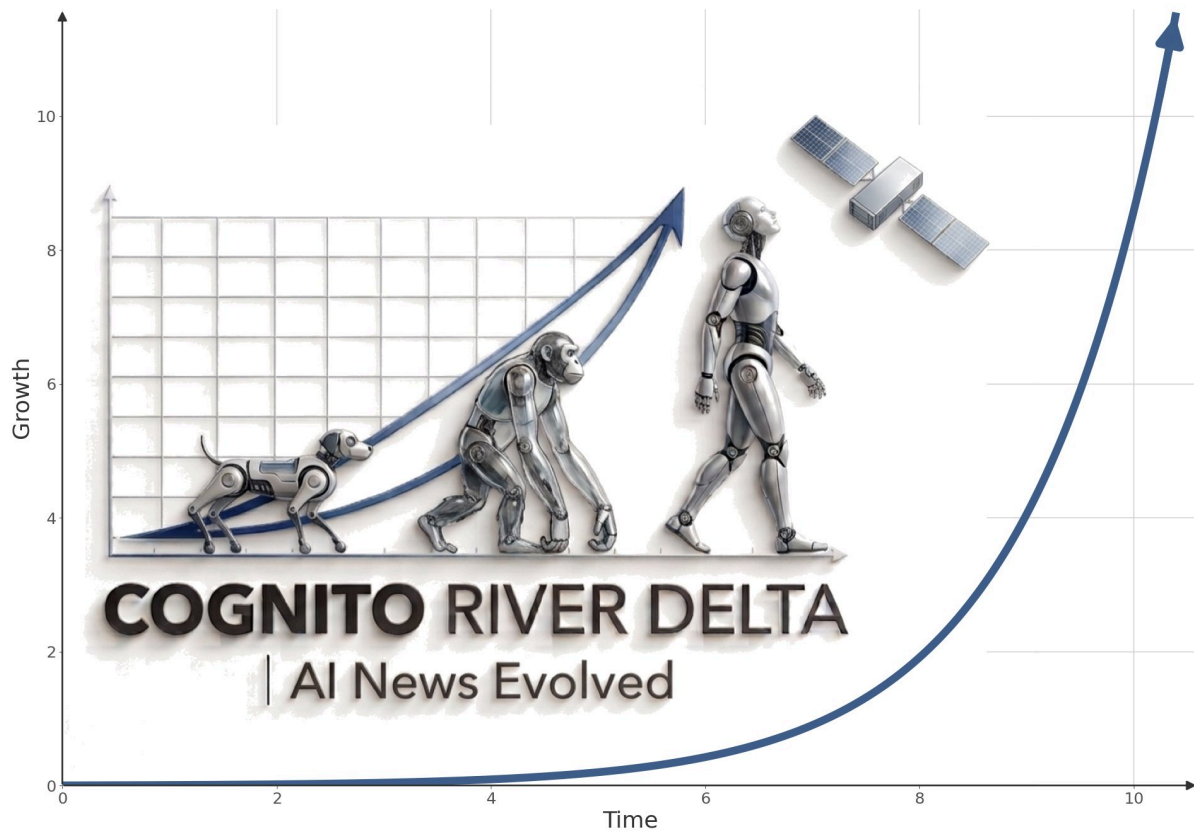




CATEGORY ROLLUP

Grid, gas & utilities - 2026-W40

Week of September 28, 2026

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Grid, gas & utilities - 2026-W40

Week of September 28, 2026 · 12 min read

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Nuclear & SMRs

Grid, gas & utilities · week 2026-W40: Sep 27 - Oct 03, 2026 · 1 subtopic(s) covered · 2239 words · expanded

Overview

The defining storyline of this week is the intensifying "collision of timescales" between the exponential, near-instantaneous scaling of AI compute and the multi-decadal inertia of the global electrical grid. We are witnessing a fundamental decoupling: while AI developers are planning capacity in gigawatts and deploying hardware in months, the traditional utility-scale power paradigm—governed by massive interconnection queues, decade-long regulatory hurdles, and aging thermal plants—is proving unable to keep pace. This mismatch is no longer a theoretical concern; it has become the primary bottleneck for the entire AI industry, manifesting in everything from data center moratoriums to a radical, multi-pronged scramble for "alternative" energy-compute architectures.

This week's developments reveal a three-tiered response to this crisis. First, there is the **Nuclear/Firm Power Pivot**, where hyperscalers like Amazon are moving beyond simple power purchase agreements (PPAs) to direct partnerships with next-generation Small Modular Reactor (SMR) developers like X-energy. Second, there is the **Grid Bypass/Decentralization Strategy**, seen in the push for on-site solid oxide fuel cells, geothermal milestones in Utah, and even the radical concept of orbital, space-based data centers. Third, there is the **Regulatory/Infrastructure Catch-up**, evidenced by the US Department of Energy's \$1.9 billion infusion into grid upgrades and FERC's attempts to prune "zombie" projects from the 2.6-terawatt interconnection queue.

The connecting thread across all these movements is a shift in the definition of "compute." Energy is no longer a background utility; it has become a core, front-end component of the AI infrastructure stack. Whether it is NVIDIA framing AI factories in terms of megawatts or SpaceXAI building its own 1.2-gigawatt plant, the industry is signaling that the next frontier of the AI arms race will not be won solely on transistor density, but on the ability to secure, deploy, and stabilize massive amounts of power.

Energy production and the grid

The energy landscape this week was characterized by a frantic search for "firm" power—energy that is both carbon-neutral and constantly available—to match the 24/7, high-intensity demand of AI workloads.

The Nuclear and SMR Resurgence The most significant strategic shift is the "verticalization" of energy procurement by hyperscalers. We are seeing a move away from being passive consumers of grid power toward becoming active architects of the next generation of nuclear deployment. Amazon is leading this charge, leveraging two distinct strategies: securing long-term supply from existing assets (a 20-year, 190MW PPA with Constellation for the Calvert Cliffs plant) and aggressively investing in the future of Small Modular Reactors (SMRs) through a massive agreement with X-energy to deploy 5GW of capacity by 2039.

The technical focus here is on overcoming "technological inertia" through advanced fuels and modularity. X-energy's transition to commercial-scale production of TRISO fuel—noted by ARK Invest for its "impossible to melt" safety profile—represents an attempt to de-risk the deployment of pebble-bed reactors. This is a direct response to the "construction project execution risk" that has historically plagued large-scale nuclear. By attempting to modularize the process, developers hope to bypass the massive capital and time requirements of traditional plants. Meanwhile, Valar Atomics is proposing an even more massive-scale integration, with a 9.4GW SMR-powered data center campus in Utah aimed for a 2028 launch. This underscores a growing belief that the future of AI compute is inextricably linked to the deployment of modular, on-site nuclear capacity.

The Geothermal and Alternative Power Push Parallel to the nuclear movement is a surge in interest in geothermal energy as a source of reliable, baseload renewable power. The milestone achieved by Fervo Energy at the Cape Station plant in Utah—reaching first power at the first utility-scale enhanced geothermal project—is a critical proof of concept. With a potential capacity of up to 900MW, projects like Cape Station offer a middle ground between the variability of solar/wind and the long lead times of traditional nuclear.

In more localized contexts, we are seeing "energy-as-a-service" models emerge to bypass grid constraints. In Vermont, the use of gas utility funds to cover upfront geothermal infrastructure for affordable housing suggests a model for how utilities might pivot to support decarbonized, local generation. Simultaneously, the promotion of solid oxide fuel cells as a scalable method for on-site data center power highlights a growing "bypass" mentality: if the grid cannot provide power fast enough, the industry will simply build its own micro-utilities to ensure operational continuity.

The Frontier: Orbital and Space-Based Infrastructure Perhaps the most radical response to terrestrial grid constraints is the move toward space. This is not merely speculative; it is becoming a collaborative engineering frontier. Google's testing of an orbital AI data center—utilizing four TPUs and 1,000W of solar power—demonstrates the technical feasibility of moving compute off-planet. However, the current limitation of 15-minute operational runs due to overheating issues highlights the extreme thermal management challenges inherent in this "off-grid" approach.

More structured collaborations are already in development. The partnership between NVIDIA and SpaceX to power the Starline satellite constellation represents a convergence of the two most critical AI components: the "brain" (NVIDIA's Vera CPUs and Rubin systems) and the "environment" (SpaceX's launch capabilities and future space-based solar energy). This suggests a future where the "grid" is no longer confined to terrestrial wires, but extends into orbit to circumvent the physical and regulatory bottlenecks of Earth-bound energy distribution.

The Grid Impedance and Regulatory Reality While the industry looks to the stars and SMRs, the terrestrial grid remains a massive, sluggish bottleneck. The sheer volume of the interconnection queue—exceeding 2.6 terawatts—is staggering. However, the "efficiency" of this queue is deeply in question; with only 19% to 21% of projects reaching commercial operation, the system is clogged with speculative or unviable projects. This is why the DOE's \$1.9 billion funding for 31 grid upgrade projects is so vital; it is an attempt to unlock 23GW of capacity specifically to facilitate data center connections, recognizing that the "last mile" of power delivery is currently the industry's greatest friction point.

The economic signals of this strain are already visible in the markets. The PJM 2025/2026 Base Residual Auction's record-breaking price surge (from ~\$29/MW-day to nearly \$270/MW-day) serves as a blunt market warning. This spike is driven by a "pincer movement": the simultaneous retirement of coal-fired generation and the massive, sudden influx of peak demand from electrification and data centers. As FERC implements new orders

(like Order 2023 to move from "first-come" to "first-ready" and Order 1920 for long-term regional planning), the goal is to transform a reactive grid into a proactive one, but the transition is occurring against a backdrop of extreme price volatility and reliability concerns regarding inverter-based resources (IBRs).

Storage and Site Repurposing Finally, we see two tactical maneuvers to optimize existing assets: massive energy storage deployment and site repurposing. Tesla's projected 15.9 gigawatts of energy storage deployment provides the necessary "buffer" to manage the intermittency of the renewable-heavy queue. Meanwhile, the plan for a 1GW data center campus at a former nuclear site in Scotland illustrates a highly efficient way to marry high-density compute with ready-made, high-capacity electrical connections, effectively "recycling" the grid's most valuable assets to minimize new interconnection delays.

Cross-cutting themes

The Energy-Compute Nexus The most significant theme this week is the total collapse of the distinction between "energy infrastructure" and "compute infrastructure." For decades, these were separate sectors with different investment cycles and regulatory frameworks. Today, they are merging. NVIDIA's pricing model—where AI factories are priced by the megawatt, with costs reaching approximately \$60 million per megawatt—and the formation of massive energy-compute partnerships (SpaceX/NVIDIA, Amazon/X-energy) indicate that an AI company's ability to scale is now directly proportional to its ability to act as an energy developer.

The Fight Against "Time-Lag" There is a pervasive tension between the *speed of innovation* and the *speed of deployment*. AI software and hardware evolve on a scale of months; the grid evolves on a scale of decades. This week's developments—from SMRs and geothermal to orbital data centers and fuel cells—are all, at their core, attempts to find "short-circuit" solutions to this temporal mismatch. Every technology discussed is essentially a bet on how to most effectively bypass the traditional, slow-moving utility model.

Centralization vs. Decentralization We are seeing a paradoxical tension in how energy is being deployed. On one hand, there is a drive toward massive, centralized "megaprojects"—9.4GW SMR campuses, 1.2GW SpaceXAI plants, and massive DOE grid upgrades. On the other hand, there is a simultaneous push toward extreme decentralization—on-site fuel cells, "balcony solar" in California, and orbital computing. This suggests that the future grid will not

be a single monolithic system, but a highly fragmented "hybrid" of massive baseload hubs and hyper-local, autonomous power pockets.

Where sources agree

- **The AI-Energy Demand Loop:** There is a universal consensus across all sources (ARK, NVIDIA, Data Center Dynamics) that the massive, unprecedented power requirements of AI are the primary driver of current energy market volatility and the resurgence of interest in nuclear power.
- **Nuclear as a Strategic Necessity:** All major analytical voices agree that Small Modular Reactors (SMRs) and firm, dispatchable nuclear power are critical to meeting the specific reliability and scale requirements of hyperscale data centers and maintaining national competitiveness.
- **Grid Constraints as a Primary Bottleneck:** There is no disagreement that the existing US power grid is under immense strain, and that the ability to connect new load (specifically data centers) is currently limited by massive interconnection queues and infrastructure capacity.

Where sources disagree

- **The Scale of SpaceX's Energy Expansion:** A significant discrepancy exists regarding SpaceX's immediate energy footprint. Randy Kirk reports a monthly capacity addition of 220 megawatt hours, whereas Tom's Hardware reports the construction of a 1.2-gigawatt power plant. This is a fundamental difference in scale (energy vs. power) that warrants verification.
- **The Future of the Grid (Renewables vs. Nuclear):** A profound ideological divide exists between analysts. Cathie Wood (ARK Invest) argues that advanced nuclear (SMRs) is the indispensable solution for AI's power needs. Conversely, Tony Seba argues that a 100% renewable grid (solar, wind, and batteries) will entirely displace both fossil fuels and nuclear power through sheer economic superiority.
- **The Nature of the Nuclear Hurdle:** There is a disagreement on what will ultimately prevent nuclear scaling. Some sources focus on the technical and financial challenge of "construction project execution risk," while others imply the primary hurdle is the "technological inertia" of current reactor designs.

Numbers and claims to verify

- **1.2-gigawatt power plant (Tom's Hardware):** Verify if this refers to a single continuous output capacity or an aggregate capacity over time, and confirm the construction timeline for SpaceXAI's plant.
- **220 megawatt hours per month (Randy Kirk):** Clarify if this refers to energy storage capacity (MWh) or a specific monthly energy generation target, as the distinction is vital for assessing scale.
- **23GW of additional capacity (Data Center Dynamics):** Verify the direct link between the \$1.9 billion DOE funding and this specific capacity figure. Does this include existing projects or only new capacity enabled by the funding?
- **900MW Cape Station plant (Data Center Dynamics):** Confirm whether 900MW is the current operational output or the ultimate theoretical design capacity for the Fervo Energy project.
- **\$60 million per megawatt (NVIDIA Blog):** Verify this cost estimate for AI factory construction to understand the capital intensity of the current scaling cycle.

Investment and strategic implications

- **The Rise of the "Energy-Compute" Developer:** For investors, the traditional distinction between "tech" and "utilities" is blurring. Companies that can successfully integrate power generation (or secure direct access to it) with compute capacity are likely to hold a significant strategic advantage. The ability to control the "megawatt" is becoming as important as the ability to control the "chip."
- **Infrastructure as the New Bottleneck:** Value is shifting from the "application layer" of AI to the "physical layer." Power availability is currently the primary constraint on scaling; therefore, the companies providing the "bypass" technologies (SMRs, fuel cells, geothermal, and grid-modernization hardware) are positioned in a high-demand, high-moat segment.
- **Risk Profile of Nuclear vs. Renewables:** The debate between Wood and Seba represents a fundamental investment tension. The nuclear path involves high regulatory and execution risk but offers the "firmness" that AI demands. The renewable path offers lower technical complexity and lower costs but faces significant "intermittency" and "grid-connection" risks.

What to watch next week

- **X-energy/Dow Chemical Progress:** Any updates on the Q1 2025 construction timeline for the first TRISO-fuel project, which will serve as a bellwether for SMR deployment speeds.
- **PJM Market Signals:** Any further fluctuations in the Base Residual Auction prices, which will serve as a barometer for grid reliability stress and the "pincer movement" of retiring coal vs. rising demand.
- **Orbital/Space-Based Testing:** Updates on Google's thermal management solutions for orbital computing, which is the key "go/no-go" technical hurdle for space-based AI.
- **DOE Project Announcements:** Further details on which specific 31 grid upgrade projects are receiving the \$1.9 billion in funding and their projected timelines for capacity release.

Appendix: Individual perspectives

- **Cathie Wood (ARK Invest):** Advocates for a "nuclear-centric" future for AI, specifically emphasizing the importance of SMRs and advanced pebble-bed technology (like X-energy) to solve the power-scaling problem and avoid technological inertia.
- **Tony Seba:** Represents the "pure renewable" view, asserting that the economics of overbuilt solar, wind, and battery storage will inevitably render both fossil fuels and nuclear power obsolete by the mid-2030s.
- **Randy Kirk:** Provides a more conservative/incremental view of SpaceX's energy additions (220 MWh/month) compared to more aggressive capacity claims made by other outlets.

Sources

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