



NextGen Highways Feasibility Study for the Minnesota Department of Transportation: Buried High-Voltage Direct Current Transmission

Executive Summary for Energy Sector

The electric sector is in the midst of a rapid transformation: the nation is changing how we generate, deliver and use electricity. As a result of clean energy and efficiency technologies, the power sector now produces fewer carbon emissions than the transportation sector, a shift that makes electrification of the transportation key to a low-carbon economy.

Transportation decarbonization is only as successful as our ability to decarbonize the grid, however, and grid decarbonization is limited by inadequate transmission. We need long distance, high-voltage transmission lines in order to move clean energy from where it's generated to where it's needed. The transportation sector is uniquely positioned to help by opening up the highway right-of-way (ROW) to transmission and communications infrastructure.

Recognizing the interdependency of the electric, transportation and communications infrastructure and their role in decarbonization, the NextGen Highways concept advocates for strategic co-location of electric and communications infrastructure in the highway ROW to enable transportation electrification, universal broadband access and a clean energy economy.

In June 2020, the Minnesota Department of Transportation (MnDOT) established a Sustainable Transportation Advisory Council (STAC) to help MnDOT plan for reducing carbon emissions. As part of its first set of recommendations to MnDOT in December 2020, the STAC recommended that MnDOT examine the value of NextGen Highways. The STAC's recommendations also included asking MnDOT to update its utility accommodation policy and initiate a multi-stakeholder process focused on NextGen Highways.

The NextGen Highways Team worked with an internal working group at the Minnesota Department of Transportation (MnDOT) to investigate the opportunities and barriers associated with locating buried high-voltage direct current (HVDC) transmission and fiber within the highway ROW.

The [Feasibility Study](#) reviewed applicable policy, regulation, and projects; analyzed MnDOT-specific concerns; examined HVDC transmission line requirements; assessed buried HVDC cost and benefits; and broadly evaluated typical highway ROW design for suitability of HVDC transmission line siting.

The findings from this study demonstrate that buried HVDC transmission is cost-effective and can be feasibly sited in interstate and highway ROW after making appropriate consideration for existing and future transportation system needs. While the team identified challenges to be addressed— including state law and policy prohibitions – none of those challenges pose barriers that cannot be overcome.

Purpose and Need

Hundreds of billions of dollars are now being invested in electric, connected, and autonomous vehicles. To fully support these vehicles, our existing transportation infrastructure will need to evolve to incorporate electric and communications infrastructure. This evolution is required to power these vehicles and the necessary communications infrastructure. In short, our existing transportation, communications and electric infrastructure will need to become integrated.

State transportation leaders see several key challenges arising from integrating transportation, communications and electric infrastructure. In each case the solution presents an opportunity for both sectors:

Challenge: Fleet electrification will require extensive upgrades of electric infrastructure in and/or along highway corridors

Opportunity: Enable the required electric grid upgrades by providing electric utilities with highway ROW access for buried transmission or distribution

Challenge: Reducing vehicle miles traveled by enabling remote work, learning and services, such as telehealth.

Opportunity: Expand broadband access by deploying fiber in the DOT ROW to provide sufficient access and capacity

Challenge: Maximizing the benefits of the highway system for adjacent communities, while mitigating negative impacts

Opportunity: Use the transportation system to (1) deliver community benefits such as broadband and economic development resulting from access to clean energy; (2) reduce air and noise pollution by supporting the electric grid investments needed to accelerate vehicle and fleet electrification; and (3) reduce the private land acquisition needed to accommodate new high-voltage transmission

Federal policy and funding to encourage integrated infrastructure is emerging. In April 2021, the Biden Administration announced a coordinated set of actions by the US Department of Energy and the US Department of Transportation that would encourage the development of “Clean Energy and Connectivity” projects along the nation’s highway system.

Minnesota Feasibility Study Background and Scope

In its April 2021 response to the STAC recommendations, MnDOT committed to working with the NextGen Highways Team and other stakeholders to conduct a Feasibility study to clarify opportunities and challenges to co-locate broadband and electric transmission in interstate and highway ROW.¹ The [Feasibility Study](#) details the Minnesota Department of Transportation findings.

NATIONAL FINDINGS

The following findings demonstrate that buried HVDC transmission is cost-effective and can be sited in interstate and highway ROW through appropriate consideration of transportation system needs.

- 1) Transmission and fiber have been and are being sited in interstate and highway ROW across the United States.
- 2) Much of the interstate is suitable for buried HVDC transmission and fiber, *but* certain areas require special considerations or routing outside of the interstate ROW.
- 3) Buried HVDC transmission can be compatible with interstate and highway ROW.
- 4) [Buried HVDC transmission is comparable in cost to overhead AC transmission while providing additional reliability and resilience benefits.](#)

¹ [MnDOT Response: 2020 Sustainable Transportation Advisory Council Recommendations](#)

- 5) Together, DOT ROW and buried HVDC transmission can deliver billions in societal benefits.
- 6) Buried HVDC transmission supports transportation decarbonization.
- 7) Wisconsin has the playbook for siting transmission in DOT ROW.

NATIONAL RECOMMENDATIONS

State DOTs should consider:

- Deploying fiber in a way that would enable co-locating buried HVDC transmission later
- Developing and investing in their relationships with utilities, public utilities commissions, and other state agencies with transmission siting jurisdiction
- Determining the amount of operational funding required to support the co-location of electric and communications infrastructure in their ROW

Utilities and energy developers should consider:

- Developing and investing in their relationship with state DOTs
- Evaluating how highway ROW (if available) could enable the various grid investments needed to support electric vehicle charging
- Evaluating how planned regional and interregional transmission lines could benefit from highway ROW (if made available)

Governors should consider:

- Supporting and facilitating the implementation of Wisconsin's co-location playbook
- Working with their DOT, utilities, and legislature to remove any statutory barriers in state law
- Evaluating options to provide their DOT with operational funding to support the co-location of electric and communications infrastructure in the ROW

Next Steps for NextGen Highways

Given the positive findings from this Feasibility Study, the NextGen Highways Team is planning to launch a NextGen Highways Coalition to support the co-location of buried fiber and transmission in highway and interstate ROW.

The NextGen Highways Coalition will do the following:

- Facilitate conversations between state DOTs, utilities, and governors
- Facilitate conversations between state DOTs, utilities, and technology vendors

- Review states' highway ROW siting and permitting regulations, identify barriers to co-location, and work with stakeholders to overcome barriers
- Share insights and best practices across states
- Provide a platform through which tribes, communities, nonprofits, cities, and companies can understand the required transformation of the national highway system
- Foster public/private partnerships to build out the required infrastructure

Interested parties can email randy@nextgenhighways.org and mprorok@gpisd.net for more information.

About NextGen Highways

The NextGen Highways is a collaborative initiative promoting the use of highways and other existing rights-of-way as infrastructure corridors where electric and communications infrastructure are strategically and safely co-located in existing highway right-of-way. Learn more at <http://www.NextGenHighways.org>