean energy resources for data centers).

Technology landscape

Gas turbines and reciprocating engines

Best role: one-to-three-year bridge power, early load blocks, resilience, and hedge against grid delay.

2026 status: mature, commercially available, and the most deployable class for large onsite generation where gas service, emissions, and local approvals are manageable. EIA's 2026 gas additions and 2028 combined-cycle pipeline show that the supply class is active, although equipment slots and grid equipment still matter (EIA gas additions; EIA CCGT pipeline).

Typical planning band: roughly $0.9 million to $2.0 million per MW of capex; $65/MWh to $160/MWh LCOE depending on gas price, utilization, emissions controls, and firm transportation. Schedule: roughly 1 year at P50, 2 years at P80, 3 years at P95 for manageable sites; longer where major-source air permitting, nonattainment, gas-lateral construction, or local opposition applies.

Main risk: air permitting and gas deliverability. A prime-power gas campus cannot rely on emergency-generator assumptions. EPA's datacenter air resources make clear that combustion turbines and engines are regulated stationary sources (EPA Clean Air Act resources).

Fuel cells

Best role: modular bridge power where turbines face public resistance or where a lower local-emissions profile is valuable.

2026 status: commercial but costly at hundreds of megawatts. AEP's up-to-1-GW Bloom Energy agreement is the strongest public hyperscale signal (AEP release).

Typical planning band: roughly $3.0 million to $6.5 million per MW; $110/MWh to $220/MWh LCOE; 85% to 95% capacity factor; 1 to 2.5 years schedule where gas and site approvals are available.

Main risk: delivered cost and fuel exposure. Fuel cells can improve the local narrative relative to turbines, but the technology still depends on fuel supply, service agreements, replacement stacks, and tax qualification.

Existing light-water reactor restarts

Best role: medium-term clean-firm supply for large hyperscale contracts.

2026 status: credible where an existing nuclear asset, transmission interconnection, workforce, and safety case can be restored. Crane Clean Energy Center / Three Mile Island Unit 1 is the reference case. NRC states that restart requires restoring the operating licensing basis (NRC Crane page). NRC's Palisades restart oversight structure is another relevant precedent for the regulatory work required to return a plant to operation (NRC Palisades page).

Typical planning band: roughly $1.5 million to $6.0 million per MW of restart capex, depending on plant condition and refurbishment scope; $70/MWh to $140/MWh PPA-equivalent cost; 3 to 7 years from serious restart program to operation.

Main risk: latent restart scope. Licensing basis restoration, workforce, equipment condition, outage readiness, and market/tariff arrangements can each move the schedule.

NuScale and light-water SMRs

Best role: 2030s clean-firm option where licensing, orderbook, and financing are already advanced.

2026 status: NuScale has the strongest U.S. design-approval reference among SMR vendors. DOE reports NRC approval of NuScale's uprated 77 MWe design (DOE NuScale release), and NRC maintains the NuScale licensing activity record (NRC NuScale page). Design approval lowers one category of licensing risk; it does not provide site permission, construction execution certainty, or commercial cost certainty.

Typical planning band: roughly $9 million to $20 million per MW for FOAK planning; $120/MWh to $220/MWh or higher risk-adjusted LCOE; 8 to 15+ years for first commercial programs.

Main risk: FOAK economics and customer attrition before commercial operation.

Holtec SMR-300

Best role: long-dated clean-firm option, especially at existing nuclear sites.

2026 status: NRC has stated it is reviewing Holtec SMR application material for completeness and acceptability, with a detailed technical review schedule not to exceed 18 months once accepted for processing (NRC Holtec SMR-300 release). That is an important process milestone, not a near-term supply guarantee.

Typical planning band: roughly $7 million to $20 million per MW; $100/MWh to $220/MWh or higher; 7 to 15+ years.

Main risk: vendor-specific commercial cost, licensing execution, and EPC wrap remain insufficiently public for investment-grade underwriting.

X-energy Xe-100

Best role: early advanced-reactor platform with strategic hyperscale relevance.

2026 status: DOE reports NRC accepted Dow's construction-permit application for an X-energy project and describes Xe-100 as a high-temperature gas-cooled reactor using TRISO fuel (DOE X-energy release). X-energy's Energy Northwest pathway is important because utility-region sponsorship improves credibility, but fuel supply and FOAK construction remain major risks.

Typical planning band: roughly $7 million to $20 million per MW; $100/MWh to $220/MWh or higher; 7 to 15+ years.

Main risk: TRISO fuel readiness, licensing execution, and first-project construction productivity.

Kairos Hermes / KP-FHR

Best role: technology-demonstration path that may mature into 2030s commercial supply.

2026 status: NRC issued a construction permit for the Hermes test reactor in December 2023 (NRC Hermes page). DOE states Hermes will be built in Oak Ridge to inform Kairos's fluoride salt-cooled high-temperature reactor development (DOE Hermes construction approval). DOE has also described commercial KP-FHR deployment as a 2030s proposition (DOE Kairos safety report).

Typical planning band: roughly $8 million to $22 million per MW for early commercial planning; $120/MWh to $240/MWh or higher; 7 to 15+ years.

Main risk: translating a test-reactor licensing path into commercial datacenter-grade supply.

TerraPower Natrium

Best role: strategic advanced-nuclear proof point; long-term clean-firm supply with load-following value.

2026 status: DOE reports NRC approval of a construction permit for the Natrium advanced reactor project in Kemmerer, Wyoming, with NRC application acceptance in May 2024 and safety review completion in December 2025 (DOE Natrium release). NRC's project page identifies Kemmerer Unit 1 and the Natrium sodium fast reactor technology (NRC TerraPower page). Wyoming's Public Service Commission role also matters because large power facilities and transmission can require state certificates (Wyoming PSC electric page).

Typical planning band: roughly $7 million to $20 million per MW; $100/MWh to $220/MWh or higher; 8 to 15+ years.

Main risk: FOAK sodium fast-reactor execution, operating authorization, fuel readiness, and state certificate / cost-treatment issues.

BESS + renewable hybrids

Best role: ride-through, peak shaving, emissions strategy, limited self-supply, demand response, and grid-support value.

2026 status: highly deployable as a component. DOE identifies solar, wind, storage, and efficiency as among the most rapidly scalable resources for datacenter demand (DOE clean energy resources). But a solar-plus-storage campus is not automatically firm 24/7 AI power. The amount of overbuild and storage required to serve flat load across seasons can make the apparent low renewable LCOE misleading.

Typical planning band: renewable capex roughly $1.2 million to $2.2 million per MW; firmed 24/7 equivalent capex can exceed $4 million to $10 million per MW-firm; $90/MWh to $250/MWh for high-reliability firmed service; 2 to 6 years depending on interconnection and land.

Main risk: confusing cheap non-firm energy with datacenter-grade firm supply.

Geothermal and enhanced geothermal systems

Best role: clean-firm 24/7 power where geology is proven.

2026 status: strategically attractive but site-specific. DOE states geothermal has a capacity factor generally around 90% and can operate steadily around the clock (DOE geothermal and data centers). Enhanced geothermal can expand the resource base, but drilling and subsurface performance risk remain central.

Typical planning band: roughly $4 million to $12 million per MW; $70/MWh to $160/MWh; 4 to 10 years depending on resource certainty and permitting.

Main risk: subsurface uncertainty and development learning curve.

Named-deal anatomy

Microsoft–Constellation: Three Mile Island / Crane Clean Energy Center

What it is: a nuclear restart-backed clean-firm supply strategy. It is not a generic SMR deployment and not an ordinary grid PPA.

Capacity and schedule: public federal material identifies the plant's capacity at 837 MW and states an expected 2028 online date (Rep. Perry release).

Regulatory pathway: NRC approval is needed to restore the operating licensing basis (NRC Crane page). Restart oversight resembles the Palisades model, where NRC established a dedicated restart panel to guide review, inspection, and readiness confirmation (NRC Palisades page).

Risk exposure: restart scope, licensing readiness, public trust after a retired nuclear asset is revived, and whether the offtake narrative is framed as clean-firm grid benefit or private AI supply.

Read-through: this is the best 2020s clean-firm template because it starts from an existing asset. It is still a regulated nuclear restart, not a procurement shortcut.

AWS–Talen: Susquehanna co-location

What it is: the doctrine-forming co-located nuclear datacenter case.

Capacity and structure: public FERC materials identify the PJM Susquehanna co-location proposal and related amended interconnection service agreement (FERC case page). Public analysis has described the disputed load expansion from 300 MW to 480 MW; broader market descriptions of the AWS–Talen transaction have referenced up to 960 MW of nuclear-backed capacity.

Regulatory pathway: FERC rejected the amended ISA (FERC order). The issues are not just wires. They are open access, backup service, transmission service, network impacts, reserve obligations, and who pays when the generator is unavailable.

Risk exposure: tariff rejection, state large-load tariff evolution, consumer-advocate intervention, and cost-shift allegations. Pennsylvania's large-load framework is the downstream policy response (Pennsylvania PUC large-load framework).

Read-through: physical co-location helps the engineering case. It does not settle the legal or political case.

Oracle's SMR announcement

What it is: a market signal that AI campuses are looking beyond conventional grid supply.

Capacity and schedule: public-company detail sufficient for commitment-grade underwriting was not available in the record reviewed here. Treat the announcement as evidence of buyer appetite, not as evidence of near-term SMR deliverability.

Regulatory pathway: any SMR-backed supply would still need vendor-specific NRC licensing, site approval, construction, operating authorization, fuel supply, state/local approvals, and grid/offtake arrangements.

Risk exposure: the risk is announcement inflation. SMR language can create the impression of solved power before licensing, fuel, and construction realities are known.

Read-through: useful for demand-side market direction; weak as a supply-side proof point until tied to a named reactor, site, license path, financing plan, and schedule.

Meta nuclear RFP

What it is: a large clean-firm procurement signal.

Capacity and schedule: deal-specific terms were not publicly sufficient in the reviewed record for hard capacity, pricing, or COD claims.

Regulatory pathway: the pathway depends entirely on the winning technology and site: existing nuclear PPA, restart, SMR, advanced reactor, or grid-connected clean-firm portfolio.

Risk exposure: site-specific acceptance. A national RFP can be well received; a named nuclear site serving a private AI load can trigger local, tribal, water, emergency-planning, and ratepayer scrutiny.

Read-through: Meta's procurement direction reinforces the move from annual renewable matching to firm clean power. It does not resolve which technologies can scale on the AI timeline.

Google–Kairos

What it is: an advanced-nuclear development pathway tied to Kairos's technology maturation.

Capacity and schedule: public federal records support Hermes permitting and test-reactor development; commercial KP-FHR deployment is a 2030s proposition according to DOE material (DOE Kairos safety report).

Regulatory pathway: Hermes is a test-reactor precedent, not a commercial datacenter supply license. Commercial deployment would require additional design/site licensing, NEPA review, construction, operating authorization, and fuel readiness.

Risk exposure: demonstration-to-commercial scale-up and whether future commercial sites have local acceptance.

Read-through: strategically important; not a 2026–2029 energization solution.

X-energy–Amazon / Energy Northwest

What it is: an SMR-backed pathway with a public-power / regional-energy anchor.

Capacity and schedule: DOE describes an X-energy four-unit, 320 MWe demonstration with Energy Northwest and Burns & McDonnell as partners in the broader advanced-reactor demonstration context (DOE advanced reactors demonstration article).

Regulatory pathway: NRC construction-permit review, advanced-reactor safety review, TRISO fuel readiness, environmental review, operating authorization, and state/local siting.

Risk exposure: fuel, FOAK EPC execution, utility/regional governance, and whether the public sees the reactors as broader clean infrastructure or private AI supply.

Read-through: one of the more credible SMR pathways because it combines vendor, utility-region sponsor, and federal-program context. It still needs bridge power for near-term AI load.

Economics: what the options really cost

The right economic question is not "what is the cheapest LCOE?" It is "what is the cost of a firm, deliverable, politically durable megawatt on the date the AI campus needs it?" For hyperscalers, a higher $/MWh solution can be rational if it prevents a multi-year capacity delay. Conversely, a low nominal LCOE is irrelevant if the resource is non-firm, unlicensed, under-fueled, or blocked by tariff treatment.

OPTION	CAPEX PLANNING BAND	LCOE / ALL-IN COST BAND	CAPACITY-FACTOR ASSUMPTION	SCHEDULE BAND	2026 ROLE
Grid / utility PPA where capacity exists	$0–0.5M/MW customer-side, excluding major network upgrades	$70–160/MWh all-in planning band	Product-specific	1–6+ years	Baseline; best where deliverable
Gas turbines / recips	$0.9–2.0M/MW	$65–160/MWh	70–95%	1–3 years	Near-term bridge
Fuel cells	$3.0–6.5M/MW	$110–220/MWh	85–95%	1–2.5 years	Modular bridge
LWR restarts	$1.5–6.0M/MW restart scope	$70–140/MWh	85–93%	3–7 years	Medium-term clean firm
NuScale / LWR SMR	$9–20M/MW FOAK	$120–220+/MWh	~90%	8–15+ years	Strategic option
Holtec SMR-300	$7–20M/MW	$100–220+/MWh	~90%	7–15+ years	Strategic option
X-energy Xe-100	$7–20M/MW	$100–220+/MWh	~90%	7–15+ years	Strategic option
Kairos KP-FHR	$8–22M/MW	$120–240+/MWh	85–90%	7–15+ years	Strategic option
TerraPower Natrium	$7–20M/MW	$100–220+/MWh	85–90%	8–15+ years	Strategic option
BESS + renewables	$4–10M/MW-firm for high-reliability firmed service	$90–250/MWh firmed	Resource-dependent	2–6 years	Component, not standalone
Geothermal / EGS	$4–12M/MW	$70–160/MWh	85–95%	4–10 years	Site-specific clean firm

EIA's levelized-cost materials define LCOE and LCOS as the estimated cost to build and operate generation or storage over a specified cost-recovery period, including available tax credits (EIA AEO 2025 LCOE report). NREL's Annual Technology Baseline provides current and projected cost and performance data for generation and storage technologies (NREL ATB via Data.gov). Those sources are useful anchors, but datacenter BTM economics require adders for firming, fuel delivery, backup service, emissions compliance, and schedule risk.

Federal incentives matter, but they do not erase execution risk. DOE's Title XVII program can reduce cost of capital for qualifying clean energy and energy-infrastructure-reinvestment projects (DOE LPO Title XVII overview). Section 45U supports qualified existing nuclear generation for tax years after 2023 and before 2033 (IRS zero-emission nuclear power production credit). Sections 45Y and 48E provide technology-neutral clean electricity production and investment credits for qualifying zero-emission resources and storage (Federal Register final rules; IRS clean electricity investment credit). DOE's Civil Nuclear Credit Program is relevant to at-risk existing nuclear facilities, not a general subsidy for new SMRs (DOE Civil Nuclear Credit Program).

Regulatory reality

FERC and co-located load

Post-Susquehanna, the safe assumption is that co-located datacenter load will be scrutinized for open access, backup service, transmission service, reliability, and cost allocation. FERC's November 2024 rejection in ER24-2172 did not ban co-location; it rejected the filed structure. Commissioner Mark Christie's publicly cited concern captures the issue: co-location arrangements can have “huge ramifications for both grid reliability and consumer costs.”

The practical implication is that a co-located project must answer five questions before the press release:

1. What transmission service is being used when generator output is netted against load?
2. What backup service is required when the generator trips, refuels, derates, or retires?
3. Who pays for network upgrades and reliability support?
4. How will the load be modeled in ISO/RTO operations?
5. What happens if the datacenter ramps faster than the generation resource or grid upgrades?

State commission roles

Pennsylvania is the leading tariff laboratory. The Pennsylvania PUC's large-load model tariff framework explicitly covers rapidly expanding datacenters while protecting existing utility customers (Pennsylvania PUC release; PUC docket M-2025-3054271).

Virginia is the leading social-carrying-capacity case. SCC proceedings and local zoning controls show that datacenter load is now a ratepayer and land-use issue, not only an economic-development issue (Virginia SCC load-flexibility conference; Loudoun County datacenter page).

Texas remains development-friendly, but ERCOT is formalizing large-load interconnection discipline. ERCOT's large-load process applies to customers with peak demand of 75 MW or more at a single site (ERCOT large-load Q&A). That makes Abilene-style AI campuses grid-operational actors, not ordinary commercial loads.

Wyoming is the advanced-reactor state case because TerraPower Natrium combines NRC licensing with Wyoming PSC certificate and power-facility oversight (Wyoming PSC electric page; DOE Natrium release).

NRC pathways

Nuclear licensing separates into four practical categories:

- **Existing operating nuclear PPAs:** fastest, but still exposed to tariff, transmission, backup-service, and market rules.
- **LWR restarts:** 3–7 years; NRC licensing-basis restoration, inspections, staffing, equipment readiness, and emergency planning are the critical path.
- **Design-approved SMRs at new sites:** 7–12+ years; design approval helps but site licensing, NEPA, hearings, construction, and operating authorization remain.
- **FOAK advanced reactors:** 7–15+ years; construction-permit progress is meaningful, but commercial operation depends on fuel, operating authorization, construction execution, and state/local siting.

Air, zoning, and NEPA

Gas BTM projects can be fast only if they are permitted for how they will actually operate. Emergency-backup permits cannot support routine prime-power dispatch. Major-source or nonattainment cases can bring PSD or nonattainment NSR, BACT or LAER, offsets, Title V, dispersion modeling, public comment, and environmental-justice scrutiny. NEPA generally enters when there is a federal action — NRC licensing, federal land, DOE support, Army Corps wetlands permits, FERC-jurisdictional pipeline facilities, or similar approvals — not simply because the project is a private datacenter.

Public acceptance and political risk

The public risk profile has shifted. Early datacenter debates centered on land use, tax revenue, and jobs. The BTM era adds four harder questions:

1. **Who pays for backup reliability?** If the datacenter self-supplies but still needs the grid during outages, refueling, weather events, or generator failures, other customers will demand cost-causation proof.

2. **Who bears local emissions and noise?** Onsite gas generation concentrates impacts near communities, even when framed as temporary.
3. **Who controls scarce infrastructure?** Nuclear restarts, transmission lines, substations, and clean-firm supply can be politically sensitive if they appear dedicated to private AI load while ordinary customers face higher bills.
4. **Who benefits from incentives?** Tax abatements, federal credits, LPO financing, and utility cost recovery can intensify opposition if permanent jobs are limited.

Virginia shows the mature-opposition path: local controls, SCC ratepayer protections, and organized resident scrutiny. Pennsylvania shows the tariff path: FERC rejection followed by state large-load framework development. Memphis/Southaven shows the environmental-justice path: fast gas deployment becomes a public-trust problem. Wyoming shows the more constructive path: advanced nuclear can be accepted more readily where it is tied to coal-transition employment and an existing energy community, but schedule slippage can still erode trust.

Outlook: when does BTM scale?

BTM scales first as a **bridge architecture**, then as a **co-located clean-firm architecture**, and only later as a **new advanced-reactor architecture**.

2026–2028: bridge power and tariff sorting

The near-term market will be dominated by gas turbines, reciprocating engines, fuel cells, BESS, grid PPAs, and utility special contracts. The best projects will not claim to be off-grid. They will specify backup service, emissions controls, fuel contracts, telemetry, dispatch limits, interconnection responsibilities, and decommissioning or conversion pathways.

2028–2032: nuclear restarts, co-location, and firm clean portfolios

Existing nuclear restarts and co-located nuclear PPAs can matter materially if FERC, ISO/RTO, and state tariff rules stabilize. The Microsoft–Constellation / Crane model is the most credible clean-firm 2020s template. The AWS–Talen / Susquehanna case is the warning that commercial adjacency is not regulatory insulation.

2032 and beyond: advanced nuclear and geothermal optionality

SMRs, non-light-water reactors, and enhanced geothermal can become important if early projects demonstrate repeatable cost, licensing duration, fuel supply, construction productivity, and host-community acceptance. The strongest hyperscalers will treat those technologies as portfolio options now, not as substitutes for 2026–2030 energization plans.

What hyperscalers, utilities, ISOs, and regulators should do differently

Hyperscalers should publish cost-causation principles before announcing BTM deals. The acceptance test is not whether the company can buy power. It is whether other customers are protected from backup, transmission, reserve, and stranded-cost exposure.

Utilities should create large-load service products that reward flexibility and direct cost responsibility. Minimum bills, take-or-pay commitments, collateral, interruptible service, onsite generation telemetry, and non-firm service options can reduce system risk while still allowing growth.

ISOs and RTOs should standardize co-located-load modeling. The sector needs transparent rules for netting, backup service, generator outages, telemetry, operating limits, and network cost allocation.

Regulators should require realism in public announcements. A nuclear design approval, construction permit, MOU, or RFP is not equivalent to delivered capacity. Public agencies should force a clean distinction between commercial aspiration, permitted construction, and authorized operation.

Local governments should treat onsite generation as infrastructure, not an accessory use. Gas turbines, fuel cells, BESS yards, substations, cooling systems, and gas laterals carry impacts that should be disclosed, conditioned, and monitored.

Bottom line

Behind-the-meter generation is no longer fringe. It is becoming the pressure-release valve for a grid that cannot always deliver large AI loads on datacenter construction schedules. But BTM will scale only where sponsors are honest about its dependencies. Gas and fuel cells buy time. Batteries buy flexibility. Grid PPAs and utility service remain the baseline where capacity is real. Existing nuclear can buy clean-firm credibility. SMRs and geothermal buy long-term optionality.

The projects that work will look less like clever private bypasses and more like integrated infrastructure programs: transparent tariffs, directly assigned costs, credible fuel and permitting plans, enforceable community protections, and finance structures that survive delay. The projects that fail will be the ones that confuse a power announcement with a power plant.

Source appendix

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