



Essential Infrastructure News: November 30 – December 17

1) U.S. DOE Funds Rare Earth Supply Chains

What happened: On Dec. 1, the U.S. Department of Energy announced a \$134 million funding to strengthen rare earth element supply chains and advance American energy independenceⁱ. This follows on announced additional \$355 million funding to expand domestic production of critical minerals (Nov. 14), contracts awarded to refill the Strategic Petroleum Reserve (Nov. 12), \$625 million investment to reinvigorate the U.S. coal industry (Sept. 29), and the Speed to Power Initiative to power initiative and accelerate large-scale grid infrastructure projects (Sept. 18).

Why it matters: Rare earths (and adjacent “strategic” minerals) are binding constraints for grid modernization, EV supply chains, high-efficiency motors, and many water-system electrification upgrades. The U.S. DOE has been investing in, and creating initiatives to expand the U.S.’ resources, supply chain and collaboration.

Likely impacts (electric/energy/water):

- **Capex & procurement:** tighter specs and “qualifying country” sourcing may become the norm for transformers, drives, pumps, and control electronics.
- **Permitting & community:** new processing capacity creates **local water/energy demand**, wastewater handling needs, and community-risk optics.

- **AI angle:** data centers and grid AI increase demand for power electronics and high-performance hardware—often mineral-intensive.

2) DOE: Releases NPC recommendations on permitting reform & infrastructure buildout (Dec 3/5)

What happened: On Dec. 3, the U.S. DOE released the National Petroleum Council's (NPC) key studies and comprehensive recommendations to help modernize America's energy infrastructure, streamline federal permitting and remove regulatory barriers that have hindered critical energy projectsⁱⁱ.

Why it matters: In building transmission, pipelines, storage and/or large-load interconnects, permitting velocity is becoming a competitive advantage.

Likely impacts:

- **Faster project throughput** (if adopted) could reshape interregional transmission, gas-electric reliability projects, and major upgrades.
- **Tradeoffs:** faster approvals may raise litigation/community risk and require stronger stakeholder plans (water impacts often become a focal point).

Reference: DOE release on NPC recommendations. [The Department of Energy's Energy.gov](https://www.energy.gov/energy-infrastructure/npc-recommendations)

3) RAND releases Report on Expanding the U.S. Grid, both Opportunities and Risks/barriers

What happened: On Dec. 4, RAND reported the U.S. DOE's aim to quickly scale power grid infrastructure and support growing electric loads to sustain U.S. AI leadership (this follows on RAND's May 2025 broader "Rethinking Social and Economic Policy in the Age of General-Purpose Artificial Intelligence"ⁱⁱⁱ). As construction is constrained by permitting, regulatory and supply chain challenges, the DOE has requested information from industry leaders to identify projects to enable load growth, to meet high-priority geographic areas that need DOE investment, and critical infrastructure constraints. RAND's Expert Insights suggest capacity and data center sites, and list 66 barriers^{iv} to showcase key issues constraining substantial increases in electric load^v. These barriers are grouped in 9 categories (future articles will do deep-dives on several of these categories):

- a) Inefficient federal agency coordination, protracted Environmental Impact Statement procedures, and technology-specific regulatory obstacles, such as the absence of federal regulatory regimes for interstate hydrogen pipelines;
- b) Cost allocation challenges for high-voltage transmission, misaligned incentives that reward capital expenditures over improving operational efficiency, and technology-specific constraints for nuclear, geothermal, hydrogen, and storage projects;
- c) Long construction timelines and delays due to insufficient interregional interconnection capacity and complementary infrastructure limitations for natural gas and renewables deployment (e.g., hydrogen and geothermal);
- d) Supply chain constraints due to a limited capacity to manufacture such critical components as transformers, cables, switchgear, and specialized nuclear equipment;

- e) Acute workforce shortages spanning the electrical construction trades, technical supervisors for infrastructure project execution, and nuclear-specific expertise;
- f) Severely congested interconnection queues with multiyear delays due to serial first-come-first-served processes, inadequate financial readiness requirements, manual application reviews, and inconsistent state-level procedures;
- g) Regulatory uncertainty stemming from misaligned federal and state planning requirements;
- h) Obstacles to integrating new technologies, such as circular dependencies between independent system operators and transmission owners, limited data management capabilities, and inconsistent line rating methodologies; and
- i) Community opposition that affects both fossil fuel and renewable energy projects.

Why it matters: Boards are getting challenged on whether their load forecasts and capital plans are robust under AI + reshoring + electrification. RAND is explicitly framing this as a planning failure mode.

Likely impacts:

- **Electric:** higher probability of “surprise” constraint costs (interconnection upgrades, accelerated reconductoring, transformer shortages).
- **Water:** data-center clustering can stress municipal water systems; water availability becomes a siting/permit constraint.

4) Sandia Labs announces its role in the U.S.’ Genesis Mission

What happened: On Dec. 4, the U.S. DOE’s multi-mission Sandia National Laboratories announced^{vi} its role in supporting the Nov. 24 Executive Order (EO) launched Genesis Mission^{vii}. The Genesis Mission, led by the DOE, seeks to transform U.S. science and innovation through AI, strengthen the U.S.’ technology leadership and global competitiveness. It builds on the prior Removing Barriers to American Leadership in AI EO^{viii}, and the America’s AI Action Plan^{ix}. The Genesis Mission mobilizes Sandia and the DOE’s other 16 national laboratories, industry and academia to build an integrated discovery platform to connect the world’s supercomputers, AI systems and next-gen quantum systems with advanced scientific instruments, focusing on three national challenges: American energy dominance, advancing discovery science and ensuring national security.

Why it matters: Signals where federal R&D and procurement are moving for AI-enabled monitoring, anomaly detection, and resilience engineering, tools that will migrate into utility operations and water systems.

Likely impacts:

- **OT operations:** faster adoption of AI for grid monitoring and predictive maintenance; governance and model-risk management become essential.
- **Cyber:** AI can help defense, but also increases attack surface (model supply chain, data poisoning, identity/credential risks).

5) Vietnam curbs Rare Earth Export

What happened: On Dec. 11, Vietnam’s parliament “approved amendments to its geology and minerals law that tighten state control over the country’s rare earth resources, reaffirm a ban on ore exports, and introduce new limits) to restrict shipments of refined materials (in order to build domestic processing)^x – the reforms take effect in January 2026.

Why it matters: As Vietnam ranks 6th in the world’s rare earth reserve sources with 4% of the estimated total (after China 49%, Brazil 23%, India 8%, and Russia 4% - the U.S. holds 2%), the move will have limited immediate impact, but the “China+1”^{xi} rare earth narrative is colliding with reality: countries with deposits are prioritizing domestic value-add and tighter controls.

Likely impacts: higher volatility/lead times for magnet materials → affects wind, EV supply chain, power electronics, and spares strategy.

6) China announces work on Streamlined Rare Earth Export Licenses

What happened: On Dec. 4, China indicated that it was working on streamlining rare earth export licenses^{xii}.

Why it matters: Even *partial easing* underscores that mineral supply is now a negotiating instrument in trade policy, and specific companies report access to Chinese rare earth magnets, steel and other production.

Likely impacts: procurement whiplash—temporary relief followed by renewed restrictions; boards should assume policy-driven supply shocks remain a base case.

7) Canada Fast-tracked Merger of Anglo American and Teck Resources (Critical Minerals)

What happened: On Dec. 16, Canada (Industry Minister Mélanie Joly) approved the merger of Canada’s natural resources firm Teck Resources Ltd and the U.K.’s Anglo American PLC, a ‘merger of equals’ approved by shareholders to create a \$70 billion copper mining company^{xiii}.

Why it matters: Signals faster deal velocity and potentially accelerated mine development in North America, demonstrating the demand for critical infrastructure, need to establish global influence, and importance of near-shored supply of these materials used in electrification and grid equipment.

Likely impacts: Potential fast-tracking of other mega-deals, and possible enhancement in U.S. procurement of key energy and utility infrastructure components.

8) Post-quantum network milestone (Switzerland data centers) (Dec 16)

What happened: On Dec. 16, IonQ and Cisco announced the completion of a cybersecurity upgrade to make two Switzerland-based data centers quantum-resistant. The collaboration deployed Cisco’s Secure Key Integration Protocol (SKIP) and IonQ subsidiary ID Quantique’s Solteris Network Appliance Solution.^{xiv}

Why it matters: Quantum computing (QC) threatens data encryption algorithms such as Rivest–Shamir–Adleman (RSA) and Elliptic-Curve Cryptography (ECC). While few QC attacks are currently occurring, data intercepted today could be “harvested” now, stored, and decrypted later (HNDL), making the migration to “post-quantum” infrastructures critical and urgent. If quantum-resistant networking is deploying commercially

between data centers, utility OT/IT programs may face earlier stakeholder expectations (and vendor marketing pressure).

Likely impacts: While quantum technologies are delivering real-world benefits in many industries, progress in quantum cybersecurity has been slow. Boards must build QC conversancy and encourage management to progressively apply post-quantum infrastructure.

ⁱ <https://www.energy.gov/cmm/critical-minerals-and-materials-program>, and

ⁱⁱ https://www.energy.gov/sites/default/files/2025-12/NPC_gas-electric_report_2025-12-3.pdf and <https://www.energy.gov/articles/energy-department-releases-national-petroleum-council-recommendations-accelerate>

ⁱⁱⁱ https://www.rand.org/content/dam/rand/pubs/research_reports/RRA3800/RRA3888-2/RAND_RRA3888-2.pdf?utm_source=chatgpt.com

^{iv} https://www.rand.org/content/dam/rand/pubs/research_reports/RRA3800/RRA3845-2/RAND_RRA3845-2.pdf - see pages 68-75 for 66 barriers, components and source of limitation, and RAND research citations.

^v <https://www.rand.org/pubs/perspectives/PEA4501-1.html> - RAND identifies the following major constraints across generation, transmission and distribution networks: i) inefficient federal agency coordination, protracted Environmental Impact Statement procedures, and technology-specific regulatory obstacles, such as the absence of federal regulatory regimes for interstate hydrogen pipelines; ii) cost allocation challenges for high-voltage transmission, misaligned incentives that reward capital expenditures over improving operational efficiency, and technology-specific constraints for nuclear, geothermal, hydrogen, and storage projects; iii) long construction timelines and delays due to insufficient interregional interconnection capacity and complementary infrastructure limitations for natural gas and renewables deployment (e.g., hydrogen and geothermal); iv) supply chain constraints due to a limited capacity to manufacture such critical components as transformers, cables, switchgear, and specialized nuclear equipment; v) acute workforce shortages spanning the electrical construction trades, technical supervisors for infrastructure project execution, and nuclear-specific expertise; vi) severely congested interconnection queues with multiyear delays due to serial first-come-first-served processes, inadequate financial readiness requirements, manual application reviews, and inconsistent state-level procedures; vii) regulatory uncertainty stemming from misaligned federal and state planning requirements; viii) obstacles to integrating new technologies, such as circular dependencies between independent system operators and transmission owners, limited data management capabilities, and inconsistent line rating methodologies; and ix) community opposition that affects both fossil fuel and renewable energy projects.

^{vi} https://www.sandia.gov/app/uploads/sites/81/2025/12/labnews_12-04-25.pdf - Sandia Labs is focused on national security, developing cutting-edge science and engineering for nuclear weapons stewardship, energy security, cybersecurity, and protecting critical infrastructure. Born from the Manhattan Project, Sandia provides the non-nuclear components (like the "brains," electronics, and safety systems) for nuclear weapons, ensuring they remain safe, secure, and reliable without physical testing, while also researching advanced energy, biosciences, and national defense technologies, with major sites in New Mexico and California (source, Google AI)

^{vii} <https://www.whitehouse.gov/presidential-actions/2025/11/launching-the-genesis-mission/>

^{viii} <https://www.whitehouse.gov/presidential-actions/2025/01/removing-barriers-to-american-leadership-in-artificial-intelligence/>

^{ix} <https://www.whitehouse.gov/presidential-actions/2025/01/removing-barriers-to-american-leadership-in-artificial-intelligence/>

^x <https://www.digitimes.com/news/a20251212VL202/exports-shipments-ban.html>

^{xi} The “China +1 Strategy” is a risk management approach initiated during the pandemic, where companies diversify their manufacturing and supply chains by adding at least one other country (like Vietnam, India, Mexico) alongside China to reduce over-reliance, mitigate geopolitical/economic risks, and leverage new growth areas, driven by rising costs in China, trade tensions, and COVID-19 disruptions, evolving from a cautious option to a strategic necessity for supply chain resilience.

^{xii} <https://kwsn.com/2025/12/04/china-says-working-on-streamlining-rare-earth-export-licenses/>

^{xiii} <https://www.cbc.ca/news/canada/british-columbia/teck-anglo-american-merger-9.7017343>

^{xiv} <https://www.idquantique.com/integrating-solutions-idq-ionq-cisco/>