

WRP Energy Webinar by the U.S. DOE's Grid Deployment Office (GDO) on the National Transmission Planning Study

January 14, 2025

Webinar Recording: [link](#)

Resources:

- [National Transmission Planning Study | Department of Energy](#)
- October 16, 2024 DOE NTP Study [Webinar](#)

Summary

The U.S. Department of Energy's (DOE) National Transmission Planning Study (NTP Study)¹ was presented by Mr. H. Patrick Harwood, Senior Technical Advisor, Transmission Division, Grid Deployment Office, U.S. Department of Energy. The NTP Study is a comprehensive assessment of the future needs for transmission infrastructure in the United States. Led by DOE's Grid Deployment Office in partnership with the National Renewable Energy Laboratory (NREL) and Pacific Northwest National Laboratory (PNNL), the study serves as a tool to address grid challenges, inform planning processes and encourage interregional planning. There was also broad stakeholder engagement.

Study Background and Purpose

Mr. Harwood noted his colleagues Erik-Logan Huges, Senior Project Manager, and others on the call with him. DOE has around \$20 billion in funding from the Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA) to oversee giving out different types of loan and grants associated with ensuring the resiliency and adequacy of the electric grid. The NTP Study, initiated in March 2022, and published on October 3, 2024, arose from the rising demand of diverse energy resources, the need for a resilient and efficient electric grid in the face of increased energy demand, diverse energy resource development, and policy shifts toward decarbonization. The Nation needs significant investments in new interregional capacity to meet growing demand, reduce costs, access energy supplies, and bolster resilience to extreme weather. Historically, U.S. transmission investment has been fragmented, with utilities focusing on regional needs rather than interregional planning. The existing planning analysis tools may not capture the reliability and consumer value of larger grid-scale interregional connections or answer questions about the operational reliability of larger systems. The study aimed to bridge this gap by offering a broader perspective, improve analysis tools, and identify opportunities for interregional transmission that can enhance grid reliability.

Study Methods and Scenarios

The extensive scope of the study incorporated 96 core scenarios and sensitivities that were analyzed for a low-cost, reliable transmission system of the future. These scenarios account

¹ <https://www.energy.gov/gdo/national-transmission-planning-study>

for factors like emissions targets (ranging from no national constraints to 100% carbon reduction by 2035), demand growth (low, medium, and high electrification scenarios), and technological variables such as the availability of new generation methods. The study explored four transmission build-out frameworks:

1. **Limited Build-out:** Limits transmission expansion to within planning regions and limits total yearly transmission expansions.
2. **Alternating Current (A/C) Build-out:** Regional expansion allowed within interconnections only, no new DC connections.
3. **Point-to-Point (P2P) DC:** Builds upon A/C with expansion across the country including long-distance point-to-point HVDC options.
4. **Multi-Terminal (MT) DC:** An innovative framework with DC lines having multiple connection points, not currently utilized in the U.S.

The study used capacity expansion modeling and resource adequacy analysis to evaluate these frameworks, linking high-level zonal models with more granular nodal models. This approach allows the study to balance the optimization of transmission with real-world utility planning needs.

Key Findings

The three primary outcomes from the study include:

1. **Grid Reliability:** The study highlights the critical role of interregional transmission in maintaining resource adequacy and reliability, particularly during extreme weather events. By enabling energy sharing across regions, expanded transmission capacity ensures consistent power delivery even during demand surges or generation deficits.
2. **Consumer Savings:** The NTP Study finds a favorable benefit-to-cost ratio of \$1.60 to \$1.80, meaning each dollar invested in transmission yields significant savings. This is primarily due to reduced overbuilding of renewable generation and storage resources and improved efficiency in power distribution.
3. **Integrating New Generation on the Grid:** Transmission expansion supports the integration of new renewable and conventional energy sources. By addressing grid congestion and connecting remote renewable resources to load centers, the study identifies high-opportunity transmission interfaces, particularly in central and western U.S. regions.

Utility of Study

The NTP Study does not dictate specific projects or siting decisions. It is a high-level economic and technical analysis that leaves detailed planning, environmental assessments, and right-of-way negotiations to subsequent processes. There are procedural and policy barriers, such as the fragmented nature of regional planning and the lack of established mechanisms for interregional collaboration. There is a need for utilities and state regulators to adopt innovative approaches to resource and transmission planning.

The Study included nationwide capacity expansion modeling, zonal to nodal model disaggregation (detailed system modeling to analyze system costs and operations) and a Chronological AC Power Automated Generation (C-PAGE) tool that samples many times time frames to analyze sequential snapshots of the most stressed hours of a year. Additionally extreme event and climate change impacts were considered on the load. Additional capacity expansion modeling could assist to inform resource assumptions in planing processes from a multi-regional basis.

Stakeholder Collaboration

The study is a product of extensive engagement with stakeholders, including utilities, state regulators, and technical experts. The DOE and national labs worked closely with industry partners to refine methodologies and gather input, ensuring the study's relevance and applicability. DOE has a commitment to fostering partnerships and providing technical support to states and utilities as they implement study findings.

Policy Implications and Future Directions

The NTP Study is aligned with current federal goals, such as the Biden administration's decarbonization targets. While changes in administration may influence specific policies, many findings are policy-neutral and offer universal benefits. The study's tools and insights are expected to support ongoing efforts like the Transmission Facilitation Program and the designation of National Interest Electric Transmission Corridors (NIETCs). There is a possibility of a follow-up "NTP Study 2.0" to build on these efforts, though no definite plans exist.

NERC Interregional Transfer Capability Study was a mandate by Congress to NERC to identify what the current existing transfer capability is between regions, and a minimum level of prudent additions and recommendations.

Conclusion

Mr. Harwood reiterated the urgency of expanding transmission infrastructure to meet future demand and policy goals. The NTP Study is a critical step in understanding national transmission needs and fostering collaboration among stakeholders. The study offers a roadmap for enhancing grid reliability, economic efficiency, and renewable integration, providing a foundation for addressing the challenges of a rapidly evolving energy system.

Questions & Answers

- Mr. Harwood explained that A/C means the Alternating Current framework for transmission build out and MT means multi-terminal. Earlier in the presentation, there were four different transmission frameworks that were tested: Limited, A/C, Point-to-Point, and MT. Basically, those frameworks are types of transmission they allow the model to build. A/C allows the model to build only A/C transmissions between regions, MT allows the model to build any type of transmission, including multi-terminal HVDC.

- Mr. Jim Bartridge expressed many thanks for the great overview and making sense of the NTP and other studies.
- Ms. Duffy asked Mr. Harwood what one thing stood out to him that he did not know before. He replied they are behind and need to prepare for the future by building more transmission. They need to double their transmission investment; otherwise the grid is inadequate to serve the future demand growth. They may also need to look for creative and innovative solutions to provide benefits on the resource side, especially with data centers' greater electrification coming into play. It is an exciting time to be working in this industry. Ms. Duffy asked why he thought this gap existed.
- He replied that in general, the power industry has done things the way they have always been done, like with traditional resource planning. There are certain incentives to build the utility based on a guaranteed rate of return and what can be improved in rate cases. There is a certain comfort, safety and assurance with continuing with the existing mechanisms. The creative and innovative thinking to get the most out of new transmission, new generation and invention capabilities does not fit the typical established rate cases process. They are institutionally stuck in the same modes of thinking. The more innovative and cutting edge they can be would be the best going forward.
- Mr. Bartridge asked in the Chat Box if there are any discussions of future valuations in transmission corridors and land uses or is that more for land use agencies like BLM 368 Corridors.
- Mr. Harwood explained the exact corridors and land uses are largely outside the scope of the NTP Study at this point. They have not identified where to site the lines yet. This would be a discussion for another agency or later down the line.
- Ms. Duffy followed up by asking whether the study addressed differing opinions on the location of transmission lines as well as resource conflicts discussions.
- Mr. Harwood explained the study did not look at specific locations; instead, it is an economic study where the models are trying to minimize the total electric system cost. The model has general cost assumptions of where a transmission line might cost less in a particular area for different geographic and other considerations.
- Ms. Duffy asked whether there is one section of the report that the states should read first. Mr. Harwood suggested starting with the Executive Summary, then the conclusion and finally the recommendations section.
- Ms. Duffy asked about fragmented inter-regional solutions and any recommendations to move forward in this area.
- Mr. Harwood stated they are currently working on a report to address and tease out the planning and development issues. Hopefully, in the next couple of weeks, there should be a lab-branded report coming out. He explained that basically the lack of inter-regional planning is not a technical challenge, but more of a procedural and policy challenge because so much of the system is founded upon building within a single utility area. It is difficult for utilities to look at resource plans beyond their footprint, plan for resources in outside areas and still meet the mandate of their state cost recovery and

rate making cases at the same time. They need to think about solutions where they can collaboratively work together, work outside of the realm of current policy, and do one-off studies to look at the transmission needs that will provide the most benefit.

- Ms. Duffy asked about future changes in policy with the new administration.
- Mr. Harwood stated he did not want to speculate on any future changes. The NTP Study has been rooted in some clean energy goals and departmentization goals that were in the Biden administration. He hopes this study will not be thrown out with the new administration. Hopefully, the findings will be used for the future benefit of all.
- Ms. Duffy asked about the timeline for another NTP Study in the future.
- Mr. Harwood explained there is typically a new study every few years but remarked he would not expect one until at least 2026.