



ENERGY IN MOTION

Unlocking the
Interconnected Grid
of Tomorrow

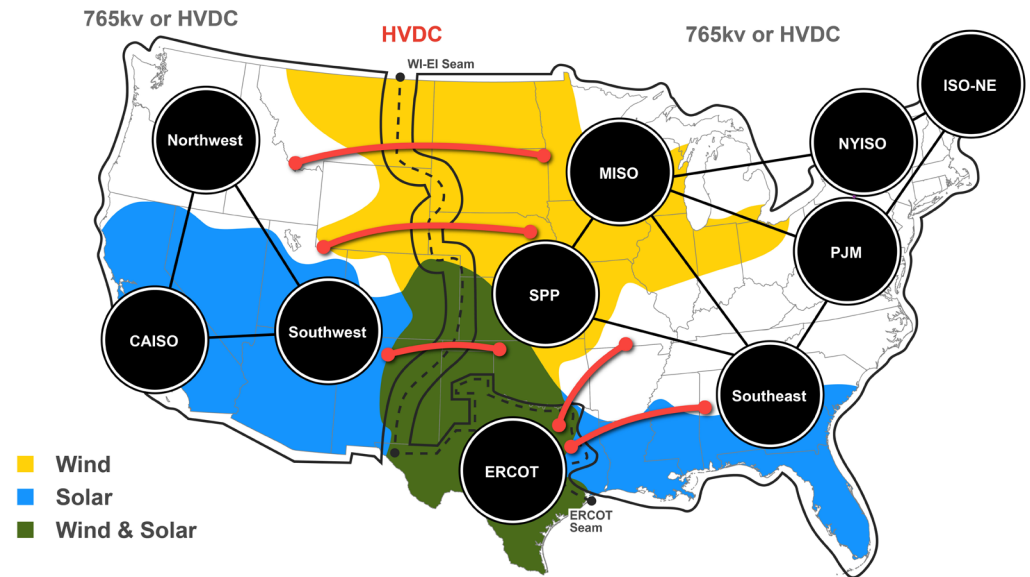


INTRODUCTION

We count on the grid to be reliable and secure. Historically, it has delivered on that promise from design through operation. However, as coal-fired generation retires, renewables are integrated, infrastructure ages and large loads grow exponentially, our grid is approaching a pivotal moment in its evolution.

Electric transmission in the U.S. is structured by region (Figure 1). This system has worked reasonably well with incremental regional expansions, yet there is an opportunity to enhance service by creating strong ties between regions. While the vision of a U.S. Interregional Transmission Overlay (ITO) has long felt aspirational, it could provide U.S. consumers access to reliable, affordable power when and where they need it. Operators and customers would also gain financial and reliability benefits from improved interconnectivity between the regions. It's time to consider an actionable plan.

FIGURE 1
U.S. Regions



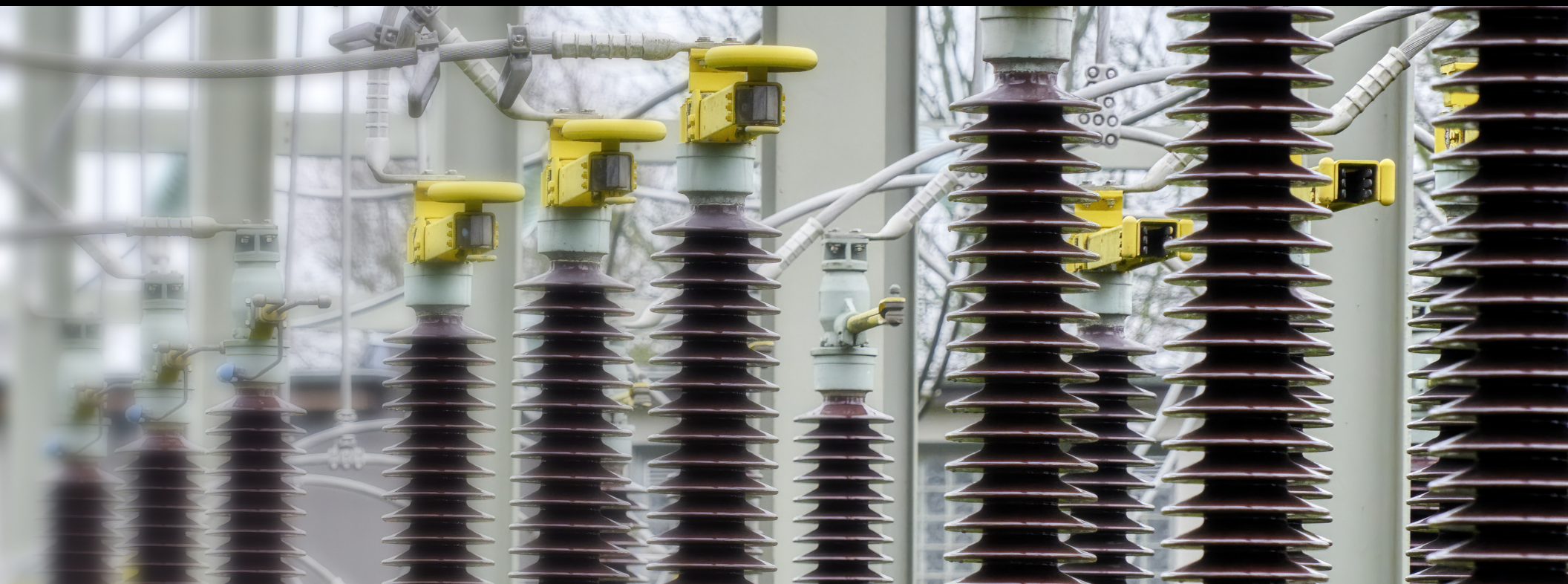
Strong interregional ties create supply flexibility, delivering low-cost energy across landscapes to the places and moments where it's needed most. It could help deliver power to areas that may be impacted by extreme weather or other unfavorable conditions.

If we're unable to bridge the gaps between regions, the potential consequences are clear: rising congestion costs, record capacity prices, curtailment of renewables and costly interconnection delays.

While multiple factors have contributed to these challenges, the rapid growth of large loads presents an opportunity to rethink transmission systems and increase collaboration to support the country's expanding energy needs.

To navigate this moment, the power sector must think bigger. Recent federal reforms, notably the Federal Energy Regulatory Commission's (FERC) Order No. 1920, have laid essential groundwork for long-distance, high-capacity transmission planning. Combined with advancements in high-voltage direct current (HVDC) and 765 kV AC lines technologies, an ITO is a tangible, investable proposition. Large loads may be the final catalyst that makes it a reality.

This playbook examines how an ITO could address today's transmission challenges, what it might entail, the obstacles stakeholders must overcome and what utilities and developers can do now to prepare.





WHY AN INTERREGIONAL TRANSMISSION OVERLAY?

An ITO is akin to the interstate highway system. Just as highways efficiently move people and goods across the country, an overlay would enable the movement of electricity across regions at scale, connecting power generation resources to customer demand.

Today, most regional grids balance supply and demand internally, with limited ability to share resources across the East/West/ERCOT seams. This isolation creates reliability risks during peak demand or extreme weather.

“Without sufficient transfer capacity between regions, the grid lacks the energy security and resilience it needs,” said Sara Mochrie, Senior Vice President, Business Development and Growth, Power and Energy for WSP in the U.S., a global engineering and professional services firm.

An ITO would change this dynamic by overlaying a high-capacity transmission system on the existing grid and further enabling new generation interconnections. It would also improve resilience, help the grid support skyrocketing demand and relieve congestion in the lower-level (or existing) transmission.

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Managing new grid pressures

Much of today's grid is well past its intended 50-year lifespan. These assets were never designed to handle the scale, speed or geographic distribution of modern electricity demand.

Our increasingly digital world exemplifies the challenge. Generative AI workloads require up to 10 times more computational power than traditional applications. Analysts project U.S. data center demand will grow 160% by 2030,¹ more than doubling its current consumption.

To put this in perspective, a single AI-enabled data center can draw as much power as a mid-sized city like Salt Lake City, UT. A 1 GW data center uses equivalent electricity to the average annual consumption of about 700,000 homes, or a city of around 1.8 million people.

Forecasts also indicate that industrial demand will climb sharply through 2030, with the reshoring of manufacturing and electrification driving up industrial electricity demand 9%² by the end of the decade. In comparison, total U.S. electricity demand grew at an average annual rate of just 0.1%³ between 2008 and 2021.

A high-capacity, interconnected transmission system could help relieve these pressures on the grid.

10X

More computational power is required for generative AI workloads, compared to traditional applications.¹

160%

U.S. data center demand growth is projected by 2030, more than doubling its current consumption.¹

Integration of modern generation resources

The U.S. Department of Energy (DOE) forecasts that 209 GW⁴ of new generation will be added to the grid by 2030, including 20 GW of natural gas, 31 GW of battery storage, 124 GW of solar and 32 GW of wind. Wind and solar generation facilities, which represent the majority of the generation likely to be added to the grid, are located where the resource is, which may not coincide with the location of growing demand. An ITO would enable the integration and coordination of these diverse generation sources, enhancing overall grid flexibility.

Linking renewable energy-rich regions with major demand centers allows solar, wind and other low-carbon energy sources to flow where needed. For example, solar energy from Arizona could help meet winter demand in the Dakotas, and wind energy from the Midwest could help stabilize peak demand on the coasts and ensure generation adequacy.

Unlocking cost savings

The economics of an ITO are compelling. The National Renewable Energy Laboratory's (NREL) National Transmission Planning Study estimated that transmission expansion could lower electric system costs by \$270 billion to \$490 billion⁵ through 2050.

Savings would come from reduced congestion, more efficient use of low-cost energy, delayed or deferred generation buildouts and less reliance on expensive peaker plants. These efficiencies make a strong economic case for investment.

209 GW

Of new generation will be added to the grid by 2030.⁴

\$270B

Decrease in electric system costs through 2050 is possible due to transmission expansion.⁵



“Balancing efficiency, flexibility and cost will require a nimble, multi-dimensional approach.”

Sara Mochrie, Senior Vice President,
Business Development and Growth,
Power and Energy for WSP in the U.S.

ENVISIONING THE ITO

An ITO would likely use high-capacity lines such as High Voltage Direct Current (HVDC) and 765 kV Extra High Voltage Alternating Current (EHVAC).

- HVDC is best suited for controllable long-distance transfers with lower line loss, making it ideal for bridging asynchronous grids across seams. However, upfront costs are high, and there are limited opportunities to add taps.
- 765 kV EHVAC supports multiple interconnection points and cost-effective distribution across regions, though it is less efficient and controllable over very long distances.

In practice, an ITO may include a mix of high-capacity line types: mid-length EHVAC and short or long (300–400 mile) HVDC lines to cross regional seams and tie the backbone together. “Balancing efficiency, flexibility and cost will require a nimble, multi-dimensional approach,” Mochrie said.

Microgrids and distributed generation

Microgrids, distributed generation and virtual power plants could be integrated with the overlay, further enhancing flexibility, according to Dan Sullivan, Senior Director of Energy Advisory Services for WSP in the U.S. “The ITO allows distributed resources to contribute reliably to system operations,” he said.

The role of large loads

The ITO system can enable improved grid stability as large, rapidly changing loads, such as data centers and industrial facilities, continue to expand. These facilities can ramp power use up or down by thousands of megawatts in seconds, posing significant challenges to grid stability and operations. With proper coordination, however, these loads can offer flexibility and deliverability, helping smooth sudden supply-demand swings. “If the large load owners provide appropriate permissions, the serving utility could even signal them to temporarily reduce demand, further enhancing system flexibility,” Sullivan said.



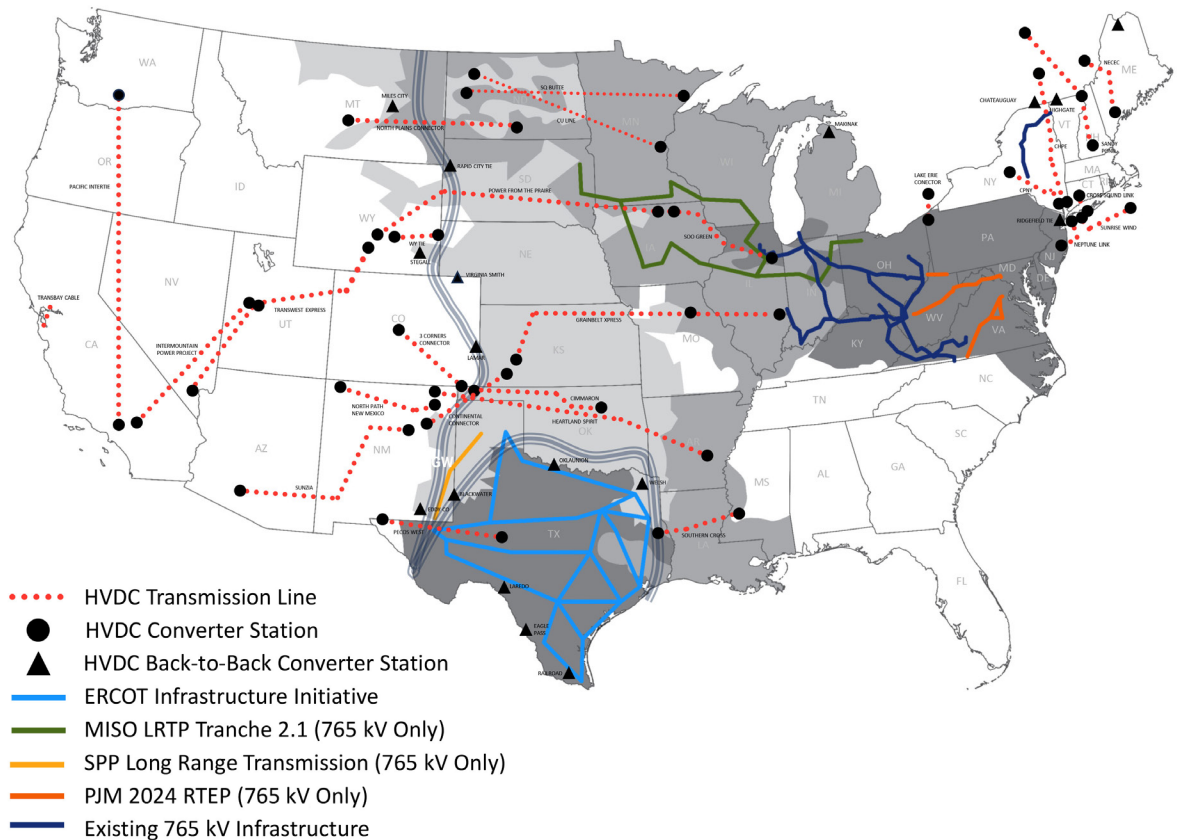
Potential corridors and early building blocks

ITO siting will depend on terrain, political conditions and regional resource mix. Infrastructure could follow highways, railways or other established rights-of-way.

Elements of this overlay are already emerging, albeit unintentionally. For example, the Champlain Hudson Power Express Transmission Line, a \$6 billion, 339-mile HVDC line, will deliver 1,250 MW of Canadian hydropower to New York City, resulting in a \$17.3 billion reduction in wholesale costs over 30 years.

While the map to the right (Figure 2) illustrates HVDC projects that are either planned or in progress based on market drivers, looking at them holistically illustrates that much of the infrastructure required for an ITO is already in development, paving the way for an industry-wide conversation to address the gaps.

FIGURE 2
HVDC and 765 kV Projects, Planned or In Progress





OVERCOMING INTERREGIONAL TRANSMISSION CHALLENGES

Several challenges must be overcome before the ITO can become a reality.

CHALLENGE ONE

Planning and Operation

Because an ITO would cross multiple state lines, federal coordination will be critical. Without it, states could stall projects or oppose lines that don't provide immediate local benefits. "Unfortunately, there is currently no entity assigned to develop a master plan," Sullivan said. "We need a playbook that breaks down the regional planning silos and shows how existing high-capacity projects can fit together to improve overall grid efficiency."

The existing planning and operational practices would need to consider interregional flows and advanced technologies like HVDC for grid operators to better navigate extreme weather or unforeseen emergency conditions (e.g., wildfires). Lack of a coordinated approach reduces efficiency and market certainty. "Without standardization of processes, improvements in supply chain and ability to import/export, bulk power costs stay high and progress slows," Mochrie said.

The U.S. gas pipeline network, shaped by federal mandates, could offer one model framework for guiding large-scale projects at a national level.

CHALLENGE TWO

Investment Barriers

While demand is growing, economic certainty lags. “Right now, there’s no economic incentive for an ITO,” Mochrie said, citing unresolved questions about transfer pricing across regions and ratepayer costs. “Utilities or developers have to create their own financial models to make high-capacity projects viable and achieve returns,” she explained. While cost allocation will always be a challenge, interregional capacity could outweigh these concerns with benefits such as time-of-day peak transfers, delivery of the lowest cost power and improved extreme event recovery. Interregional capabilities may prove to be more than a shared cost.

Election cycles and subsequent policy changes further compound economic uncertainty by making it difficult to propose, design, fund and construct multi-year transmission projects before the landscape shifts again. A fluid political climate may

also present challenges that require complex negotiations. The Grain Belt Express, an 800-mile proposed HVDC transmission line linking four U.S. grid regions,⁶ illustrates these stakes. Despite receiving a conditional federal loan guarantee of up to \$4.9 billion⁷ in 2024, the U.S. Department of Energy terminated its commitment in July 2025, leaving the developer to pursue private financing options.⁸

Permitting will also prove to be a significant bottleneck. “When a project spans multiple states, the most challenging jurisdiction drives the level of risk,” Mochrie said. Securing rights-of-way with diverse stakeholders, including homeowners, municipalities and industrial landowners, often takes longer than the construction itself. “Routing and permitting delays cascade into engineering, supply chain and financing challenges,” said Buck Fife, Senior Director, Power Delivery for WSP in the U.S.

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Sara Mochrie, Senior Vice President, Business Development and Growth, Power and Energy for WSP in the U.S.



CHALLENGE THREE

Markets

An interregional transmission overlay could significantly shift market dynamics. “Congestion pricing is a business model for many developers,” Mochrie explained. “The overlay would relieve congestion, reducing those opportunities and reshaping revenue models.”

Furthermore, the variation of market protocols across regions may require consensus-building that considers the impacts of pricing and cost allocations. Day-ahead and real-time market pricing, along with capacity and ancillary services, will require seamless market coordination, unified congestion management, harmonized schedules, enhanced transparent schedules, standardized resource metrics and regulatory alignment.





CHALLENGE FOUR

Limitations

High-capacity interregional transmission and its endpoint stations would quickly shift the market from using traditional equipment services to requiring large and complex endpoints with specialized materials. This would include updated substations, breakers, transformers and converters, and would be challenged by limitations with overseas suppliers that may not be able to scale as quickly as needed.

“For decades, electricity demand was relatively flat. Now, we’re asking the market to deliver a massive quantity of specialized equipment all at once,” Sullivan said. “The supply chain is not broken, but it’s showing its limitations.”

To promote the timely availability of components when needed, supply chain decisions, including when to secure equipment, how much to order, and how to manage fluctuating costs of supplies, must often be made before project approvals are secured. This adds financial and operational risks for developers and utilities.

“These are big-ticket items, and demand spikes can raise uncertainty and costs significantly,” Fife said. “The cost of that risk ultimately flows to ratepayers.”

CHALLENGE FIVE

Uncertainty

Lastly, there are a host of uncertainties that may need to be addressed. These include the most fundamental concepts of relying on external power for system reliability and the resistance that comes from states' real and perceived concerns about federal overreach.

Incumbent utilities may resist changes that reduce their control, revenue or ability to predict future generation mixes and load profiles.

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BUILDING THE ITO ROADMAP

Moving from vision to a tangible ITO requires a new level of holistic strategy and consensual collaboration. Historically, IOUs built transmission for reliability or economic needs and to accommodate interconnecting customers, whereas developers generally looked to leverage market economics and integrate renewables. The latter is especially true for the use of HVDC transmission.

While this broad roadmap provides general direction, the path to implementation will require careful navigation and collaboration. However, public support for grid expansion is strong, as highlighted in the [“2025 WSP Pulse Report on Energy.”](#) Proactive planning can help utilities anticipate challenges related to permitting, supply chain and engineering standards. That way, when larger-scale, multi-state projects emerge, they can be executed efficiently and effectively.

Early ideas for implementing an ITO could lay the groundwork for future development.

Actionable steps for utilities and developers

- **Identify strategic ITO corridors:** Conduct economic, reliability, environmental and geospatial studies to highlight routes with high interregional value, low permitting risk and alignment with projected demand growth and renewable integration. Coordinate findings through regional planning organizations and the DOE’s National Transmission Planning initiative to ensure alignment with national studies and FERC Order 1920 compliance.

- **Develop oversight entity:** Form a multi-stakeholder committee and working groups including utilities, developers, Regional Transmission Organizations/Independent System Operators and federal/state agencies to set planning standards and coordinate technical and operational frameworks. Create a shared project database and data exchange protocol to avoid duplication of studies and promote open access to economic and technical modeling data.
- **Secure state and federal support:** Engage policymakers and communities early to demonstrate economic, reliability and resilience benefits. Leverage FERC Order 1920, DOE programs and augmented reality/3D visualization tools to accelerate permitting and public buy-in.
- **Coordinate regional and interregional studies:** Align long-range planning assumptions across neighboring regions,

validate economic and reliability models and incorporate lessons from existing high-capacity projects to ensure seamless integration. Develop shared planning templates and cost-benefit methodologies that allow for direct comparison across regions.

- **Determine cost allocation and benefits:** Collaborate with regulators and stakeholders to develop equitable cost-sharing approaches, quantify multi-regional economic and resilience benefits and explore innovative financing to reduce risk and attract investment.

Once these initial steps are complete — no small effort — utilities, developers and oversight entities can work together to initiate operational protocols, design, engineering and construction planning.



TAKE THE NEXT STEP

The North American transmission system faces unprecedented challenges: aging infrastructure, rising demand and the need to integrate diverse energy resources. An ITO provides a pathway to address these challenges by creating a resilient, efficient and cost-effective grid that links regions and enables energy flows across long distances.

Utilities, developers and policymakers can start now by engaging stakeholders, preparing their teams, leveraging regulatory momentum and using current interregional projects as building blocks. Acting today is a critical step toward building a grid for tomorrow that is reliable, affordable and sustainable.



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