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Lessons Along the Road to Transmission Deployment

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About the Great Plains Institute

A nonpartisan, nonprofit organization, the Great Plains Institute (GPI) accelerates the transition to net-zero carbon emissions for the benefit of people, the economy, and the environment. Working across the US, we combine a unique consensus-building approach, expert knowledge, research and analysis, and local action to find and implement lasting solutions. Our work strengthens communities and provides greater economic opportunity through the creation of higher-paying jobs, expansion of the nation's industrial base, and greater domestic energy independence while eliminating carbon emissions.

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Executive summary

To meet rising energy demand and decarbonization goals while keeping energy affordable, the United States needs to expand transmission capacity by two to five times by 2050.[1] However, social, regulatory, and supply chain barriers[2] have made it increasingly difficult to achieve these goals. Local opposition to high-voltage transmission lines (HVTLs) is one of the key barriers to rapid development. Lengthy, costly lawsuits can delay projects for years and even lead to their cancellation.[3] Additionally, organized opposition and protests have prompted some county governments and state legislatures to consider and pass laws that jeopardize the feasibility of some projects.[4] Finally, projects have faced public scrutiny from federal and state legislators, spurred on by local opposition, which has arguably led to significant delays and some projects even being denied approval.[5] Though local opposition to HVTLs has been studied since the 1950s,[6] the need to rapidly expand HVTL development and the growing efficacy of opposition movements have made understanding the origins of, and solutions to, local opposition to HVTLs of paramount importance.

To better understand community and local perceptions of transmission development and merge previously siloed research on areas relevant to transmission siting, the Great Plains Institute (GPI) embarked on a grassroots research effort.

GPI conducted semi-structured interviews with 110 local stakeholders, developers, and government officials, among others, across 11 states and 11 shovel-ready HVTL projects (shown in figure 1) to uncover significant drivers of opposition and best practices across diverse regulatory schemes, geographies, and communities to both mitigate that opposition and build overall support.

Projects were chosen due to their relative significance, geographic location, type of development, or levels of observed opposition. Figure 1 also shows how this research builds on the author's prior research in the Western United States.

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[1] Eric Larson, Chris Greig, Jesse Jenkins, Erin Mayfield, Andrew Pascale, Chuan Zhang et al., *Net-Zero America: Potential Pathways, Infrastructure, and Impacts, Final Report Summary* (Princeton University, October 29, 2021), 28–29.

[2] International Energy Agency, *Building the Future Transmission Grid* (International Energy Agency, 2025), 19–32.

[3] Olga Baranoff and Zachary Norris, *A closer look at the role of litigation and opposition in transmission undergoing federal permitting* (Niskanen Center, March 4, 2024); Matthew Eisenson, Jacob Elkin, Harmukh Singh, and Noah Schaffir, *Opposition to Renewable Energy Facilities in the United States* (Sabin Center for Climate Change Law, June 2024), 5.

[4] Wesley Muller, "Law will help wealthy Louisiana Landowner in Dispute with Power Line Builder," *Louisiana Illuminator*, May 30, 2024; Robin Allen, *Let's make a deal: high-capacity transmission edition* (Niskanen Center, June 10, 2024); Teghan Simonton, "Senate passes changes to eminent domain, but Grain Belt Express can proceed," *Columbia Missourian*, May 5, 2022; Eisenson et al., *Opposition to Renewable Energy*, 22.

[5] Russell Gold, *Superpower: One Man's Quest to Transform American Energy* (Simon & Shuster, 2019); Carson Swick, "Lawmakers oppose Maryland Piedmont Reliability Project at Fox 45 town hall," *The Baltimore Sun*, March 27, 2025; Josh Hawley, "Senator Hawley Calls on Department of Energy to Cancel Grain Belt Express $5 Billion Loan," U.S. Senator for Missouri Josh Hawley, March 25, 2025.

[6] Lita Furby, Paul Slovic, Baruch Fischhoff, and Robin Gregory, "Public Perception of Electric Power Transmission Lines," *Journal of Environmental Psychology* 8, no. 1 (1988): 21.

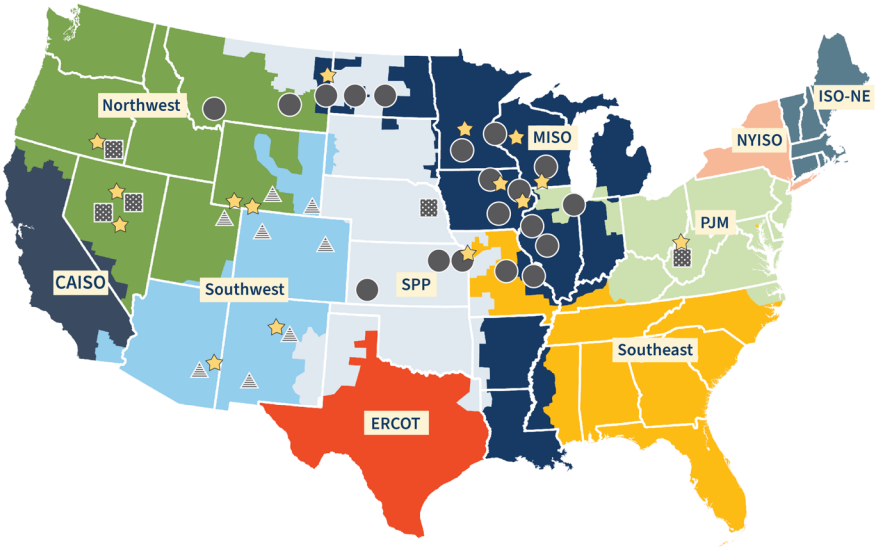


Figure 1. Geographic scope of GPI's grassroots research

- In-person interviewee
- Virtual interviewee
- Prior in-person research
- Transmission projects studied

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Aime Bita, Great Plains Institute, and Esther Ramsay, Horizon Climate Group, based on data from Joshua Rogers, Great Plains Institute, and transmission planning regions by Elizabeth Abramson, Horizon Climate Group, and Aparna Narang, Clean Grid Initiative, 2025, adapted from Federal Energy Regulatory Commission (FERC) Order 1000 Regions shapefile, December 2024.

The vast majority of these interviews were conducted in person by the author of this report, who traveled and lived along proposed transmission routes for five months. The interviews were anonymous and semi-structured to promote candor and avoid response bias. Interviewees were contacted based on their expected or observed involvement with selected projects. For example, government officials for every county hosting a transmission line studied in this report were contacted. The author also used articles, dockets, public meetings, and the recommendations of other interviewees to connect with other stakeholders. Additional research was conducted to corroborate claims made by interviewees.

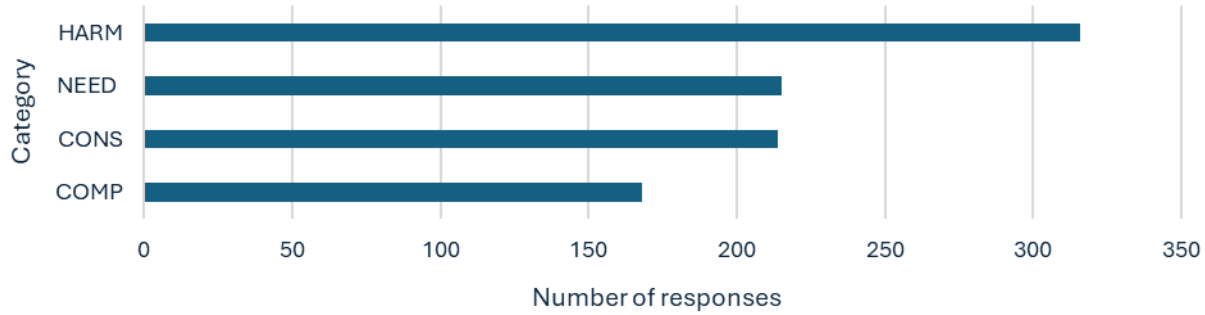
The resulting research represents what we believe to be the largest and most geographically diverse study of local opposition to HVTL development conducted to date. The following sections will address the literature surrounding opposition to HVTLs, the methodology utilized in this paper, and the high-level results of interview responses, as well as provide in-depth discussions about influential drivers of opposition and support.

The discussions will include key findings and considerations identified throughout this study for developers and policy makers. The discussions will also tell the stories of interviewees impacted by development from across the regions studied. Of the 37 distinct drivers of opposition or support identified in this study (shown in the "Interview results & opposition framework" section), 13 of the most common drivers are discussed at length throughout this report.

Table 1. Common drivers of opposition and support	
Driver category	***Primary driver***
Agricultural impacts	Opposition
Environmental impacts	Opposition
Property values	Opposition
Cultural impacts	Opposition
Electromagnetic fields	Opposition
Transmission's association with renewable energy	Both
Transmission alternatives	Both
Early and often engagement	Support
Micrositing	Support
Eminent domain	Opposition
Collective action	Support
Local tax revenues	Support
Monetary incentives	Support

The report aims to give researchers, policy makers, and developers broad categories to pull from when engaging stakeholders during high-voltage transmission development. It also discusses specific elements of those categories and relevant literature associated with them. The resulting framework, highlighted below in figure 2 and introduced in the section "Interview results & opposition framework," is a one-stop shop for transmission siting concerns that can be used by developers, policy makers, local stakeholders, and landowners alike.

Figure 2. Opposition framework: Interview responses



Developers can use this framework in future projects as a baseline, ensuring their messaging, stakeholder engagement processes, and development techniques adequately address each proposed category. Similarly, policy makers aiming to ensure developers follow equitable practices can use this framework in their efforts to address local stakeholders' concerns. Finally, landowners and other local stakeholders may use this framework to communicate the kind of engagement and policies they would like to see from developers and policy makers *and* use it as a standard for the kind of engagement they should expect during the development process.

Through this first-of-its-kind approach to researching transmission siting and permitting, GPI is offering readers a deeper understanding of how communities hosting this infrastructure engage with and often react to transmission developers. Furthermore, readers will gain a more nuanced perspective on factors that can inform and improve transmission siting practices and policy proposals across the country.

"This study aims to both understand why people dedicate their time, money, and effort to oppose necessary infrastructure and provide developers and policy makers with tools to earn trust and secure buy-in from host communities. I was driven by principles core to GPI's mission, most notably the notion that meeting people where they are, both physically and mentally, is the best way to understand perspectives contrary to your own."

– Joshua Rogers, report author and Energy Systems fellow at GPI

Literature review

Research into perceptions of HVTLs began in earnest in the 1970s, though concerns around siting and permitting HVTLs were documented as early as 1955. Early reporting attributed a shift in opposition to HVTLs to the economic health of farmers: "After years of prosperity, he is no longer in debt…and he no longer wants the power line on his property."[7] As the 1960s and '70s rolled in, the opposition of the '50s increased across the country, culminating in arguably the most famous example of HVTL opposition in 1978, centered on the CU power line running from North Dakota to Minnesota's Twin Cities. Farmers, angered by utility siting decisions to place the CU power line on private land instead of state forests, raised a pseudo-militia to delay the project. Hundreds of farmers began chasing away surveyors, shooting and uprooting transmission towers, and protesting. The governor of Minnesota was forced to call in a large law enforcement contingent of over 200 state troopers to restore order.[8] Notably, the more recent development of the CapX2020 lines in Minnesota and across the upper Midwest showed that practices can be improved and new best practices can help build local support for high-voltage transmission projects.[9]

There have been a series of attempts to explain why local stakeholders have such ardent opposition to HVTLs and why some support them. Furby's 1988 conceptual framework included nine "determining elements" of opposition:[10]

- Property alterations
- Aesthetics
- Human health and safety effects
- Environmental effects
- Economic benefits
- Equity effects
- Process characteristics
- Information and knowledge
- Symbolic meaning

[7] Claude Crawford, "Appraising damages to land from power line easements," *The Appraisal Journal* 37 (1955): 367–378, as documented by Furby et al., "Perception of Transmission," 21.

[8] Paul Wellstone and Barry Casper, *Powerline: The First Battle of America's Energy War* (University of Minnesota Press, 2003), 4.

[9] Marta C. Monti, Stephen Rose, Kimberley A. Mullins, and Elizabeth J. Wilson, *CapX2020: Building trust to build regional transmission systems* (University of Minnesota, April 2016), 40–45.

[10] Furby et al., "Perception of Transmission," 21.

Over 30 years later, the list, despite expanding, looked remarkably similar. Jackson and Pitts observed 13 elements in their 2010 literature review:[11]

- Property values
- Safety
- Visual disruption
- Land use attributed
- Risk perception
- Political ideology
- Sense of place disruption
- Sense of fairness and trust
- Siting process
- National political context
- Environmental reviews
- Lack of public participation

As transmission development and other energy infrastructure like renewable energy have become more critical and politicized, more research has been done to determine the general reasons for opposition across the country. The most notable and expansive project within the United States to build a robust framework of drivers settled on seven primary barriers to renewable energy and transmission project development:[12]

- Environmental impact
- Financial viability
- Lacking public participation
- "Failure to respect Tribal rights, including the right to consultation"
- Health and safety concerns
- Intergovernmental issues
- Property value concerns

These seven factors were gleaned from 53 cases in 28 states involving solar, wind, and geothermal projects, along with three transmission lines. Notably, a disproportionate number of projects, just shy of half, were sited in California and the Northeast. Conversely, only a handful of projects represented the Great Plains, Mountain West, Southwest, and Southeast. No projects in Montana, Wyoming, Utah, Colorado, Oklahoma, Nebraska, South Dakota, Minnesota, Idaho, Louisiana, Mississippi, Alabama, Georgia, South Carolina, and Tennessee were documented. Furthermore, the relatively small number of transmission projects studied, in conjunction with the disproportionate focus on the West Coast and Northeast, leaves a gap in the literature for transmission projects developed in the Midwest and Great Plains that faced significant opposition or have been proposed recently.

[11] Thomas Jackson and Jennifer Pitts, "*The Effects of Electric Transmission Lines on Property Values: A Literature Review*," *Journal of Real Estate Literature* 18, no. 2 (2010).

[12] Lawrence Susskind, Jungwoo Chun, Alexander Gant, Chelsea Hodgkins, Jessica Cohen, and Sarah Lohmar, "*Sources of Opposition to Renewable Energy Projects in the United States,*" *Energy Policy* 165 (2022): 3.

The most recent approach that addressed parts of those regions was done by researchers at Harvard University's Salata Institute. Dozens of interviews from stakeholders supporting and opposing one of four transmission projects in Texas, Wyoming, Oregon, Kansas, Missouri, Illinois, Indiana, and Maine revealed four primary sources of concern stakeholders had about transmission:[13]

- Recognition: "Acknowledging and respecting the rights of the people who are on the land or respect for the communities and ecosystems that currently exist."
- Process: Meaningful and continuous consultation throughout the life of the project.
- Distributional consequences: How the benefits and costs of the project are distributed among local stakeholders, states, and the country.
- Restoration: "Keeping or restoring the area to its original state to the greatest extent possible and having as minimal an impact on existing ecosystems as possible."

Unlike prior studies, these more recent studies attempt to condense a series of specific objections into a few categories of opposition. Though helpful for understanding broad reasons for opposition, or lack thereof, recent studies have not been conducted at the level of detail captured in prior work. Furthermore, despite the extensive research conducted prior to this report, opposition to HVTL development remains a consistent component of project development. As such, the following sections aim to validate prior studies' findings across diverse geographic regions and give developers and policy makers a robust framework to understand and begin to address the concerns of local stakeholders, particularly landowners and county governments.

Methodology

This report aims to rectify the gaps within the current literature by providing a robust and geographically diverse framework, introduced in the "Interview results & opposition framework" section, to analyze local opposition to HVTLs and provide in-depth discussions of specific drivers of opposition. This research builds on research conducted at Princeton University by the author of this report between June 2023 and March 2024.

The data for this report was collected between July 2024 and January 2025. Interviewees were contacted based on their expected or observed involvement with a known transmission project. For example, government officials for every county hosting a transmission line studied in this report were contacted. The author also used articles, dockets, and the recommendations of other interviewees to connect with other stakeholders. Once contacted, semi-structured, anonymous, and often in-person interviews were conducted with 110 stakeholders, the occupations of which are provided below in table 2.

[13] Lawrence Susskind, Jungwoo Chun, Alexander Gant, Chelsea Hodgkins, Jessica Cohen, and Sarah Lohmar, *How Grid Projects Get Stuck: Four Cases in Long-Distance Transmission Development in the United States* (Harvard University Salata Institute for Climate Sustainability, June 2024), 15.

Table 2. Stakeholder occupation[14]	
Academic	9
Advocate	9
Developer	15
Landowner	36
Local gov.	44
State gov.	16
Tribal gov.	1

Note that only one tribal nation stakeholder was interviewed as part of this study. Of the tribal nations located near the HVTLs in this study and contacted by the researcher (there were only two in proximity), only one responded and chose to participate. Some developers have historically selected routes that avoid tribal nations due to the legal authority they have as sovereign nations, creating both a lack of necessary interconnection capacity near tribal lands and minimal tribal nation-developer engagement for most of the lines studied. Expanding grid access to tribal nations through close collaboration should be a focus of future work for researchers, policy makers, and transmission developers.[15]

The results of this study are primarily based on the interviews and reflect the author's interpretation of the conversations. Interviewee responses were also tracked and cataloged into 37 distinct drivers of opposition and support. Though interviews were loosely structured to avoid response bias, the interviewer did ask similar questions across interviews. Project-focused interviews discussed the following:

- How stakeholders first learned about the HVTL.
- Their personal perceptions of the project.
- How, if at all, they were involved with the project or consulted by the developer.
- How their community responded to the relevant project, if at all.
- The kind of incentives offered by the developer.
- What they would have liked to have been different.

Interviews that were not focused on projects, often with academics or national advocates, focused broadly on the themes discussed in this report. The drivers of opposition identified in this report are derived from corroboration from multiple stakeholders across various geographies and projects.

Transmission lines were chosen for their interstate or interregional and high-voltage nature (due to the particular relevance for decarbonization and grid resilience goals), notable public opposition or support, or were added for study as the researcher connected with stakeholders across the study region. Interviews with a loosely connected national network of transmission opponents and national nonprofit organizations led to additional interviews with stakeholders impacted by lines being developed in Oregon, Idaho, Nevada, and West Virginia. The chosen projects represent a diverse set of ownership and regulatory structures, technologies, designs, voltages, and transmission planning regions, as shown in table 3. Most transmission

[14] Some stakeholders held multiple occupations and, as such, were double-counted (a state government official who is also a landowner hosting the project, for example, would be represented as both a landowner and a state government official). Additionally, public commenters observed at public meetings are included in this table.

[15] James Downing, "Most Stakeholders Support Special Interconnection Rules for Tribes," *Utility Dive*, November 20, 2024.

planning regions in the United States are defined by entities called regional transmission organizations (RTOs) and independent system operators (ISOs) that are responsible for managing the grid and wholesale energy markets. In other parts of the country (e.g., the non-RTO West), utilities and state regulators play the lead role in transmission planning.

Table 3. Project characteristics		
		# of projects
Ownership structure	Merchant	3
	Investor-owned utility (IOU)	8
Transmission planning regions	Midcontinent Independent System Operator (MISO)	7
	Pennsylvania-New Jersey-Maryland Interconnection (PJM)	3
	Southwest Power Pool (SPP)	3
	Southwest	4
	Northwest	3
Construction	Underground	1
	Overhead	10
Voltage	115 kilovolts (kV)	1
	345kV	4
	500kV	1
	525kV	4
	600kV	1

It should be noted that, given the limited number of locations researched in this study, the proposed framework shown on page 10 and other research contained in this study pertain primarily to the Midwest, Great Plains, Mountain West, and Southwest. These regions were chosen mainly due to the concentration of long-distance, high-voltage transmission being built compared to other regions, as shown in the figure below, and GPI's programmatic focus on SPP and MISO regions. Additional research should be done in the Southeast, Northeast, South, and West Coast to validate these findings further in different geographies and communities.

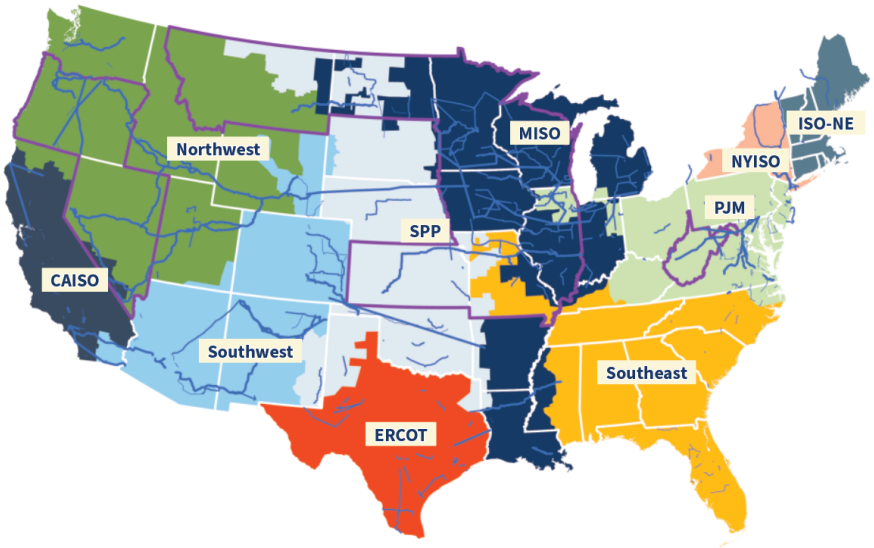


Figure 3. Map of proposed HVTLs in the United States

States in focus

Planned transmission projects

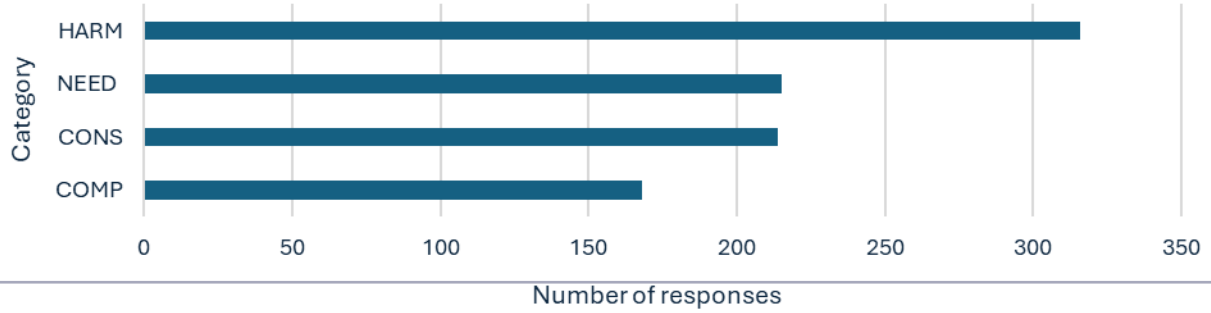
- ≤ 230 kV
- 231 kV to 345 kV
- 346 kV to 745 kV

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Horizon Climate Group, 2025, using Our Grid Future Planned Transmission Projects National Database, Horizon Climate Group, May 2025. Transmission planning regions by Abramson, Horizon Climate Group, and Narang, Clean Grid Initiative, 2025, adapted from FERC Order 1000 Regions shapefile, December 2024.

Interview results & opposition framework

Figure 4. Opposition framework: Interview responses



Across the 110 interviewees and 18 public commenters relied upon in this study, 910 distinct responses were categorized, identifying 37 drivers of opposition/support, shown in tables 4, 5, 6, and 7 below. These drivers fit neatly within a framework consisting of four primary categories of opposition: ***harm, need, consultation, and compensation***.

Framework definitions:

- ***Harm***: Any perceived and/or actual damage to a stakeholder's financial prospects, business operations, or cultural values (e.g., property devaluation, crop/property damage, environmental damage, farming interference, viewshed impacts, adverse health consequences, safety implications, etc.).
- ***Need***: The stakeholders' understanding or perception of the project's need, or lack of need, and the need for specific construction methods (e.g., undergrounding, alternative transmission technologies, transportation rights-of-way [ROWs], etc.).

- ***Consultation***: Local stakeholders' understanding of how their voices are included in the project's decision-making processes, beginning with the planning of the project itself, to its permitting and subsequent construction.
- ***Compensation***: Local stakeholders' understanding of compensation for the real and understood harm inflicted by the line on landowners and the greater community.

As shown in figure 4, the various actual and perceived harmful impacts that transmission development can have on landowners and host communities were the most commonly observed drivers. However, ***considerations around the need for the project and how local stakeholders were engaged and consulted throughout the development process were brought up more consistently than how local stakeholders would be compensated***.

This framework helps explain the rationale and nuances behind local opposition to HVTL development. It provides developers with a road map of the questions and areas of concern that local stakeholders voice when in opposition. Put another way, the framework is based on four basic questions local stakeholders often ask:

- How will this negatively impact my life?
- Why is this project even needed?
- How will I be consulted on this project?
- How will I be compensated for any potential harm caused by this project?

Despite the broad nature of the framework, every project is different and, as such, requires further explanation. Within each category of opposition discussed above, local stakeholders shared distinct reasons for their opposition, which added necessary nuance to the broad framework. The following tables illustrate the number of respondents interviewed who articulated concerns about a distinct reason for their opposition.

Table 4. Harm-based responses

Response type	***Totals***
Viewshed	46
Property value	32
Physical safety	32
Electromagnetic fields (health)	30
Cultural (general)	30
Environmental Impact	29
Cultural (farmland)	24
Crop damage/loss	22
Farming operations	21
Trespassing	16
Property damage	13
Stray voltage	11
Noise	4

Table 5. Need-based responses

Response type	***Totals***
Local demand	35
Renewable energy perception	35
State demand	29
Undergrounding	25
Route	25
Merchant/private developer	24
Unreliable/out-of-date data	15
Alternative transmission technologies	14
Highway ROWs	11

Table 6. Consultation-based responses	
Response type	***Total***
Early and often	66
Eminent domain	54
Micrositing	33
Predatory utility	23
Community-wide engagement	22
Collective negotiation	15
Lack of legal representation	13

Table 7. Compensation-based responses	
Response type	***Total***
Taxes (limited or no understanding)	49
Broadband (no)	27
Community-led grants	25
Negative externalities	17
Middle-mile broadband (yes)	16
Taxes (good understanding)	11
Developer-led grants	11
Co-ownership	5

These broad findings corroborate and add to much of the existing literature on local opposition to high-voltage transmission. Consistent with previous studies, concerns around viewsheds, property values, physical safety, health, a lack of public participation, cultural concerns, and environmental impacts stand out as driving factors of opposition across the United States.

Given this report's focus on the Great Plains and Midwest, however, there was a greater focus on adverse agricultural impacts, which is absent from much of the prior literature. Furthermore, though need has been briefly discussed in some prior work, this study argues that it should be a focus of the conversation around stakeholder engagement, especially as transmission becomes more closely associated with renewable energy, which has become increasingly polarized in recent years.[16] Finally, regarding compensation, these findings underscore an overarching disconnect between developers, policy makers, and local stakeholders on the local value proposition of transmission. Most notably, prior literature has not adequately addressed how communities' understanding of the tax benefits associated with transmission impacts their perception of the project.

Using the framework proposed above and the responses from these interviews, the following sections will go a step further and discuss a select few of the most common concerns interviewees cited and their broader themes. They will also highlight stories of why people are concerned with transmission development in their community, any existing literature associated with those concerns, and what policy makers and developers can do to begin addressing these concerns.

[16] Elizabeth Weise and Suhail Bhat, "Across America, clean energy plants are being banned faster than they're being built," *USA Today*, February 4, 2024; Brian Kennedy, Cary Funk, and Alec Tyson, *What Americans think about an energy transition from fossil fuels to renewables* (Pew Research Center, June 28, 2023).

Agricultural impacts

Stories from the road: Mr. and Ms. X agreed to lease portions of their farm to a wind developer on the condition that HVTLs would not be built. Regardless, an HVTL developer chose to route a proposed HVTL on their land. Choosing not to engage with the developer because of their contract, Mr. and Ms. X had to subsequently spend nearly $20,000 in legal fees to secure a study of a less impactful route on their land. A route, they had been told by state regulators, that was both better and technically feasible.

Category of opposition: harm

Drivers discussed and frequency: farming operations (21), crop loss (22), and stray voltage (11). Instances of these concerns are highlighted in figure 5.

Key takeaways: Farmers, ranchers, and other agricultural landowners disproportionately impact the success or failure of an HVTL project. Efforts to reduce adverse agricultural impacts through increased early consultation, micrositing, continued outreach, self-imposed standards, and increased compensation should be paramount to developers, especially those operating in agricultural communities.

Introduction

HVTLs typically have an outsized impact on agricultural, ranching, and farming interests. With ROWs spanning over 100 feet, HVTLs are often sited on agricultural land and sometimes use eminent domain (the government's power to take private property for public use, read more in the "Eminent domain" section) to do so. As such, there should be no surprise that there is a series of concerns, across nearly every project examined in this study, on the impact HVTLs have on farming and ranching operations.

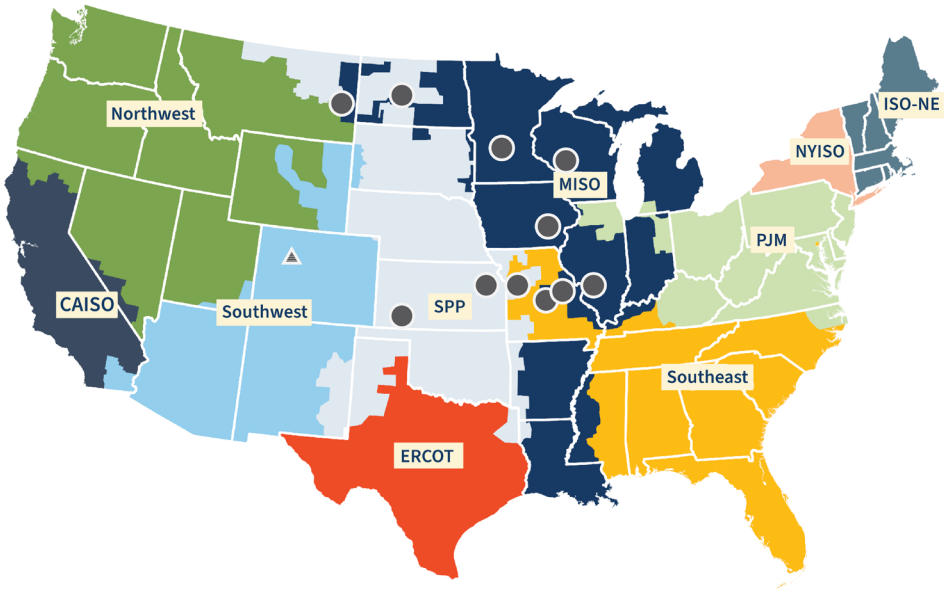


Figure 5. Instances of agricultural concerns

In-person interviewee

Virtual interviewee

Prior in-person research

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Aime Bita, Great Plains Institute, and Esther Ramsay, Horizon Climate Group, based on data from Joshua Rogers, Great Plains Institute, and transmission planning regions by Abramson, Horizon Climate Group, and Narang, Clean Grid Initiative, 2025, adapted from FERC Order 1000 Regions shapefile, December 2024.

Interview results

The stakeholders interviewed for this study articulated myriad concerns highlighting the adverse impacts of HVTL development on farming and ranching operations, including ***aerial spraying, center pivot irrigation, GPS-operated machinery, crop production, crop damage during and after construction, the health of farm animals, property damage, and farmers' liability.***

Many of the concerns identified were from personal experience with transmission development or stories told to them by friends, family, and neighbors. Farmers in Kansas, for example, noted how their neighbor had to purchase two new irrigation systems after a transmission line bisected their field, which was originally serviced by one center pivot irrigation system.[17]

Even more concerning to some farmers is the potential for property or crop damage by contractors. Stories of farmers having to tow out utility trucks stuck in the mud and contractors driving through crops, leaving gates open, or damaging property have made many landowners uncertain about the potential impact on their land.[18]

[17] Anonymous Landowner in discussion with the author, August 2024; the landowner was unaware whether their neighbor or cousin had been compensated for these intrusions.

[18] Anonymous Landowner in discussion with the author, August 2024.

What does the research say?

Of the concerns discussed above, a few have been extensively researched. A brief summary of the relevant literature can be found below:

- ***Aerial spraying:*** While there is not extensive research into this subject, anecdotal reports from farmers, their contractors living near HVTLs, and public service commissions indicate that aerial spraying is less effective, more dangerous, and occasionally impossible when done near HVTLs. Various factors, including low flying and precision requirements, contribute to these concerns.[19]
- ***Soil compaction***: Soil compaction is created by heavy construction machinery and vehicles, which weigh down otherwise aerated soil. Studies show that land with compacted soil may have decreased crop yields by "as much as 10 to 20 percent in unfavorable years."[20]
- ***Stray voltage***: Stray voltage (low-level voltages between surfaces induced by electromagnetic fields near operating alternating current transmission lines that animals may come in contact with) can also have adverse impacts on farm animals, most notably dairy cows and pigs.[21] Though stray voltage is often associated with high-voltage transmission development, it is most often caused by distribution systems and on-site wiring, both of which are necessary for farming operations.[22] Studies that directly study farm animals grazing underneath or near HVTLs find negligible impacts.[23]
- ***Impact on GPS***: Though some contradictory anecdotal evidence supports the claim that HVTLs adversely impact GPS systems installed on farming equipment, the available literature contradicts this claim. Research and reports from Egypt and Australia concluded that HVTLs have minimal impacts on GPS performance.[24]

Discussion

Despite payments aimed at mitigating the impacts of crop losses, many farmers view these payments as insufficient, often noting how lump sums and limited timeframes do not adequately account for the years of potential revenue loss. As such, developers and policy makers can pursue policies to mitigate agricultural impacts. The New York Department of Agriculture and Markets, for example, gives developers best practices on how to reduce their agricultural impact. The guidelines suggest developers employ an "***agricultural and soil conservation specialist***" to review and recommend mitigation practices during each development

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[19] Noel Palmer, *Rebuttal Testimony on Behalf of Neighbors United Against Ameren's Power Line*, Missouri Public Service Commission, Case No. EA-2015-0146, October 21, 2015, 3–5; Anonymous Landowner in conversation with the author, August 2024; Public Service Commission of Wisconsin, *Environmental Impacts of Transmission Lines* (Public Service Commission of Wisconsin, accessed, May 2025), 8.

[20] Mark Hanna, Mahdi Al-Kaisi, and Michael Tidman, *Soil Compaction May be Cutting into Your Yield* (Iowa State University, 2002).

[21] Douglas J. Reinemann, *Stray Voltage in Animal Housing* (Merck Manual, February 2021); Anonymous Developer in discussion with the author, October 2024; "Stray voltage on the farm is an often misunderstood phenomenon," Rural Power, accessed April 2025.

[22] Douglas J. Reinemann, *What do we know about Stray Voltage?* (University of Wisconsin, updated 2009), 4.

[23] R. F. Angell, M. R. Schott, R. J. Raleigh, and T. D. Bracken, *Effects of a high-voltage direct-current transmission line on beef cattle production* (National Library of Medicine, 1990); Dan Haugen, "As a power line moves in, an organic farm ponders its future," *Canary Media*, March 15, 2013.

[24] Mostafa Rabah and Ahmed El-Hattab, "Investigating the Impact of High Voltage Power Lines on GPS Signal," *Fachbeitrag* 136, (2011): 1; VicGrid and Victoria State Government, *Working and Farming Near Transmission Infrastructure* (VicGrid, March 2024).

phase and liaise with state departments.[25] Absent statewide regulations, developers have, and can continue to have, ***their own standards*** aimed at mitigating and compensating for adverse agricultural impacts.[26]

Robust land surveying is needed to determine proposed routes that avoid sensitive cultural, environmental, and agricultural areas. Developers interviewed in this study noted that offering landowners ***compensation*** to obtain access to their land may increase the amount of land one is able to survey. Obtaining access to more land before a route is decided upon can enable developers to better understand sensitive areas that landowners would want them to avoid, resulting in a less harmful initial proposal.[27]

Understanding the nuances of agricultural lands begins and ends with the landowner themself or the farmer who tills the land. Landowners interviewed in this study consistently advocated for a greater voice in determining where the line would be placed on their property.[28] Furthermore, having physical indications of the line's placement was also incredibly important. This, however, presents a barrier for developers because physically identifying line placement along a property can be incredibly costly, as it typically requires an engineer, land agent, and other employees to travel to the site location to ensure proper placement.

Yet, farmers, ranchers, and other landowners have an unparalleled understanding of their land and the impact new development may have on it. Developers can utilize this knowledge to create a route that is maximized for local stakeholders as opposed to linear efficiency. Even more, state policy makers and regulators could endeavor to allow developer-landowner cooperation on route siting, especially in the later stages of the permitting process.[29] This practice, referred to as ***micrositing*** within this study, is discussed at greater length in subsequent sections. Researchers examining developer best practices during MISO's CapX2020 projects also provide a compelling narrative for how to incorporate local voices into route planning.[30]

Following the routing decision, developers can ***reduce uncertainty for landowners*** and others impacted by the project to the greatest extent possible. Physically marking areas planned for development, for example, is important for farmers who must plan where and when to plant crops.[31] Similarly, landowners advocated for frequent updates regarding the construction timeline for the project, so that they may adequately plan for the imminent development.

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[25] New York State Department of Agriculture and Markets, *Guidelines for Electric Transmission Right-of-Way Projects* (New York State Department of Agriculture and Markets, April 27, 2011), 1.

[26] Clean Line Energy Partners, *Missouri Agricultural Impact Mitigation Protocol for the Construction of the Grain Belt Express Clean Line* (Clean Line Energy Partners, June 2016).

[27] Anonymous Developer in discussion with the author, January 2025.

[28] Anonymous Landowner in discussion with the author, August 2024; Anonymous Landowner in discussion with the author, October 2024; Anonymous Landowner in discussion with the author, November 2024; Anonymous Landowner in discussion with the author, January 2025.

[29] Regulatory barriers in states like Kansas require developers to conduct additional studies for small changes following route approval. This disincentive continued cooperation between landowners who may become engaged late in the process and developers. Disagreements can then lead to costly lawsuits, harming both the developer and landowner.

[30] Monti et al., *CapX2020*, 42.

[31] Anonymous Landowner in discussion with the author, August 2024.

Considerations for future transmission development

- Produce socially optimal route proposals by conducting robust land surveys, for which landowners are compensated.
- Mitigate agricultural harms by employing agricultural and soil conservation specialists.
- Mitigate agricultural harms by implementing standards, regulatory and self-imposed, aimed at protecting soil and crop health.
- Increase landowner-developer cooperation through micrositing.
- Reduce uncertainty through continuous communication, physical markings, and updated timelines.

Environmental impacts

Stories from the road: Ms. X considers herself an environmentalist. She has lived in New Mexico for years now and finds beauty and peace in the seemingly endless and untouched deserts surrounding her. Now that she is retired, she has tasked herself with preserving these lands from any form of development, including HVTLs, which she referred to as "scars on the land."

Category of opposition: harm

Drivers discussed and frequency: environmental (29). Instances of environmental concerns are highlighted in figure 6.

Key takeaways: The most successful projects in terms of environmental opposition addressed concerns by conducting robust environmental surveys before the route's proposal, investing heavily in mitigation measures, and engaging and actively working with state agencies and environmental interest groups throughout every phase of the project.

Introduction

The United States is home to some of the world's most beautiful, environmentally diverse, and untouched natural landscapes. As such, environmental advocacy and a rich conservationist tradition are present throughout the nation. Environmental proponents have come into direct conflict with HVTL developers over potential environmental impacts. These groups have been effective at delaying and, at times, cancelling projects that they view as environmentally harmful.

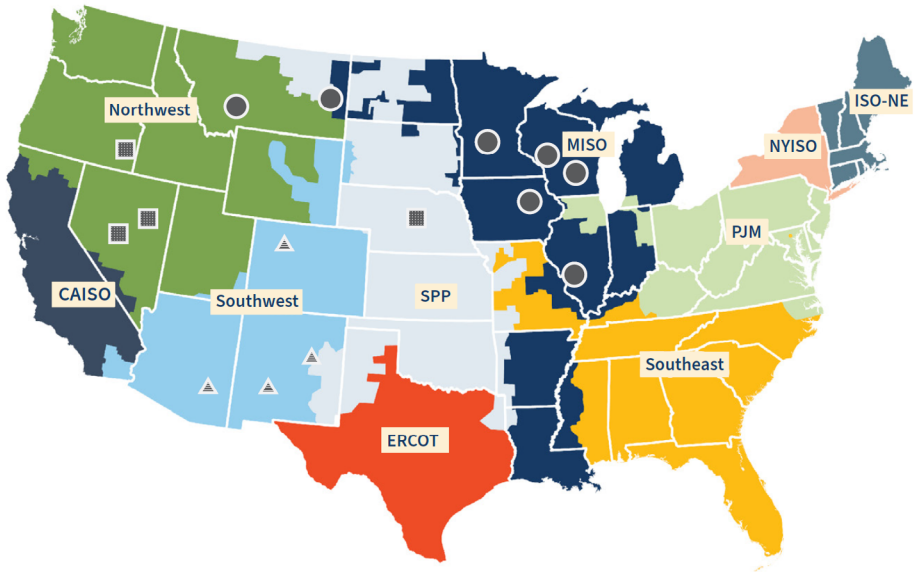

Figure 6. Instances of environmental concerns

In-person interviewee

Virtual interviewee

Prior in-person research

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Aime Bita, Great Plains Institute, and Esther Ramsay, Horizon Climate Group, based on data from Joshua Rogers, Great Plains Institute, and transmission planning regions by Abramson, Horizon Climate Group, and Narang, Clean Grid Initiative, 2025, adapted from FERC Order 1000 Regions shapefile, December 2024.

Interview results

Interviewees across the country were particularly attuned to the potentially harmful impacts that transmission development can have on their local environments. Interviewees noted the potential impact increased development could have on native plant species, native and endangered animals, water quality, and deforestation.

Unlike agricultural impacts, which are typically much more consistent across geographies, many environmental impacts are intensely regional and localized. Within this research alone, concerns around impacts to river trout, sage grouse, leks (the dancing and mating grounds for sage grouse), sand dunes, desert turtles, hawks, crows, rivers, and forests have been cited as reasons for opposition or, at the very least, concern.

What does the research say?

Significant research has been done to determine the local and national impacts of HVTL development on the environment. A summary of some of the studies conducted can be found below:

- ***General environmental impacts:*** The adverse impacts that HVTLs can have on local environments

should not be understated. With a ROW between 100 and 200 feet, researchers have found that lines can "increase human access into natural areas, displace wildlife from their habitat, act as barriers to wildlife movement" and migration, and often must be cleared of any flora and fauna that may cause damage to the line or exacerbate fire risks.[32] Recent research suggests that most environmental disruptions appear in the early stages of development but persist for the life of the line. This is in large part due to the additional infrastructure necessary to build out HVTLs; new roads, ROW clearing, and increased pollution from heavy-duty vehicles and other machinery all contribute to environmental degradation prior to operation of the line.[33]

- ***Enabling emissions reductions:*** Studies from the National Renewable Energy Laboratory[34] and Princeton University,[35] among others, show that a rapid expansion of HVTL capacity is needed to quickly decarbonize the United States economy. Studies show that rapid decarbonization can have direct and indirect demonstrable positive impacts on local and nationwide particulate matter levels,[36] conservation, animal health and safety, and ecological health and safety.[37]
- ***Conservation benefits:*** Though not commonly discussed by environmental advocates or transmission opponents, a few studies have highlighted the benefits of HVTLs on local environments, especially for pollinators. A 2013 study that examined the impact of HVTLs on pollination habitats in Oregon, Maryland, Wisconsin, and New Jersey found that HVTL easements provide "quality habitat for native pollinators." This is especially true when integrated vegetation management and native plants are utilized. In these instances, the number and diversity of native bee species within the region increased.[38] Research conducted in New England revealed similar results.[39]

Discussion

Environmental advocates have been influential in both the success and failure of HVTL projects. Developers must adhere to a series of federal and state regulations prior to construction. For example, the National Environmental Protection Act requires certain HVTLs to undergo environmental impact studies, which assess the "environmental effects of their proposed project" on local environmental interests and weigh them against the greater public benefit of the line.[40] Additional requirements may be established by state agencies as well. In Wisconsin, for example, all HVTLs must go through varying levels of environmental review

[32] "Electric Transmission Lines," US Fish and Wildlife Service, accessed April 2025.

[33] Larissa D. Biasotto and Andreas Kindel, "Power Lines and Impacts on Biodiversity: A Systematic Review," *Environmental Impact Assessment Review* 71, (2018): 110–119.

[34] US Department of Energy and Grid Deployment Office, *The National Transmission Planning Study* (US Department of Energy, 2024), 2, 6, & 8–9.

[35] Larson et al., *Net-Zero America*, 28–29.

[36] Paul Picciano, Minghao Qiu, Sebastian D. Estham, Mei Yuan, John Reilly, and Noelle Selin, "Air Quality related equity implications of U.S. decarbonization policy," *Nature Communications* 14, no. 5543 (2023); Mesfin Mekonnen, Daniel Loughlin, and Gyungwon Kim, *Impacts of Decarbonization on Reducing Air Quality Health Disparities in Georgia* (Annual Biomedical Research Conference for Minoritized Scientists, November 2023).

[37] "Issues Brief: Species and Climate Change," International Union for Conservation of Nature, October 2021.

[38] K. Russel and S. Kornbluth, *Use of Transmission Line Easements for the Benefit of Native Bees* (Electric Power Research Institute, October 2013).

[39] David Wagner, Kenneth Metzler, and Henry Frye, "Importance of Transmission Line Corridors for Conservation of Native Bees and Other Wildlife," *Biological Conservation* 235, (2019): 147–156.

[40] "What is the National Environmental Policy Act?," US Environmental Protection Agency, updated April 11, 2025.

depending on the expected impact of the line.[41] Similarly, according to interviews with state regulators in Minnesota, developers working in the state are highly encouraged to engage early on with the Minnesota Department of Natural Resources, which advises the Minnesota Public Utilities Commission when evaluating HVTL proposals. States without independent environmental reviews could consider creating their own regulations to curb bad practices and increase trust among environmental advocates.

Beyond the regulations meant to mitigate environmental damage, developers have successfully mitigated environmental opposition by using environmentally friendly development practices. For example, Arizona developers used helicopters to transport transmission parts, thus eliminating the need for new roads to access building sites. Similar efforts have been made to mitigate potential impacts, including replanting native plant species at a "3:1 ratio," investing in technologies meant to limit bird nesting, and investing in trail and park management.[42] The Audubon Society has also published a series of best practices it recommends for developers to avoid unnecessary environmental harm to birds.[43]

Considerations for future transmission development

- Promote state-developer cooperation by working closely with state environmental protection and natural resource agencies.
- Promote developer-local stakeholder cooperation through early and continuous communication.
- Mitigate environmental harm by achieving standards aimed at protecting sensitive areas, native ecosystems, and viewsheds.
- Reduce ancillary infrastructure where possible.

[41] Wis. Admin. Code § PSC 4.10 (amended version effective July 1, 2000).

[42] Joshua Rogers, "Transmitting Consensus: A Political Guide to Transmission Reform in the United States," (Princeton University, 2024), 69.

[43] Brooke L. Bateman, Gary Moody, Jennifer Fuller, Lotem Taylor, Nat Seavy, Joanna Grand et al., *Birds and Transmission Report: Building the Grid Birds Need* (National Audubon Society, 2023).

Property values

Stories from the road: Ms. X from Missouri had recently started her own business: a charming bed and breakfast (B&B) surrounded by farms and the beautiful Missouri forests. This business was her dream, so when she heard of the proposed development of an HVTL right next to her B&B and would not receive any compensation for it, she found ways to oppose the project, joining a group of landowners suing the developer.

Category of opposition: harm

Drivers discussed and frequency: property values (32). Instances of property value concerns are highlighted in figure 7.

Key takeaways: Developers who are paying landowners above the fair market value of their land mitigate the impacts of depreciated land values. Reforming the way developers compensate those impacted by eminent domain and landowners whose property sits adjacent to the line will likely be necessary to mitigate opposition as more development is proposed. Good neighbor payments and increased eminent domain and landowner payments have found some success in states impacted by development.

Introduction

Local stakeholders often cite the possibility of depreciated property values as a core reason for their opposition to HVTLs. There is a long history of research into this subject, discussed below, which has only recently been challenged. What is clear, however, is that local stakeholders believe, for a variety of reasons, that HVTLs will reduce the value of property near the line. Their intuition is a simple one: given the choice, people would rather live in a place without a transmission line than in a place with one.

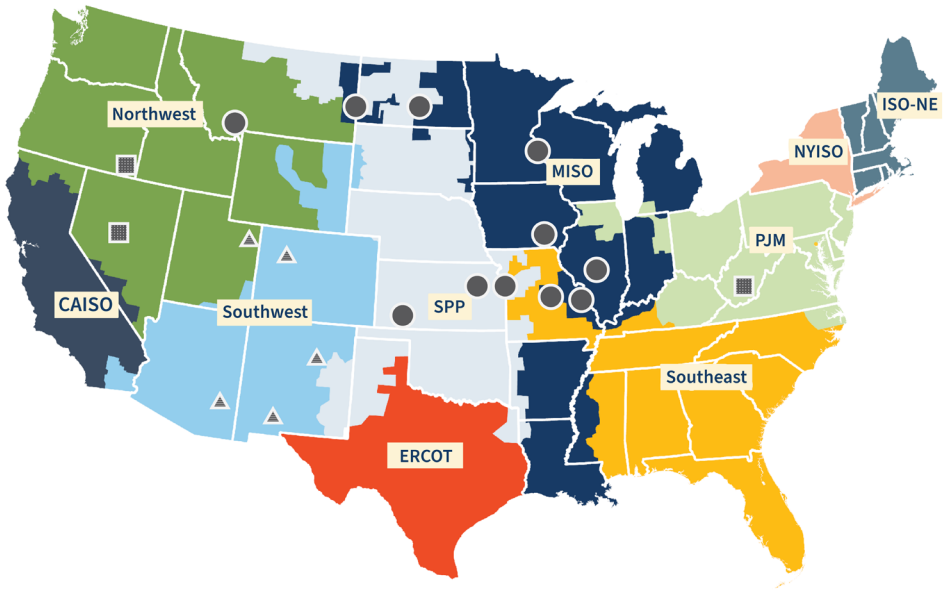

Figure 7. Instances of property value concerns

In-person interviewee

Virtual interviewee

Prior in-person research

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Aime Bita, Great Plains Institute, and Esther Ramsay, Horizon Climate Group, based on data from Joshua Rogers, Great Plains Institute, and transmission planning regions by Abramson, Horizon Climate Group, and Narang, Clean Grid Initiative, 2025, adapted from FERC Order 1000 Regions shapefile, December 2024.

Interview results

Property values consistently came up in discussions with stakeholders across the country. Developers interviewed in Kansas, Missouri, Illinois, Montana, North Dakota, New Mexico, and Arizona, understanding these concerns, offered landowners hosting the line prices above the industry standard. Developers in Iowa went as far as offering some adjacent landowners payments, which are referred to as good neighbor payments.

Despite these efforts, local stakeholders' concerns over HVTLs' impact on property values were consistent across interviews with landowners. The concerns most often raised fall into three categories:

1. Viewshed
2. Safety and health impacts
3. Fairness

The first category was of particular concern for stakeholders whose property relies upon viewsheds and rural characteristics (agritourism businesses, people who moved to rural areas to get away from industrial settings, etc.). The second was described by stakeholders who were concerned that perceptions around safety, regardless of the validity, would make buyers less likely to bid on their property. Finally, there is an element of fairness in which local stakeholders were concerned that they were not fairly compensated, or their neighbors were not fairly compensated.

What does the research say?

As discussed above, the impact of HVTLs on property values remains a concern for local stakeholders. A large body of research has attempted to understand and address this concern. The literature, however, is mixed:

- ***Property value depreciation:*** Early studies found moderate effects on property values before and after transmission lines are built, with depreciation ranging from 2 percent to 9 percent, while some properties showed no change.[44] Subsequent research reported similar findings, with losses between 4.9 percent and 8.3 percent for adjacent properties[45] and reductions of 1.65 percent to 2.43 percent for moderately priced homes, rising to 11.23 percent for high-end properties.[46]
- ***Substantial impacts:*** In 2018, researchers found pricing discounts of 44.9 percent for properties adjacent to power lines and 17.9 percent for non-adjacent lots within 1,000 feet.[47] In 2024, United Kingdom-based academics reported a 3.9 percent price drop within 1,500 meters of power lines.[48] In that same year, Max Harleman found that in Texas' Competitive Renewable Energy Zones, properties within 500 meters of HVTLs depreciated by 10 percent if owners were uncompensated.[49]
- ***Rural property (mixed findings):*** Most research has focused on residential properties, with limited studies on agricultural and recreational land. Early studies suggested HVTLs had little effect on rural property values.[50] However, Colwell and Sanders argue that prior research fails to distinguish between productive and non-productive land. Their study found HVTLs in Wisconsin and Illinois significantly devalued encumbered agricultural land, often exceeding easement fee values by more than 200 percent.[51]
- ***Stakeholder perception***: Regardless of the actual market impact, stakeholder concerns persist. Surveys indicate that landowners and realtors often perceive depreciation as more severe than the literature suggests.[52]

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[44] Jackson and Pitts, "Effects of Transmission on Property Values," 258.

[45] Charles Thomas and Gerd Welke, "The Effects of HVTLs on Property Values: An Event Study," *International Real Estate Review* 20, no. 2 (2017): 183.

[46] Steven C. Bottemiller and Marvin L. Wolverton, "The Price Effects of HVTLs on Abutting Homes," *The Appraisal Journal* 18 (2013): 53 and 56.

[47] David Wyman and Chris Mothorpe, "The Pricing of Power Lines: A Geospatial Approach to Measuring Residential Property Values," *Journal of Real Estate Research* 40, no. 1 (2018): 121.

[48] Cheng Keat Tang and Stephen Gibbons, "Are Friends Electric? Valuing the Social Costs of Power Lines Using House Prices," *Energy Economics* 134 (2024): 1.

[49] Max Harleman, "Who Bears the Cost of Renewable Power Transmission Lines? Evidence from Housing Values," *Energy Policy* 191, (2024): 1.

[50] Peter F. Colwell and Jim L. Sanders, "Electric Transmission Lines and Farmland Value," *Journal of Real Estate Research* 39, no. 3 (2017): 376-379; James A. Chalmers and Frank Voorvaart, "High Voltage Transmission Lines: Proximity, Visibility, and Encumbrance Effects," *The Appraisal Journal* 77, no.3 (2009): 239.

[51] Colwell and Sanders, "Transmission and Farmland," 389.

[52] Furby et al., "Perception of Transmission," 21; Jackson and Pitts, "Effects of Transmission on Property Values," 244; Hal Nelson, Brian Swanson, and Nicholas Cain, "Close and Connected: The Effects of Proximity and Social Ties on Citizen Opposition to Electricity Transmission Lines," *Environment and Behavior* 50, no. 5 (2017): 570.

Discussion

Compensating landowners for depreciated land values is not only common but is often required; there are already a number of legal requirements and self-imposed standards developers follow when compensating landowners (some developers, for example, compensate landowners at 110 percent fair market value). But the question remains—can compensation adequately compensate landowners for lost value?

More often than not, landowners are happier when they are compensated more. For example, developers in Kansas, Missouri, and Illinois offered 110 percent of fair market value to landowners hosting the line on their property.[53] Similarly, developers must compensate landowners whose land is taken through eminent domain at 100 percent of the fair market value.

Especially for extraordinarily unpopular policies like eminent domain, state governments have found success in dulling their unpopularity by increasing the level of compensation developers have to give. In Missouri, for example, in response to outcries over eminent domain used by HVTL developers, state legislators increased the legal compensation required for eminent domain uses to 150 percent of fair market value for horticultural and agricultural lands.[54] Similarly, a group of landowners who collectively negotiated an easement in Montana and North Dakota noted that limited resistance to the project was partly due to the developer offering compensation "significantly more than industry standard." However, compensation was secondary—having control over where the line crossed their property was their primary concern.[55]

Despite these practices, regardless of whether implemented by regulatory bodies or developers themselves, landowners adjacent to the transmission project and its associated ROW are typically not compensated, and when they are, the compensation offered is minimal. Failing to account for this negative externality, especially for businesses relying on agritourism, caused significant opposition in Iowa, Kansas, and Missouri from both landowners adjacent to the line and community members who felt they should be compensated. Beyond the existence of compensation for adjacent landowners and communities, the manner of that compensation influences its efficacy in mitigating opposition.

One developer in Iowa chose to give small good neighbor payments to landowners along the transportation corridor they were following.[56] While many chose to accept these, some landowners felt the contract they would be required to sign would act as implicit support for the project, which they were not willing to give. It is unclear whether these good neighbor payments impacted the perception of the project.

Considerations for future transmission development

- Mitigate property devaluation and compensate landowners above fair market value for land obtained both voluntarily and by eminent domain.
- Mitigate property devaluation and consider compensating adjacent landowners adversely impacted by transmission development (for example, those who rely on agritourism).
- Promote developer-landowner relations and provide unconditional good neighbor payments.

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[53] Joe Hack, Josh Rogers, and Devashree Saha, "Community Benefits Snapshot: Grain Belt Express Community Engagement and Benefits," World Resources Institute, June 23, 2025.

[54] Matthew McFarland, "Eminent domain bill aims to level the playing field for Missouri farmers," *The Missouri Times*, June 14, 2022.

[55] Anonymous Landowner Committee Representative in conversation with the author, January 2025.

[56] Anonymous Landowner in conversation with the author, October 2024.

Cultural impacts

Stories from the road: "I spent three hours driving around Ms. X's community as she introduced me to her son, neighbors, and childhood farm. She showed me where her friends had hoped to retire and the Amish school near an HVTL. After our interview, she sent me songs—*Dirt Cheap* by Cody Johnson and *This is My Dirt* by Justin Moore—to explain why she was reluctant to give up their land. To them, it wasn't just land; it held memories of childhood, lost loved ones, and their future."

— Joshua Rogers, report author and Energy Systems fellow at GPI

Category of opposition: harm

Drivers discussed and frequency: cultural—farmland (24), cultural—general (30), and predatory utility (23).[57] Instances of cultural concerns are highlighted in figure 8.

Key takeaways: Cultural impacts from development are both specific to individual local stakeholders and can inspire passionate opposition. Granting these landowners greater agency over the placement of the line on their property, increasing the value of the line for the greater community, and using third-party local messengers to advocate for the line within the cultural context of the specific host community have been used by developers to varying degrees of success.

57 Though technically in the consultation category, this section discusses how out-of-state developers speak to communities with different cultures than their own and how that communication can paint them in a bad light. As such, this specific driver is applicable here.

Introduction

It is often difficult for people who have not spoken with transmission opponents to understand why they spend years and sometimes tens of thousands of dollars to oppose HVTL development. The cultural diversity of the United States forces developers and advocates to engage with a series of distinct value systems that prioritize protecting private lands, rural characteristics, and local interests and voices.

The transition to decarbonize the economy, including HVTL development, promises to reshape the American landscape with wind farms, solar fields, and transmission lines in addition to the expansive ranches, century farms, and untouched lands that make up so much of the current landscape. However, this promise often conflicts with the value systems of many of the people being asked to host this critical infrastructure.

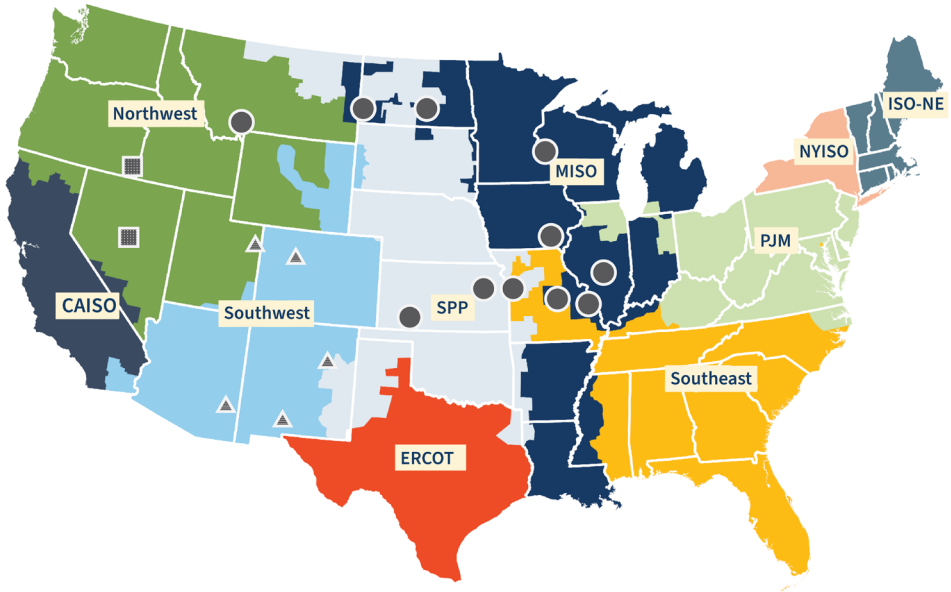

Figure 8. Instances of cultural concerns

In-person interviewee

Virtual interviewee

Prior in-person research

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Aime Bita, Great Plains Institute, and Esther Ramsay, Horizon Climate Group, based on data from Joshua Rogers, Great Plains Institute, and transmission planning regions by Abramson, Horizon Climate Group, and Narang, Clean Grid Initiative, 2025, adapted from FERC Order 1000 Regions shapefile, December 2024.

Interview results

Interviewees in this study reveal that cultural opposition is an incredibly difficult driver to address. Cultural opponents, from generational farmers to individual landowners who have spent decades transforming their land, have a vested interest in maintaining its original character and appearance. Some will oppose development of any kind. One Illinois county commissioner, for example, told the author they would oppose any development on productive agricultural lands because it would be an affront for that land to be used for anything other than farming.[58]

Beyond physical alterations, interviewees also noted how the manner of engagement can turn local stakeholders against developers before they have even been engaged. Developer-led trainings entitled "Marketing to Mayberry," for example, which were widely condemned by local stakeholders in this study

[58] Anonymous County Commissioner in discussion with the author, September 2024.

who found it to be patronizing, were a factor in two landowners' decisions to become leaders of extremely effective opposition movements and, for one, motivated them to help form a "loosely connected national network" of transmission opponents.[59]

What does the research say?

- ***NIMBYism:*** The closest research connected to what we refer to as cultural impacts began as a theory around place attachment, which emerged in the early 2000s as a response to the NIMBY (not in my backyard) explanation for local opposition.[60] NIMBYism, often used to categorize local opponents as selfish or ignorant, anti-progress or climate deniers, is often an oversimplification that blurs the distinction between legitimate concerns and self-interested motivations. The blanket term lacks many of the necessary nuances required to mitigate opposition.[61]
- ***Place attachment:*** Studies show that individuals with strong attachments to their communities are more likely to oppose projects perceived as disruptive. According to this research, this opposition is akin to a coping mechanism against unwanted change, while support is more likely to occur when a project is seen as beneficial or neutral to the community. This attachment often fuels resistance to new development, which is seen as harmful, while industries with historical ties, such as coal and oil, are defended due to their economic and cultural significance.[62] This study and prior research have found similar patterns within the context of HVTL development in the United States. Specifically, people with deep generational or personal attachments to their land or community tend to be more likely to either oppose HVTL projects or want greater concessions from developers regarding[63] how they are consulted and compensated.

Discussion

Combating and mitigating cultural opposition is inordinately difficult, as the core of this opposition is anchored by constancy. Avoiding impact on landowners who are ideologically opposed to transmission development is the best course of action to mitigate opposition. However, in instances where that is not possible, giving landowners greater agency over where the line is placed on their property has been shown to be an effective way to mitigate cultural concerns. Furthermore, increasing the value proposition of transmission for the community through grants, co-located infrastructure that serves the community, and other investments has been shown to garner goodwill from both the community and individual landowners waffling on the edge of support and opposition.

Acknowledging and recognizing the innate value of land, whether it is agricultural, horticultural, residential, or untouched, is also of utmost importance. Developers have successfully mitigated opposition by hiring or engaging with local stakeholders who support the project and understand the host community and its specific concerns.

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[59] Anonymous Landowner in discussion with the author, October 2024.

[60] Patrick Devine-Wright, "Explaining 'NIMBY' Objections to a Power Line: The Role of Personal Place Attachment and Project-Related Factors," *Journal of Environmental Planning and Management* 45, no. 6 (2012).

[61] Derek Bell, Tim Gray, and Claire Haggett, "Re-Visiting the 'Social Gap': Public Opinion and Relations of Power in the Local Politics of Wind Energy," *Environmental Politics* 22, no. 1 (2013): 116.

[62] Devine-Wright, "NIMBY Objections," 762; Dustin Tingley and Alexander Gazmararian, *Uncertain Futures: How to Unlock the Climate Impasse* (Cambridge University Press, 2013).

[63] Rogers, "Transmitting Consensus," 49.

Considerations for future transmission development

- Avoid developing in culturally sensitive areas.
- Produce socially optimal route proposals by conducting robust land surveys that compensate landowners.
- Increase landowner-developer cooperation through micrositing.
- Increase community-developer cooperation through community-led grants.
- Acknowledge the innate value of land.

Electromagnetic fields

Stories from the road: A Missouri doctor and landowner, concerned about potential health impacts, purportedly conducted an "unbiased" literature review. He found a report by 29 MDs and PhDs claiming EMF exposure causes childhood leukemia. Though the report was retracted in 2014 for its "unreliable," "ambiguous," and "flawed" research, the doctor's op-ed in the local newspaper and the study itself are still cited by opponents as evidence of harm.[64]

Category of opposition: harm

Drivers discussed and frequency: electromagnetic fields (30). Instances of EMF concerns are highlighted in figure 9.

Key takeaways: As the debate over the impact electromagnetic fields (EMFs) have on health continues, developers have a series of nationally determined standards they can cite to mitigate concerns. However, taking the time to meaningfully engage with host communities across the line can be costly. Yet, without meaningful engagement, misinformation and disinformation about EMFs will likely spread more easily.

[64] Stefan Schreck, Ladislav Miko, Robert Vanhoorde, and Michael Walsh, "BioInitiative Working Group Comments on 2014 SCENIHR Preliminary Opinion on Potential Health Effects of EMF," BioInitiative, April 12, 2014

Introduction

One of the most common and controversial objections to HVTL development is its association with EMFs and cancer. This association has become a hotbed for misinformation and disinformation, fear, and distrust in areas impacted by HVTL development. It has led to significant opposition from landowners, county officials, and even state legislators.

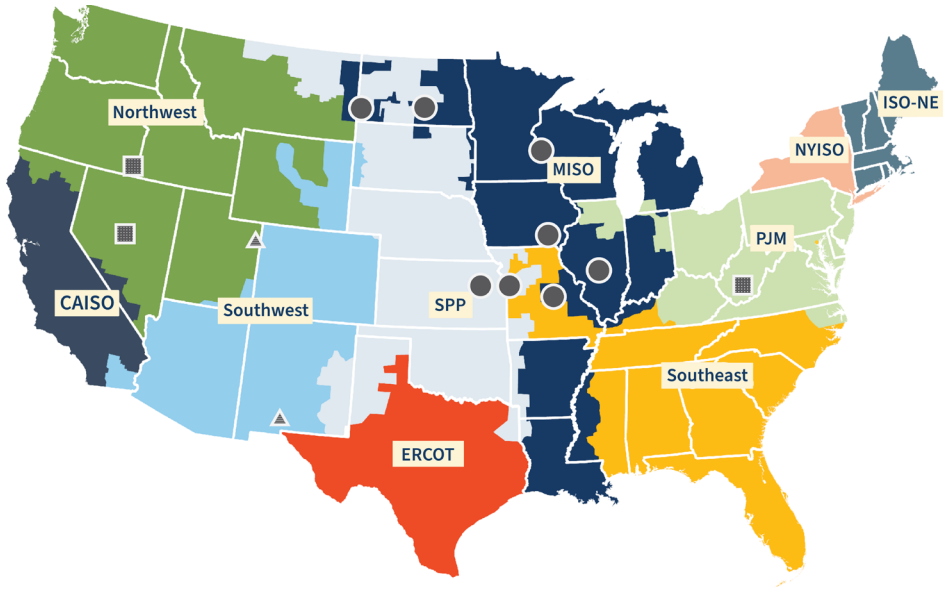

Figure 9. Instances of EMF concerns

In-person interviewee

Virtual interviewee

Prior in-person research

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Aime Bita, Great Plains Institute, and Esther Ramsay, Horizon Climate Group, based on data from Joshua Rogers, Great Plains Institute, and transmission planning regions by Abramson, Horizon Climate Group, and Narang, Clean Grid Initiative, 2025, adapted from FERC Order 1000 Regions shapefile, December 2024.

Interview results

Despite its commonality, concerns surrounding the impact of EMFs on local stakeholders' health varied in severity. Some landowners in Missouri, for example, were encouraged to leave their homes by a local doctor who was also hosting the line on their property. Others, according to an interviewee who had just moved next to a proposed HVTL easement, needed no prompting and chose to move due to fears of cancer. On the less extreme end, as discussed in the section on property values, it was not the fear of adverse health impacts that motivated opposition but rather the fear that potential buyers may have. Finally, for communities with a history of adverse health impacts from development, there was a tone of resignation that adverse health impacts were simply a fact of development.

Stakeholders who were not concerned about EMF impacts often joked about the concern, noting how similar arguments are made against wind turbines, which have no scientific backing.[65]

[65] Jason Semprini, *Does exposure to wind turbines affect cancer incidence? A quasi-experimental analysis linking SEER and Geological Survey data in a hierarchical framework* (University of Chicago, June 1, 2019).

What does the research say?

Exposure to EMFs is unavoidable, regardless of your proximity to HVTLs. Everyone interacts with EMFs to some degree from cell phones, microwaves, and even the Earth's magnetic field.

- ***Childhood leukemia:*** Concerns about non-ionizing EMFs' impact on childhood leukemia stem from a 1979 study suggesting a possible link between alternating current magnetic fields and increased cancer rates.[66] Since then, multiple studies have investigated this connection, but major health organizations, including the Environmental Protection Agency, the World Health Organization, and the National Cancer Institute, agree that the current body of literature does not confirm the existence of any health consequences from HVTL-emitted EMFs.[67] No evidence links EMFs to adult cancers, "such as leukemia, brain cancer, and breast cancer."[68]
- ***Research challenges:*** One challenge in studying EMFs from high-voltage power lines is exposure variability. Legally required setbacks, which limit exposure to people living near the lines, also make it difficult to gather reliable data. Furthermore, due to the hypothetical consequences, researchers are unable to use control groups, making the research highly correlational. Consequently, recent pooled studies (studies using data from numerous studies, conducted independently of one another, to form more robust conclusions) lack sufficient highly exposed subjects to establish a clear causation.[69] Given these limitations, despite extensive research on this topic, a scientifically definitive answer on EMFs and cancer risk remains unlikely in the near future.

Discussion

Combating fears around EMFs has, in large part, to do with the ability for developers to engage with landowners along the proposed route to combat misinformation and disinformation. Fears around EMFs often coalesce in two specific categories: (1) genuine fears around the health impacts EMFs have and (2) the impact others' perceived fears may have on one's property values. In both instances, ensuring landowners are engaged early and often and have a greater say in where the line is placed on their property is integral to mitigating fears of EMFs.

The National Electric Safety Code, written by the Institute of Electrical and Electronics Engineers and approved by the American National Standards Institute, provides developers with best practices and setback recommendations that increase with the line's voltage.[70] Developers who went beyond these standards and then communicated these findings openly to the public effectively dispelled fears. Doing this often enough to mitigate misinformation and disinformation, however, can be costly, especially for lines spanning hundreds of miles. Furthermore, because cost recovery for community engagement is controlled by state

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[66] Nancy Wertheimer and Ed Leeper, "Electrical Wiring Configurations and Childhood Cancer," *American Journal of Epidemiology* 109, no. 3 (1979): 274.

[67] "Electromagnetic Fields and Cancer," National Cancer Institute, reviewed May 30, 2022; "Electric and Magnetic Fields from Power Lines," US Environmental Protection Agency, updated July 24, 2024; "Radiation: Electromagnetic Fields," World Health Organization, August 4, 2016.

[68] "Electric & Magnetic Fields," National Institute of Environmental Health Sciences, last reviewed March 20, 2024.

[69] National Cancer Institute, "Fields and Cancer."

[70] Western Area Power Administration, *Living and Working Around High-Voltage Power Lines* (Western Area Power Administration, November 2021), 2; Institute of Electrical and Electronics Engineers, *The National Electrical Safety Code (NESC)* (Institute of Electrical and Electronics Engineers, August 2022).

public service commissions and their equivalents, these costs may not be deemed necessary. This will be discussed further in the "Engage early and often" section.

Considerations for future transmission development

- Reduce uncertainty by engaging in dialogue early and often throughout each phase of development.
- Promote a sense of security by highlighting and going beyond industry standards.

Transmission and renewable energy

Stories from the road: Landowners and conservationists in Nevada, angered by a new proposed HVTL, coined the term "renewable energy sprawl" to describe how transmission enables greater solar and wind development. Their opposition was primarily opposition against further development.

Category of opposition: need

Drivers discussed and frequency: renewable energy (35). Instances of renewable energy development associated with transmission development are highlighted in figure 10.

Key takeaways: HVTLs are becoming increasingly associated with renewable energy development. For communities that value the move to cleaner energy sources, this connection can positively impact how local stakeholders perceive a given project. The inverse is also true, however. Local stakeholders with a negative perception of renewable energy will likely voice that connection as a reason for their opposition. Given these associations, developers have found success by understanding and communicating the full slate of transmission benefits and tailoring their approach to messaging around the value systems of local stakeholders (energy agnostic for communities that embrace traditional energy resources and a renewable energy positive approach for towns that embrace renewable energy development).

Introduction

Renewable energy and HVTLs are connected in a variety of ways. They are both critical energy infrastructure needed to meet decarbonization goals and to meet rising energy demand in a timely and cost-effective manner. More renewable energy development will require more HVTL capacity. These connections have been noticed by transmission opponents and advocates alike who view HVTL development as a precursor and enabler of renewable energy, for better or for worse.

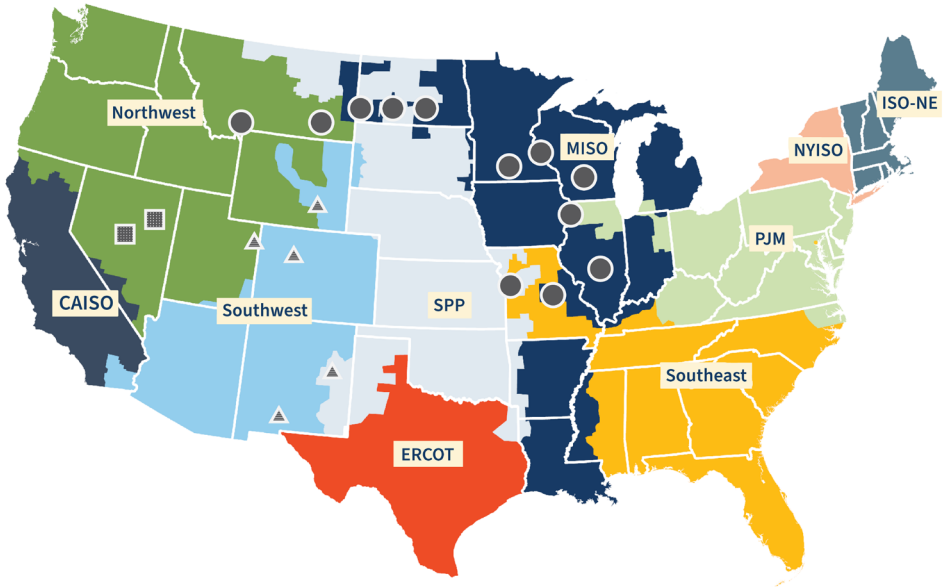

Figure 10. Instances of Renewable Energy Association

In-person interviewee

Virtual interviewee

Prior in-person research

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Aime Bita, Great Plains Institute, and Esther Ramsay, Horizon Climate Group, based on data from Joshua Rogers, Great Plains Institute, and transmission planning regions by Abramson, Horizon Climate Group, and Narang, Clean Grid Initiative, 2025, adapted from FERC Order 1000 Regions shapefile, December 2024.

Interview results

The results of this study suggest that the connection between HVTLs and renewable energy is not only present across different geographies but has a tangible impact on one's perception of the need for an HVTL.

Interviewees across the country noted how their perception of renewable energy often influenced their perception of transmission. For example, phrases like "renewable energy sprawl" (the incursion of renewable energy development in primarily rural areas) emerged in the Mountain West and Southwest as arguments against transmission development. Conversely, developers in Wisconsin explained how recent support for renewable energy development made obtaining social support for transmission projects easier.

What does the research say?

Although HVTLs and renewable energy have been implicitly connected in prior research (i.e., they have been studied together), that connection has been due to loosely associated connections to their impacts on the energy system as opposed to researching how local stakeholders perceive their connection, if any.[71] Research conducted by Rogers and by Ansolabehere et al. recently made the direct association between

[71] Susskind et al., "Opposition to Renewable Energy," 3.

transmission and renewable energy clear.[72] Researchers, however, are still grappling with the impact of positive or negative associations with renewable energy on the perception of HVTLs.

Discussion

Given the growing association local stakeholders have between HVTLs and renewable energy, it has become increasingly important for developers to understand how host communities perceive renewable energy development. In some instances, support for renewable energy development may aid in the value proposition of HVTLs.[73] However, as renewable energy projects become more controversial,[74] understanding and communicating the full slate of benefits associated with HVTLs (reliability, lower costs, national security, economic development, etc.) will become more important.[75] Developers in Montana, North Dakota, Iowa, Kansas, Missouri, and Illinois have found greater success using an energy-agnostic approach to communication.[76] Conversely, some developers, especially in Wisconsin and Minnesota, have found success promoting HVTL's connection with renewable energy. As such, developers may find success tailoring their treatment of the energy resource associated with their project to the local context.

Considerations for future transmission development

- Underscore the need for transmission by focusing on the slate of benefits associated with transmission: reliability, lower costs, national security, economic development, etc.
- Tailor the treatment of the energy resource associated with the transmission project to the local context.

[72] Rogers, "Transmitting Consensus," 37; Ansolabehere et al., *Grid Projects Get Stuck*, 15.

[73] Anonymous Developer in conversation with the author, November 2024.

[74] Weise and Bhat, "Plant Banned."; Brian Kennedy, Emma Kikuchi, and Alec Tyson, *Americans' Views on Energy at the Start of Trump's Second Term* (Pew Research Center, June 5, 2025).

[75] Abel Gustagson, Matthew Goldberg, Parrish Bergquist, Karine Lacroix, Seth Rosenthal, and Anthony Leiserowitz, "The durable, bipartisan effects of emphasizing the cost savings of renewable energy" *Nature Energy* 7, no. 11 (2022): 1023–1025.

[76] Anonymous Developer in discussion with the author, August 2024; Anonymous Developer in discussion with the author, September 2024; Anonymous Developer in discussion with the author, October 2024; Anonymous Developer in discussion with the author, November 2024; Anonymous Developer in discussion with the author, July 2025.

Transmission alternatives

Stories from the road: "Overhead transmission is an obsolete technology," noted Ms. X in Oregon. Living in an unregulated region of the country, Ms. X was particularly concerned about how the proposed transmission line running through her community came to be. The more she learned, the more concerned she became, and the easier it became to lead the opposition movement against the proposed project.

Category of opposition: need

Drivers discussed and frequency: local demand (35), undergrounding (25), alternative transmission technologies (14), highway ROWs (11). Instances of requests for transmission alternatives are highlighted in figure 11.

Key takeaways: Transmission alternatives are a series of practical and socially desirable technologies that reduce, though they do not eliminate, the need for HVTLs. As opposition to HVTL development increases, so will the importance of considering less impactful alternatives like advanced transmission technologies (ATTs), grid-enhancing technologies (GETs), distributed energy resources (DERs), virtual power plants, co-location of transmission, and undergrounding transmission.

Introduction

Opponents of high-voltage transmission commonly have alternative proposals that they view as less impactful. These alternatives vary widely and address different aspects of harm. What they all have in common, however, is the view that high-voltage transmission development is an archaic way to plan and build our energy system.

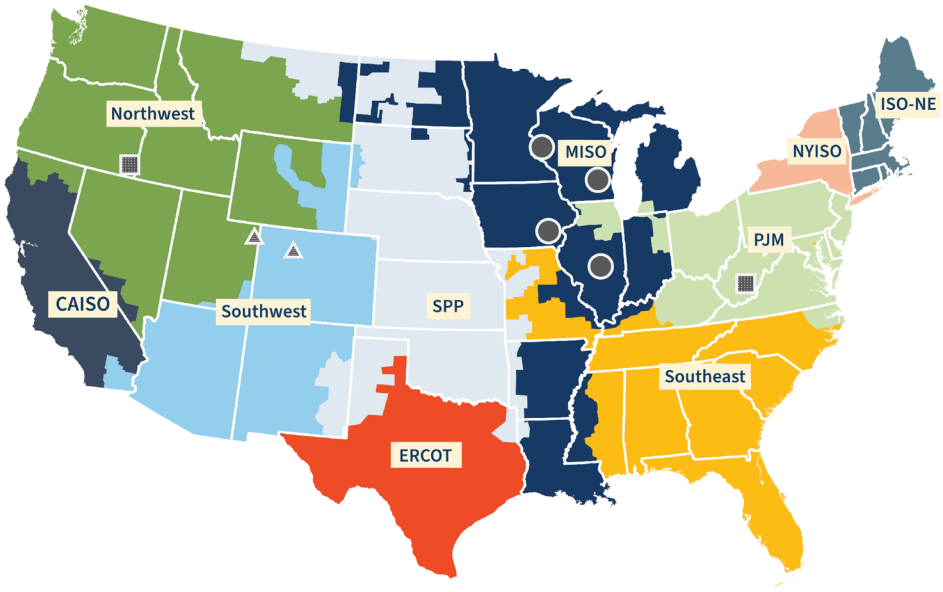

Figure 11. Instances of requests for transmission alternatives

In-person interviewee

Virtual interviewee

Prior in-person research

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Aime Bita, Great Plains Institute, and Esther Ramsay, Horizon Climate Group, based on data from Joshua Rogers, Great Plains Institute, and transmission planning regions by Abramson, Horizon Climate Group, and Narang, Clean Grid Initiative, 2025, adapted from FERC Order 1000 Regions shapefile, December 2024.

Interview results

Local stakeholders, especially those who have spent a great deal of effort opposing projects, often suggested alternatives to transmission development. Proposals include more local generation and microgrids to obviate the need for a transmission line, as well as buried transmission, also known as undergrounding transmission, along existing ROWs or public lands to mitigate impacts when transmission is built. None of these proposals will eliminate the need for HVTL development. They do, however, raise interesting questions about how our energy system is built and how groups respond to certain kinds of development. For example, data from this study suggests projects that are undergrounded along existing transportation ROWs see less public opposition, even if the developer does relatively less community outreach.

What does the research say?

How the energy system is structured has been a topic of debate since the United States began distributing energy.[77] A wide body of research shows that high-voltage transmission is necessary to meet affordability, reliability, and decarbonization needs. However, the type of transmission matters.

- ***Building an energy system:*** Proponents of transmission development and decarbonization have

[77] "The War of the Currents: AC vs. DC Power," US Department of Energy, November 18, 2014.

criticized regional planning authorities for not adequately considering the potential benefits of ATTs,[78] GETs,[79] and other solutions that can reduce the need for transmission, including virtual power plants[80] and DERs.[81] These technologies can help *quickly* and *cheaply* get more energy out of our existing grid. The US Department of Energy, for example, estimated that mass deployment of ATTs can save states and utilities up to $35 billion. Similarly, nationally deployed advanced conductors "could quadruple energy transmission capacity in the US by 2035 and save $85 billion in system costs."[82] Simultaneously, nearly every macro-analysis of how to decarbonize energy systems identifies HVTL development as the most cost-effective way to create a decarbonized, reliable, and cheap energy system. Both transmission proponents and opponents seem to agree that alternatives should be considered and incorporated more in policy development. High-voltage transmission development remains critical to the energy transition. Decarbonization is neither economic nor practical without it.

- ***Undergrounding HVTLs:*** Aside from alternatives to HVTLs, local stakeholders often advocate for less impactful approaches to development. Most notably, landowners advocate for burying or undergrounding HVTLs along existing transportation ROWs or public lands. These proposals are bolstered by proposed projects in Iowa and Illinois[83] and Quebec and New York,[84] one of which has already begun construction. Undergrounding has social and practical benefits, including greater resilience, reduced land use, and no viewshed impacts, among others. However, the high upfront costs associated with undergrounding, costly repair timeframes, and the untraditional nature of this kind of development have made these kinds of proposals uncommon.[85] The only developers who have taken up such projects are privately funded merchant developers.

Discussion

Alternative transmission technologies and different development strategies offer less impactful and controversial solutions to HVTL development. The way transmission is planned in the United States reduces the ability for some of these alternatives to be considered. Some states have begun requiring transmission planning authorities to evaluate the impact of GET and ATT in their modeling. California Senate Bill 100, for example, requires the regional planning authority, California ISO, to consider dynamic line ratings, advanced

[78] WATT Coalition, Grid Strategies, and American Council on Renewable Energy (ACORE), *Unlocking Power: A Playbook on Grid Enhancing Technologies for State and Regional Regulators and Policymakers* (ACORE, October 2024), 11.

[79] Katie Mulvaney, Katie Siegner, Chaz Teplin, and Sarah Toth, *GETting Interconnected in PJM: Grid-Enhancing Technologies (GETs) Can Increase the Speed and Scale of New Entry from PJM's Queue* (RMI, February 2024).

[80] Ryan Hledik, Kala Viswanathan and Kate Peters, "Virtual power plants: Resource adequacy without interconnection delays," *Utility Dive*, August 17, 2023.

[81] Srishti Slaria, Molly Robertson, and Karen Palmer, *Expanding the Possibilities: When and Where Can Grid-Enhancing Technologies, Distributed Energy Resources, and Microgrid Support the Future of the Grid* (Resources for the Future, September 21, 2023).

[82] Carter Harms, "With U.S. Energy Grid Under Strain, Governments Promote Technology Solutions," Pew Charitable Trusts, August 2, 2024.

[83] "Powering Energy Growth in the Midwest" SOO Green HVDC Link LLC, accessed April 2025.

[84] "Champlain Hudson Power Express: Home Page," Champlain Hudson Power Express, accessed April 2025.

[85] NGI Consulting, The Ray, Great Plains Institute, Satterfield Consulting, Tracy Warren, and 5 Lakes Energy, *NextGen Highways Feasibility Study for the Minnesota Department of Transportation: Buried High-Voltage Direct Current Transmission* (NextGen Highways, 2022), 67.

power flow devices, and topology optimization every two years.[86] Similarly, the Federal Energy Regulatory Commission's Order 1920 asks transmission operators to consider GET and other ATT in their long-term transmission planning.[87]

However, how these rules are implemented and their practical impact are yet to be seen. Furthermore, there are additional barriers to GET and ATT deployment, most notably misaligned incentives: the current cost recovery structure incentivizes utilities to construct capital-intensive projects instead of cheaper alternatives, like ATTs and GETs.[88] In response, some states have implemented performance-based rate making, which determines a utility's revenue based on its performance (reliability, energy efficiency, customer satisfaction, etc.).[89] Hypothetically, this approach could focus investment on transmission projects with the greatest public benefit. Finally, some argue that national transmission planning may be required to avoid the inefficiencies often produced by regional transmission planning.[90] This approach, though politically unlikely, would likely result in cost savings and a more efficient and reliable grid.[91] Even more, it was supported by some conservative local stakeholders in this study, who likened it to building out the national highway system.

[86] Paul Gerke, "Bill requiring utilities to consider grid enhancing technologies in transmission planning signed into California law," *Factor This*, September 26, 2024.

[87] "Fact Sheet | Building for the Future Through Electric Regional Transmission Planning and Cost Allocation," Federal Energy Regulatory Commission, last updated May 15, 2024.

[88] US Department of Energy, *Grid-Enhancing Technologies: A Case Study on Ratepayer Impact* (US Department of Energy, 2022), xii and 74.

[89] Gennelle Wilson, Cory Felder, and Rachel Gold, "States move swiftly on performance-based regulation to achieve policy priorities," RMI, March 31, 2022.

[90] Christina E. Simeone and Amy Rose, *Barriers and Opportunities to Realize the System Value of Interregional Transmission* (National Renewable Energy Laboratory, June 2024), 35; Rogers, "Transmitting Consensus," 81–82.

[91] "Macro Grid Initiative," American Council on Renewable Energy, accessed April 2025.

Transmission alternatives can be considered thoroughly and thoughtfully by RTOs, ISOs, and utilities across the country. As intense natural disasters from wildfires to hurricanes increase, the lifecycle costs of undergrounding transmission, for example, could be considered and compared against less resilient overhead transmission. Similarly, state and national regulations limiting co-located infrastructure could be eased. Initiatives like NextGen Highways have already begun advocating for such changes.[92]

Considerations for future transmission development

- Evaluate the impact of non-wire alternatives, grid-enhancing technologies, and ATTs on the energy system.
- Evaluate the impact of performance-based rate making on the energy system.
- Evaluate the impact undergrounding may have on ratepayers and the energy system.
- Assess the ability of developers to site HVTLs along transportation ROW.

[92] NGI Consulting, *Feasibility Study*, 1, 9–10.

Engage early and often

Stories from the road: After hearing from a neighbor about a proposed transmission line that would run through her family farm, Ms. X drove two hours to a press conference, purportedly with an open mind, just to be turned away because the developer was not ready to engage with landowners. Feeling disrespected and angry, she would later be elected to the local county commission in part due to her vow to oppose the project and help lead a group of landowners in a lawsuit against the developer.

Category of opposition: consultation

Drivers discussed and frequency: early and often engagement (66) and community-wide engagement (22). Instances of requests for early and often engagement are highlighted in figure 12.

Key takeaways: Early and often engagement is central to developers' ability to mitigate the effects of local opposition. However, not all kinds of early and often engagement are made the same. Effective engagement means it's open to everyone, consistently invested in throughout the development process, and communicated transparently and respectfully. Such an approach can reduce costs and maintain good community relations by effectively reducing opposition and building support. This, in turn, defrays legal and public relations and engineering costs over the lifespan of the project and reduces risk to the project overall. Regulators and policy makers can seek to incentivize this engagement by increasing legal requirements for engagement and reflecting the cost benefits of early and often engagement in rate cases.

Introduction

Early and often engagement has been touted as a key principle in community engagement for decades now, and participants in this study overwhelmingly agree.[93] HVTLs and other linear infrastructures, unlike geographically confined infrastructure like a power plant, may have to engage with thousands of individual stakeholders and dozens of governments, making stakeholder engagement processes incredibly complex. Furthermore, while they often require early engagement, regulatory processes limit the frequency and amount of engagement developers are allowed or incentivized to do to reduce the project's cost.

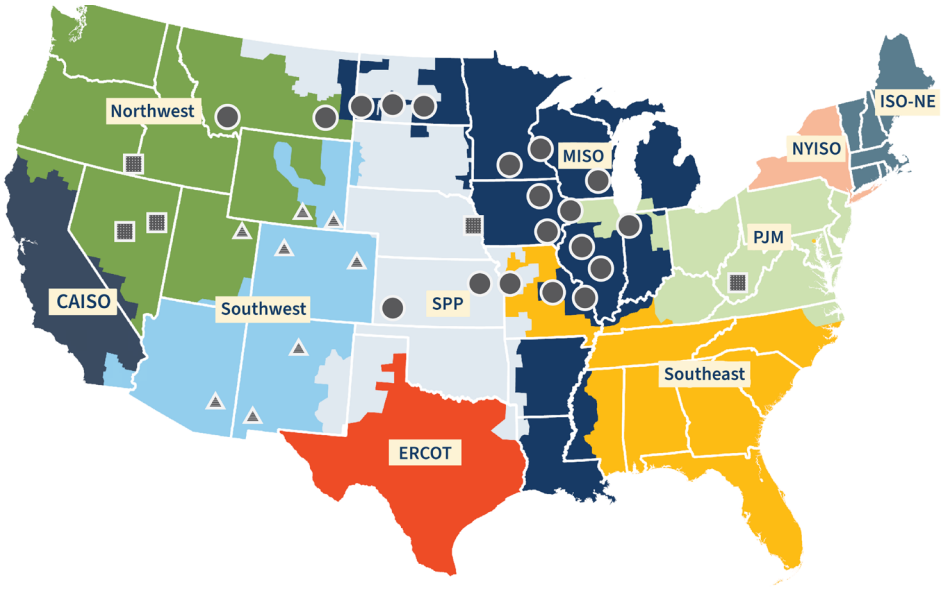

Figure 12. Instances of requests for early and often engagement

In-person interviewee

Virtual interviewee

Prior in-person research

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Aime Bita, Great Plains Institute, and Esther Ramsay, Horizon Climate Group, based on data from Joshua Rogers, Great Plains Institute, and transmission planning regions by Abramson, Horizon Climate Group, and Narang, Clean Grid Initiative, 2025, adapted from FERC Order 1000 Regions shapefile, December 2024.

Interview results

Interviews across the Midwest and West indicate that, absent early and continuous engagement, local stakeholders are liable to forget the project is happening, uncertainty and anxieties about the project's timeline may increase, and misinformation and disinformation can spread easily. Even more concerning for local stakeholders, however, is the feeling that they are being left out, cheated, or imposed upon by developers. Some of the most influential HVTL opponents interviewed in this study all found out about the project that would inevitably run across their land from concerned community members, as opposed to the developers themselves. This factor, though certainly not the only one, was raised during interviews as a motivating factor. The influential opponents we interviewed led thousands of landowners in lawsuits against transmission developers, were elected to local office, or helped develop a loosely connected national network of transmission opponents.

[93] Susskind et al., "Opposition to Renewable Energy," 7–8 and 13; US Environmental Protection Agency and US Office of Policy, Economics, and Innovation, *Public Involvement Policy of the U.S. Environmental Protection Agency* (US Environmental Protection Agency, May 2003).

What does the research say?

- ***Renewable energy:*** Early and often engagement is neither unique nor new. Researchers in the United States and abroad have consistently found that early and continuous engagement with local stakeholders and potential opponents has the potential to decrease the likelihood of delays, lawsuits, protests, cases of eminent domain, and ultimately, project cancellations.[94] In the case of wind and solar development, both qualitative and quantitative studies show that "perceptions of fair process are correlated with positive attitudes or support of wind and solar energy projects."[95] There is a broad consensus that this approach to engagement, which incentivizes local agency, constant communication, and transparency, works for renewable energy development.
- ***Transmission:*** Recently, reports from Americans for a Clean Energy Grid[96] and the Colorado Electric Transmission Authority,[97] among others, have honed in on early and often engagement as a helpful component in the siting and permitting of HVTLs. This is corroborated in research literature and interviews with stakeholders uniquely aware of transmission development, including landowner representatives, consumer representatives, tribal governments, union representatives, federal and state regulators, utilities, independent transmission developers, and environmental and conservation groups.

Discussion

HVTLs, pipelines, broadband, and other linear infrastructures face a much more difficult stakeholder engagement process than localized infrastructure projects. Depending on the length of the line, developers must engage constructively with thousands of landowners and dozens of counties, not to mention state and federal regulators, consumers, and legislators. Keeping a few best practices in mind, however, has the potential to mitigate opposition across stakeholder groups:

1. ***Early means everyone***: Transparent community-wide communication early in the process allows developers to get ahead of controversy, rebuke misconceptions, and begin to create a relationship with anyone who may be interested in the success or failure of the project.
2. ***Often means throughout***: Developers interviewed in this study who saw the most success either had very little impact on private landowners and communities or chose to engage with communities, often quarterly, to ensure they were updated on any recent changes, answer any questions they may have, and understand any controversies that may have arisen.
3. ***Intentional and transparent engagement***: Miscommunications between developers and

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[94] Susskind et al., "Opposition to Renewable Energy," 7–8 and 13; Leonhard Späth and Anna Scolobig, "Stakeholder empowerment through participatory planning practices: The case of electricity transmission lines in France and Norway," *Energy Research & Social Science*, 23 (2016): 189–198.

[95] Robi Nilson, Joseph Rand, Ben Hoen, and Salma Elmallah, "Halfway up the ladder: Developer practices and perspectives on community engagement for utility-scale renewable energy in the United States," *Energy Research & Social Science* 117, (2024); Jeremy Firestone, Ben Hoen, Joseph Rand, Debi Elliott, Gundula Hübner, and Johannes Pohl, "Reconsidering barriers to wind power projects: community engagement, developer transparency and place," *Journal of Environmental Policy and Planning* 20, no. 3 (2018): 370.

[96] Americans for a Clean Energy Grid and DNV, *The PACE of Trust: A Framework by Community Voices for Advancing Transmission* (Americans for a Clean Energy Grid, January 15, 2025); Americans for a Clean Energy Grid, *Recommended Siting Practices for Electric Transmission Developers* (Americans for a Clean Energy Grid, February 2023), 1.

[97] Gridworks, *Electric Transmission Development and Community Engagement: Literature Review and Best Practices* (Gridworks, April 2024).

landowners often arise when developers are unclear about the consequences of non-engagement (e.g., eminent domain, inability to microsite, etc.).

Despite the broad understanding that early investments into community engagement have the potential to reduce costs and time in the later stages of the project, there is little incentive for developers to continuously engage with communities. Statutes requiring community engagement often only require a few public meetings, which can be held in a relatively short period of time before developers are allowed to seek statewide permits. Even more, developers interviewed in this study complained of regulatory caps on how much they could recover from ratepayers for community engagements. There is a good reason for these kinds of concerns; consumers should not be required to pay for unnecessary expenses. Yet, once a project is approved, ratepayers are expected to pay for the consequences of the engagement process, good or bad: delays, lawsuits, eminent domain cases, etc. Regulators and legislators can find a balance between these two concerns, striving to enable effective community engagement and aiming to reduce the overall cost of the project for ratepayers.

Considerations for future transmission development

- Reassess informal and formal regulatory caps on rate-based recovery for stakeholder engagement.
- Engage with all local stakeholders (landowners, county government, local leaders, etc.) in the planning, permitting, construction, and operation phases of development.
- To promote greater cooperation, engage in transparent and intentional dialogue.

Micrositing

Stories from the road: "When I arrived in Montana to begin my research on a proposed transmission line, I expected support for the line. The company had invested millions of dollars into host communities by securing federal grants and investing their own funds. When I began speaking with developers and local stakeholders, however, it was not the money that stood out to them, but the respect the developer had shown landowners by listening to and, more importantly, acting upon their concerns. By choosing to create a socially optimal route, they gained the trust of the communities they hoped to be neighbors with for the coming decades."

— Joshua Rogers, report author and Energy Systems fellow at GPI

Category of opposition: consultation

Drivers discussed and frequency: micrositing (33). Instances of requests for or execution of micrositing are highlighted in figure 13.

Key takeaways: Micrositing is a key driver of landowner and local advocate support or opposition of a project. Investing in a socially optimal route, as opposed to an efficient route, has the potential to not only mitigate opposition to a project but also increase its support. Even more, this approach to community engagement creates a more cooperative relationship between host communities and developers, which may pay dividends when future conflict arises.

Introduction

Most developers engage in a form of micrositing: making small route alterations based on the preferences of impacted landowners. However, the current developer business model prioritizes route efficiency over social optimization. Flipping these models, while initially more expensive, may have greater cost savings for both the developer and consumers on the back end. Even more, it has been shown to be extremely effective in mitigating opposition to HVTL projects.

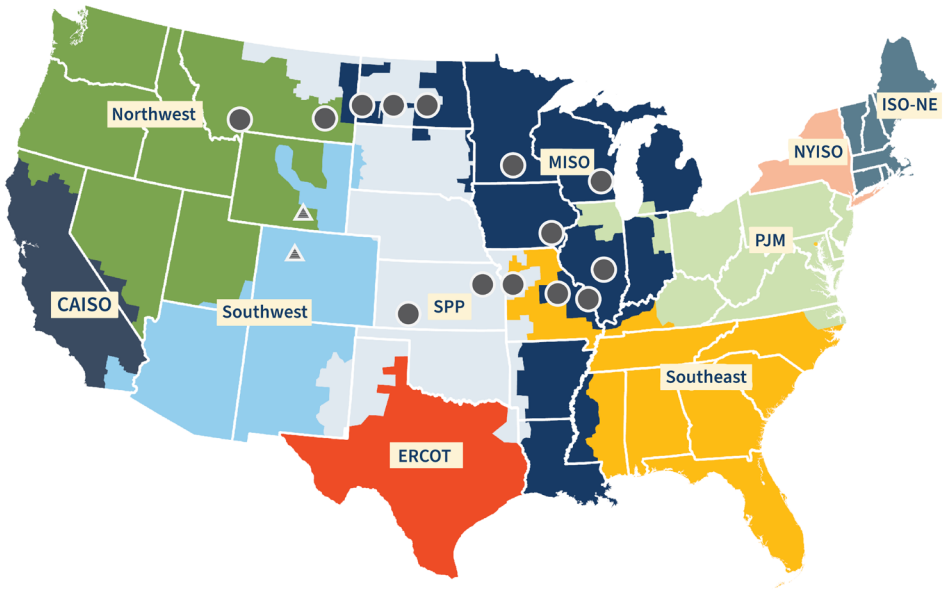

Figure 13. Instances of requests for or execution of micrositing

In-person interviewee

Virtual interviewee

Prior in-person research

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Aime Bita, Great Plains Institute, and Esther Ramsay, Horizon Climate Group, based on data from Joshua Rogers, Great Plains Institute, and transmission planning regions by Abramson, Horizon Climate Group, and Narang, Clean Grid Initiative, 2025, adapted from FERC Order 1000 Regions shapefile, December 2024.

Interview results

Micrositing, as defined in this study, has not been meaningfully discussed as a legitimate approach to development until recently. The basic principle, however, is simple: people are less likely to oppose HVTL development if they have a chance to mitigate its impact. Giving landowners the agency to decide where the line will go on their property creates a collaborative relationship and mitigates the possibility of a combative one. In one transmission project studied where micrositing was consistently used, opposition was almost non-existent. The project did have higher upfront costs related to intensive stakeholder engagement and a route optimized for social willingness instead of linear efficiency (i.e., micrositing). By focusing on meeting individual landowner interests, the final line route was longer, and construction costs (primarily due to increased material costs) were more expensive.[98]

Landowners impacted by that specific project typically had very large plots of land spanning hundreds, if not thousands, of acres. As such, it was easier for the developer to move the line to less impactful areas. Though

[98] Despite higher upfront costs, the absence of opposition led to minimal expenditures on conflict resolution. While the final project cost is still pending, the time and cost savings from avoiding opposition may ultimately result in a lower total cost than if a less deliberate approach had been taken.

landowners with smaller plots of land may not be able to mitigate the impacts to the same extent as larger landowners, there will likely be a socially optimal route. Land is a personal commodity, and finding the personal sensitivities within the land can only come from the landowners and local community members themselves.

Landowners and local advocates interviewed in this study consistently cited micrositing efforts as a driving factor for their support of specific transmission projects. However, in other situations where developers had promised landowners the ability to change the route on their property but later reneged on that promise after receiving state permits, these reversals became another reason to distrust developers' intentions.

Discussion

Current development practices optimize routes for linear efficiency and low upfront costs. The hypothetical result should be lower material costs and shorter project timelines. This thesis, however, fails to acknowledge the impact of political opposition on project costs. Developers who have begun to meaningfully engage with micrositing have proposed an alternative thesis: high upfront investments in socially optimal routing and engagement reduce costs on the back end. Even though this theory has yet to be fully tested, the initial results observed in this study are promising.

Barriers to micrositing do not end with developers, however. State regulators often require additional costly studies for route changes made outside of the route proposed to the public utility commission. As such, developers, because of the costs of these studies, are not incentivized to make any changes, regardless of their merit. Landowners are then given two options: intervene in the permitting process in the hopes of forcing the developer to conduct the study or submit to the initial route. Neither option yields an optimal outcome. Mutually agreed upon routing conducted prior to the permitting process mitigates the possibility of lawsuits and opposition and creates goodwill across the line.

It should be noted that micrositing, while an important part of traditional siting practices, would be less necessary if better "macrositing" practices are pursued, such as siting along existing transportation ROWs, including highways and railroads. Current regulatory barriers, however, make these practices difficult or impossible in many areas of the United States.[99] The more macrositing done early on, the less micrositing is needed as landowner negotiations begin.

Considerations for future transmission development

- Optimize route proposals for social efficiency as opposed to linear efficiency.
- Engage with communities early to identify sensitive areas at a broad and localized scale.
- Assess the ability of developers to site HVTLs along transportation ROW.

[99] "Co-locating Electric Transmission Lines Within Highway ROWs is a Transformative Opportunity," NextGen Highways, accessed May 2025.

Eminent domain

Stories from the road: "It's a marathon, not a sprint…so long as eminent domain is used, and property is being taken from landowners, I'll oppose these projects."

— Anonymous West Virginia Landowner

Category of opposition: consultation

Driver(s): eminent domain (54). Instances of eminent domain concerns are highlighted in figure 14.

Key takeaways: Eminent domain is a controversial policy that will always have the potential to cause both local and broad opposition to a project. Developers, regulators, and policy makers can support policies that aim to mitigate the need for eminent domain use and increase the compensation and standards needed for its use.

Introduction

Eminent domain refers to "the power of the government to take private property and convert it into public use."[100] Also known as a taking, this practice is largely responsible for most modern-day infrastructure systems, including railroads, highways, and many federal offices and parks.

Eminent domain is one of the leading drivers of opposition to high-voltage transmission development and is widely unpopular across the country. Furthermore, the unpopularity of eminent domain, combined with misinformation and disinformation about the policy, makes it incredibly difficult to communicate with local stakeholders, especially landowners, without receiving significant backlash. Increasing compensation for condemned land and significantly mitigating the use of the practice, either through restraint by developers or through public regulation, may reduce opposition based on its use.

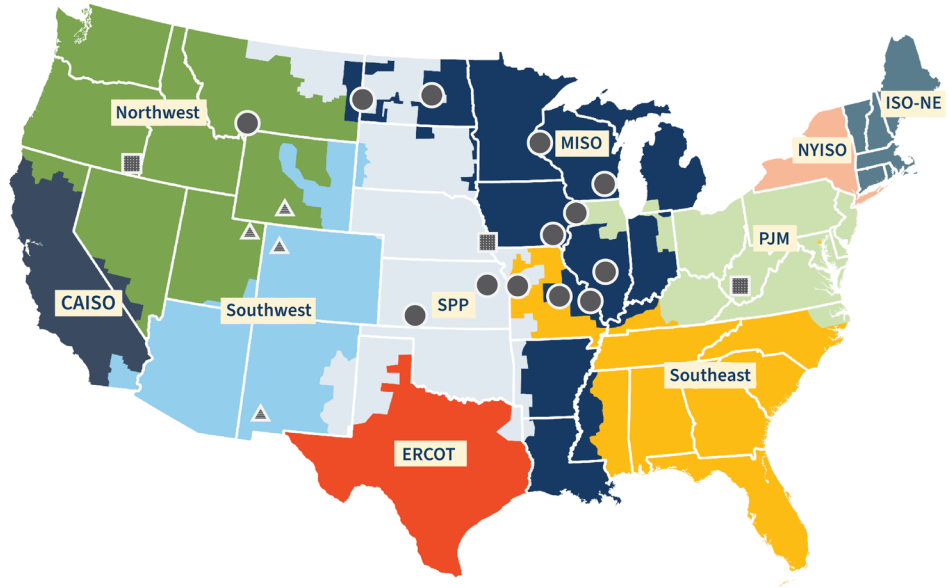

Figure 14. Instances of eminent domain concerns

In-person interviewee

Virtual interviewee

Prior in-person research

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Aime Bita, Great Plains Institute, and Esther Ramsay, Horizon Climate Group, based on data from Joshua Rogers, Great Plains Institute, and transmission planning regions by Abramson, Horizon Climate Group, and Narang, Clean Grid Initiative, 2025, adapted from FERC Order 1000 Regions shapefile, December 2024.

Interview results

Eminent domain consistently arose as a significant barrier to social acceptance of HVTL development among interviewees. Aside from general opposition to the practice, which is fairly widespread among those interviewed in this study, mis/disinformation surrounding the term's meaning exacerbated and enflamed people's opinions of the practice.

As noted below, the legal jargon used for eminent domain is a "taking." According to developers and landowners interviewed in this study, many transmission opponents have interpreted this literally. The resulting understanding is that transmission developers are allowed to simply take over a given landowner's property without compensation, which is illegal. Conversely, developers who actively chose not to seek

[100] "Eminent Domain," Cornell Law School Legal Information Institute, accessed April 2025.

eminent domain powers were praised by landowners and local stakeholders.

What does the research say?

- ***Troubled history:*** Eminent domain's history is troubled, to say the least. The practice was influential in facilitating racist and detrimental siting practices when building interstate highways.[101] Furthermore, some argue that the practice has been abused as courts broadened the government's use of eminent domain from the 1950s through the early 2000s. During this period, entire towns were leveled to make way for development that was determined to be in the public interest.[102]
- ***Modern-day perceptions:*** In a recent poll, 81 percent of respondents across 6 Midwestern states said they opposed the practice when used for private interests, giving examples of pipelines and shopping malls.[103] Earlier polls have similar results. Polls in 2008 and 2010 found that 87 percent and 81.3 percent of Americans opposed the use of eminent domain for private development.[104]

Discussion

As noted above, this study, along with others, shows that the practice is widely unpopular when it comes to HVTL development, especially among local stakeholders.[105] Yet, there is still widespread disagreement about how eminent domain should be used. Many developers, understanding the policy's unpopularity, have limited the amount they use it, with most communicating to the public that they will use it as sparingly as possible. Communicating this power to local stakeholders, however, regardless of how it is used in practice, always has the potential to be perceived in a negative light. As one developer put it, "If you tell landowners you have eminent domain when you first walk in the door, it looks like you're setting them up to bully them, but if you don't tell them, they are angry that you are hiding something from them."[106] Yet, foregoing any use of eminent domain becomes risky if landowner negotiations begin to stall.

It is not only developers who have had to work through how to apply eminent domain standards. Federal regulators,[107] legislators, and national advocates have pushed to give the federal government more authority to grant eminent domain to developers within areas designated as National Interest Electric Transmission Corridors (NIETCs).[108] State legislators interviewed in this study, as well as those who publicly spoke out against NIETCs, noted that a lack of community consultation and the breadth of the designations caused significant backlash from their constituents.[109] Even some of the developers who would have benefited most from these designations noted the backlash was making it more difficult to engage with communities. In

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[101] Michele M. Hoyman and Jamie R. McCall, "Not Imminent in My Domain!" County Leaders' Attitudes toward Eminent Domain Decisions," *Public Administration Review* 70, no. 6 (2010): 885–893; Noel King, "A Brief History Of How Racism Shaped Interstate Highways," *National Public Radio*, April 7, 2021.

[102] "History of Eminent Domain and its Abuse," Institute for Justice, accessed April 2025.

[103] Jared Strong, "New poll shows 81% oppose eminent domain for 'private projects,'" *The Gazette*, September 5, 2024.

[104] Logan Strother, "Beyond Kelo: An Experimental Study of Public Opposition to Eminent Domain," *Journal of Law and Courts* 4, no. 2 (2016): 5.

[105] Ansolabehere et al., *Grid Projects Get Stuck*, 38–39, 44 and 58; DNV and Americans for a Clean Energy Grid, *PACE of Trust*, 18.

[106] Anonymous Developer in conversation with the author, July 2024.

[107] "Explainer on the Notice of Proposed Rulemaking regarding Applications for Permits to Site Interstate Electric Transmission Facilities (12/15/22)," Federal Energy Regulatory Commission, last updated January 22, 2025.

[108] "National Interest Electric Transmission Corridor Designation Process," US Department of Energy, accessed April 2025.

[109] Robert Walton, "'Good riddance' says Oklahoma governor as DOE nixes 7 national transmission corridors, refines 3," *Utility Dive*, December 17, 2024.

the most extreme cases, misinformation and disinformation spread through social media influencers and Facebook groups falsely claimed that entire towns would have to be evacuated.

Eminent domain has, and likely always will, have a communications problem. Any federal, state, local, or private policy aiming to use eminent domain may also consider bolstering and supporting practices like macrositing and micrositing to reduce the need for the practice in the first place. Even more, as more development is proposed, increasing compensation for condemned properties and strengthening the standards developers must meet to condemn properties may add more credibility to the practice.

Considerations for future transmission development

- Limit the spread of misinformation and disinformation by engaging with communities early and often, detailing their rights with regard to eminent domain.
- Limit the use of eminent domain to the greatest extent possible.
- Increase compensation for condemned land.

Collective action

Stories from the road: "By the time we got to the end, I don't think there's anything else that someone else could have come up with, but it was also an interesting thing. By the end, the company was directing people to join our group. You know, there are these problematic landowners that were like, well, I'm worried about this and this, and eventually they just started saying, well, why don't you go talk to these guys, they kind of worked through all of this and have it all laid out. By the end, I mean, I think the company itself doubled our membership by the landowners they were directing to us."

— Anonymous North Dakota Landowner & Landowner Group Board Member

Category of opposition: consultation

Drivers discussed and frequency: collective action (15). Instances of productive collective action are highlighted in figure 15.

Key takeaways: Collective negotiations—when multiple landowners negotiate with developers as one group as opposed to individually—have consistently led to better outcomes across industries, and HVTL development is no exception. When developers and local stakeholders engage in productive collective negotiations, they can achieve benefits such as standardized easements, expedited project timelines, improved community relations, and reduced uncertainty. To maximize these advantages, developers and state regulators should consider actively promoting and facilitating collective negotiation processes.

Introduction

Though not commonly used, productive collective action by county officials and landowners has been shown to have extremely positive impacts on both the developer and the impacted landowners. The burden of forming these groups, however, typically falls on the shoulders of community leaders, often with limited access to the legal representation required for meaningful negotiations.

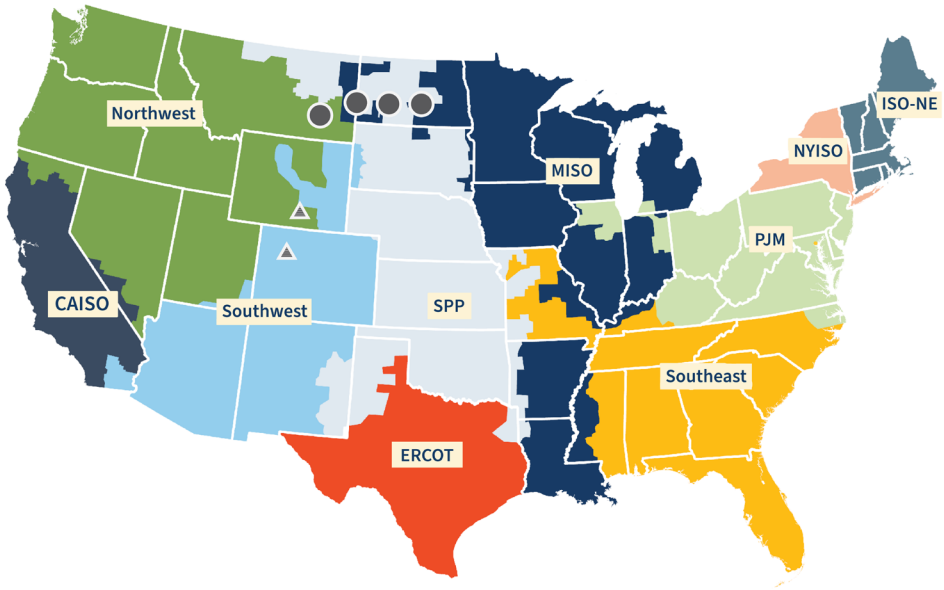

Figure 15. Instances of productive collective action

In-person interviewee

Virtual interviewee

Prior in-person research

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Aime Bita, Great Plains Institute, and Esther Ramsay, Horizon Climate Group, based on data from Joshua Rogers, Great Plains Institute, and transmission planning regions by Abramson, Horizon Climate Group, and Narang, Clean Grid Initiative, 2025, adapted from FERC Order 1000 Regions shapefile, December 2024.

Interview results

No developer observed in this study encouraged landowners to form a collective to negotiate easement contracts at the beginning of the development process. Rather, local leaders took the initiative to form these collectives. Only after developers saw the utility of collective negotiations, the benefits of which are discussed below, did they begin encouraging others to join it. This approach has two distinct disadvantages. First and foremost, it forces landowners to both understand the benefits of collective bargaining and voluntarily invest time and resources into convincing their neighbors to join and finding the necessary legal representation. Second, local stakeholders likely will not have the benefit of having done this before. Though not widespread, the two projects in this study that embraced local initiatives to bargain as a collective saw improved outcomes and better community relations.

What does the research say?

Collective negotiations and action have been shown to produce better overall outcomes across industries. Though research has primarily focused on the impact this kind of negotiation can have on labor disputes,[110]

[110] Katie Shonk, "Collective Bargaining Negotiations and the Risk of Strikes," Harvard University, Program on Negotiation, May 13, 2025.

global concerns like climate change,[111] and economic theories like the prisoner's dilemma or the Tragedy of the Commons,[112] the principles of collective negotiation are directly applicable to transmission development. However, what is clear from all these examples is that actions determined by and advocated for a collective tend to produce better outcomes. In the case of HVTL development, the same is true.

Discussion

Encouraging local stakeholders to engage in collective negotiation early on in the process and providing the technical resources necessary to make these conversations fruitful has the potential to foster faster and more equitable development practices. Similarly, statewide utility regulators could help advocate for a form of collective negotiations by providing technical resources and, at the very least, letting local stakeholders know that this is an option.

Developers who embraced this kind of collective negotiation benefited from the following:

- ***Fewer negotiations***
- ***Standard easements***
- ***Faster results***
- ***Greater local engagement***

Landowners and county commissioners who took the initiative to form these groups benefited from the following:

- ***Greater protection from liability***
- ***Better easement prices***
- ***Locally driven siting decisions***
- ***Greater certainty***

This is not to say that collective action always produces better results. Most landowner groups that form in response to an HVTL project are formed in opposition to it. However, encouraging landowner groups to form early in the process can improve community relations, speed up land acquisition processes, and mitigate opposition. As far as the author is aware, this kind of institutional encouragement has not occurred. The two examples of collective negotiation observed in this study were brought on by a connected county commissioner and a law firm specializing in easement negotiations. In the latter instance, surveying payments given to landowners by developers seeking to survey their land were used as dues to join the collective.[113]

Considerations for future transmission development

- Encourage and possibly facilitate collective negotiations between landowners and developers.
- Provide compensation for landowners interested in joining a collective negotiation.

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[111] Khushboo Awasthi Kumari and Rucha Pande, "Uniting for change: The imperative of collective action in a fragmented world," World Economic Forum, June 29, 2023.

[112] Landon Yoder, Courtney Hammond Wagner, Kira Sullivan-Wiley, and Gemma Smith, "The Promise of Collective Action for Large-Scale Commons Dilemmas: Reflections on Common-Pool-Resource Theory," *International Journal of the Commons* 16, no.1 (2022).

[113] Surveying payments were not commonly used by developers in this study. Yet, in this instance, they helped facilitate a productive collective negotiation.

Local tax revenues

Stories from the road: "I'll tell you, one gentleman…he was very up to date on that [how much tax revenues county governments should expect to receive from an HVTL] and it probably was because there was another line that goes through his county, and it's a 345 line, so he was acutely aware of exactly what [tax] benefits would be coming to his county. And when we had the open house, he approached us, and I'll be honest, we didn't even realize that until we talked to him…He was supporting the project."

— Anonymous Wisconsin Developer

Category of opposition: compensation

Drivers discussed and frequency: taxes—limited to no understanding (49), and taxes—good understanding (11). Instances of this knowledge are highlighted in figure 16.

Key takeaways: Local taxation has the potential to significantly increase the value proposition of HVTLs to host communities. State-assessed taxation schemes, however, make understanding the revenue implications of development inordinately difficult. Giving local stakeholders the tools to determine these revenues independently of the developer has the potential to increase support for the project.

Introduction

Increased local tax revenues are one of, if not the largest, monetary benefits host communities will receive from HVTL development. However, state-assessed taxation schemes make determining the amount of revenues benefiting impacted communities incredibly difficult for local stakeholders and government officials representing those communities. This lack of understanding dulls what could otherwise be a driving factor of support for development.

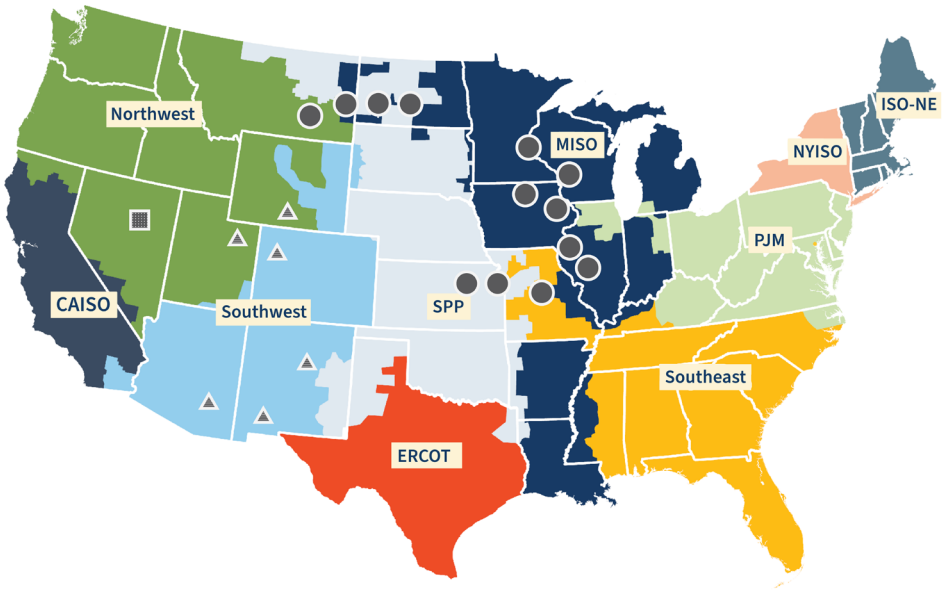

Figure 16. Instances of tax knowledge

In-person interviewee

Virtual interviewee

Prior in-person research

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Aime Bita, Great Plains Institute, and Esther Ramsay, Horizon Climate Group, based on data from Joshua Rogers, Great Plains Institute, and transmission planning regions by Abramson, Horizon Climate Group, and Narang, Clean Grid Initiative, 2025, adapted from FERC Order 1000 Regions shapefile, December 2024.

Interview results

Of the county commissioners and local government officials interviewed, roughly one in five were confident they, or someone they knew, could find out how much local tax revenue the proposed HVTL in their county would bring. Figure 16 above shows instances of confidence and instances of uncertainty. Developers were similarly pessimistic about local stakeholders' ability to understand expected tax revenues.

Discussion

The centrally assessed nature of utility taxation means that it is incredibly difficult, or, as one state tax official put it, sometimes "impossible" to determine the expected tax revenues HVTLs will bring for a specific county. Combined with local capacity constraints and a lack of public information necessary to calculate the expected benefits of the line, most county officials do not know how much revenue they should expect to receive from HVTL development. As such, they also lack the ability to communicate these benefits to their constituents.

Though developers occasionally provide estimates to local officials, these are often met with skepticism by local officials. This uncertainty limits the ability of developers and project proponents to communicate the potential benefits of development. However, anecdotal data from county commissioners and developers suggest that those who understand the tax implications of HVTL development, independent of developer-led studies, are likely to have a more favorable view of the project in its entirety.

Tax structures have historically been structured to aid developers and state regulators in taxing large, often multi-state corporations. Simplifying, decentralizing, or at the very least, giving local stakeholders the tools to understand how utilities are taxed would likely increase the value proposition of HVTL development for local stakeholders. It would also allow host communities to communicate the plans for how this increase in revenue would be spent (decreased taxation, local infrastructure, etc.).

Considerations for future transmission development

- Reassess the simplicity of centralized taxation of HVTLs.
- Provide education to local stakeholders on how to determine expected tax revenues from HVTLs.

Grants, donations, and other monetary incentives

Stories from the road: "I don't know if the [developer] is getting as much credit as they deserve for this…but at the end of the day…there's that initial push where like this is something cool the [developer] did and then eventually they leave the conversation and it's like, it is cool that we have this now, which may be what they want."

— Anonymous Economic Development Advocate in Montana

Category of opposition: compensation

Drivers discussed and frequency: community-led grants (25), and developer-led grants (11). Instances of monetary incentive concerns are highlighted in figure 17.

Key takeaways: Developers, especially merchant developers, often rely on monetary incentives to help build a rapport with local stakeholder groups. While these incentive structures have the potential to build goodwill between the developer and host communities, the inverse is also true. Monetary incentives can, by and large, be committed early in the development process without conditions. Furthermore, for large grants, engaging with trusted third-party facilitators and community leaders will help ensure local investments are spent in a durable and popular way.

Introduction

Developers across the country have made a point of making financial contributions to and investments in host communities. This practice has been used across industries to create goodwill with communities neighboring new development. However, not all incentive structures are the same; if done incorrectly, these kinds of investments can cause negative externalities and even opposition to the project.

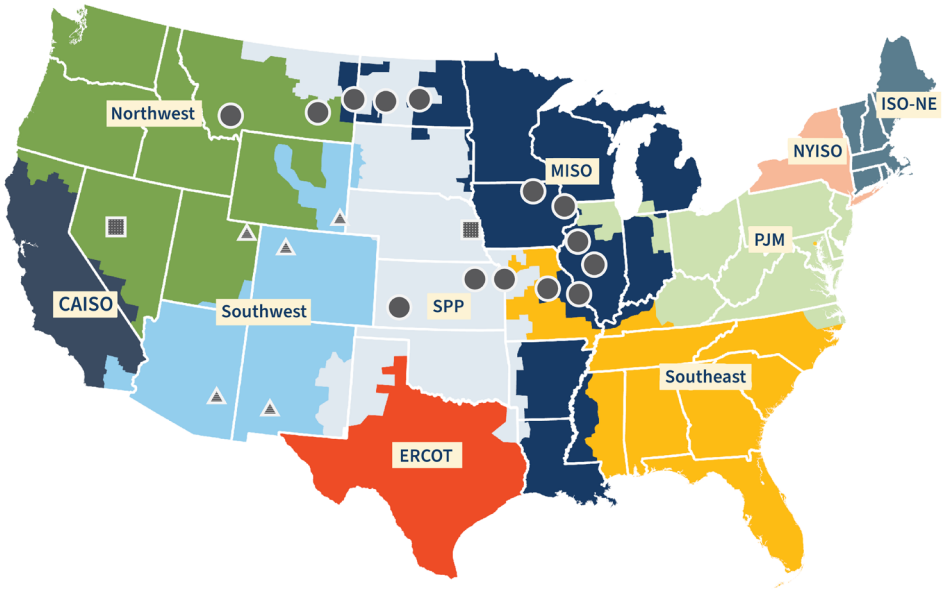

Figure 17. Instances of monetary incentive concerns

In-person interviewee

Virtual interviewee

Prior in-person research

Note: Multi-color regions on the map represent transmission planning regions.

Sources: Figure by Aime Bita, Great Plains Institute, and Esther Ramsay, Horizon Climate Group, based on data from Joshua Rogers, Great Plains Institute, and transmission planning regions by Abramson, Horizon Climate Group, and Narang, Clean Grid Initiative, 2025, adapted from FERC Order 1000 Regions shapefile, December 2024.

Interview results

Throughout the course of this study, there were five distinct monetary incentive structures utilized by developers, some to a greater degree than others, and all with varying success rates:

1. ***Developer-led***: Often small, one-time grants or purchases by developers (e.g., buying the prize cow or pig at a county fair and donating it back to the community).
2. ***Developer-led, applicant-based***: Often an online portal where local nonprofit organizations, schools, and businesses can apply for small loans.
3. ***Developer-led, community input***: Projects proposed by the developer with local consent.
4. ***Community-led, developer constraints***: Projects proposed by the community within parameters set by the developer.
5. ***Community-led***: Broad authority from community leaders to decide where the grant money will go.

Local stakeholders across the country were skeptical of the impact that incentive structures like these had on local perceptions of the project. Though they have the potential to build goodwill, local stakeholders noted that developer-led grants and donations, with no community input, could feel as though the developer was attempting to buy their support. Additionally, even in instances in which developers worked with communities to mobilize millions of dollars in host communities, mitigation techniques like micrositing and environmental or agricultural rehabilitation were described as more important to the perception of the project.

Discussion

Each of the incentive structures discussed has the potential to garner goodwill among local stakeholders and may create support for the project. They all, however, have the potential to have little to no impact on the overall perception of the project and may even cause opposition. Local stakeholders who feel developers are trying to buy their support, for example, are likely to oppose the project instead of supporting it. Common lessons appeared across incentive structures:

1. ***Early and often***: Local investments should occur early and continuously throughout the project's development.
2. ***Unconditional***: Local investments should not be tied to the project's success or any action by local stakeholders, including expressed or implied support of the project.
3. ***Trusted third-party facilitators***: Large grants have the potential to overwhelm local communities and create negative externalities. Trusted local or state nonprofit organizations can help create processes to manage and distribute locally determined funds.
4. ***Community-led:*** Local stakeholders know where to direct local spending best, and developers should lean on their expertise.

Considerations for future transmission development

- Provide unconditional, early, and continuous monetary incentives throughout the development process.
- Give communities agency over monetary incentives.
- Utilize trusted third-party facilitators for distributing large grants.

Conclusion

At GPI, we are committed to meeting people where they are to find solutions that help all people navigate and benefit from the transition to an equitable net-zero carbon economy. We began this project to give developers and policy makers a more nuanced understanding of *why* local stakeholders so often oppose high-voltage transmission projects and *what* they can do to mitigate that opposition.

As the United States continues to decarbonize, electrify, and reindustrialize, we will have to grapple with the challenges that increasing development pressure for high-voltage transmission presents. Understanding these nuances and the best practices to mitigate them is the first step in ensuring the rapid and equitable development of HVTLs.

The results of this study provide transmission advocates with a robust, grassroots-based framework to understand local opposition to HVTLs, particularly for landowners and county governments. At the highest level, local opposition to HVTLs can be separated into four primary categories:

- ***Harm*** → ***How will this project negatively impact my life?***
- ***Need*** → ***Why is this project necessary?***
- ***Consultation*** → ***How will I be consulted on this project?***
- ***Compensation*** → ***How will I be compensated for any potential harm?***

These categories represent a series of distinct concerns that typically drive local stakeholders to oppose HVTLs. Many of these concerns consistently appear in project development, regardless of geographic location. They also follow four questions that developers and transmission advocates should be prepared to answer and engage with as they begin engaging with local stakeholders.

Drawing on the author's prior research, the thoughts of 110 interviewees, and a review of 18 sets of public comments, this report focused on detailing and categorizing specific drivers of opposition to high-voltage transmission and the tools policy makers and developers have at their disposal to address these local concerns. Of the 37 distinct drivers of opposition identified in this study, a series of distinct and influential drivers were addressed due to their disproportionate impact or frequency.

The findings from this report provide a series of actionable considerations developers and policy makers may employ as we work together to reshape our energy system.

Strengthen community relations and trust

- Engage early, often, and transparently with all local stakeholders (landowners, county governments, local leaders, etc.) across all project phases.
- Reduce uncertainty through continuous communication, physically marked routes, education, and regularly updated timelines.
- Head off mistrust by providing education on expected tax revenues, land rights, and eminent domain proceedings.
- Encourage and facilitate collective negotiations between landowners and developers.
- Provide compensation for landowners interested in joining a collective negotiation.
- Promote micrositing, allowing landowners to maintain agency and control over their land.
- Avoid developing in culturally sensitive areas.
- Consider bolstering or imposing company-wide standards aimed at mitigating adverse environmental and agricultural impacts.

Improve incentive structures

- Provide unconditional, early, and continuous monetary incentives.
- Give communities agency over monetary incentives.
- Acknowledge the innate value of land and landowner time.
- Compensate landowners above fair market value for land obtained both voluntarily and by eminent domain.
- Consider compensating adjacent landowners adversely impacted by transmission development (for example, those who rely on agritourism).
- Reassess the simplicity of centralized taxation of HVTLs.
- Reassess informal and formal regulatory caps on rate-based recovery for stakeholder engagement.

Build trust through external partners

- Utilize trusted third-party facilitators for distributing large grants.
- Promote state-developer cooperation by working closely with state environmental protection and natural resource agencies
- Mitigate agricultural harms by employing agricultural and soil conservation specialists.

Communicate and evaluate broader energy system benefits

- Clearly communicate the slate of benefits HVTLs bring, including grid reliability, cost savings, economic development, national security, weather resilience, and more.
- Tailor the treatment of the energy resource associated with the transmission project to the local context.
- Evaluate the impact of non-wire alternatives, grid-enhancing technologies, and ATTs on the energy system.
- Evaluate the impact of performance-based rate making on the energy system.
- Evaluate the impact undergrounding may have on ratepayers and the energy system.
- Demonstrate consideration of alternative technologies and routing/siting options.

As more development begins to permeate American landscapes and communities, research must continue to gauge the efficacy of proposed solutions and development practices. Approaches to community engagement must continue to evolve to meet the needs of our time. Absent developmental and policy reforms, the ambitious decarbonization and energy goals of the United States will become increasingly difficult to achieve, developers will continue to face increasingly coordinated and effective opposition, and the history of distrust between developers and local stakeholders will continue to persist.[114]

[114] Americans for a Clean Energy Grid, *Recommended Siting*, 5; Tingley and Gazmararian, *Uncertain Futures*.