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FHWA MN Peer Exchange Final Report

Leveraging Highway ROW to Meet Future Needs: Electrification, CAV, and Transmission

June 28-29, 2022
Hosted by the Minnesota Department of Transportation
St. Paul, MN



[Technical Report Documentation Page]

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Abbreviations & Acronyms

- AC - Alternating Current
- CAV - Connected and Autonomous Vehicle
- CO - Central Office: Bureau of Highway Maintenance
- CPCN - Certificate of Public Convenience and Necessity
- DC - Direct Current
- DOT - Department of Transportation
- EV - Electric Vehicle
- EVCS - Electric Vehicle Charging Station
- EVSE - Electric Vehicle Supply Equipment
- GHG - Greenhouse Gas
- GIS - Geographic Information Systems
- HVDC - High-Voltage Direct Current
- IIJA - Infrastructure Investment and Jobs Act
- ITS - Intelligent Transportation Systems
- MnDOT - Minnesota Department of Transportation
- NEVI - National Electric Vehicle Infrastructure
- O&M - Operations and Maintenance
- OEM - Original Equipment Manufacturer
- OTSM - Office of Transportation System Management (Minnesota)
- P3 - Public/Private Partnership
- PPA - Power Purchase Agreement
- PSC - Public Service Commission
- RFP - Request for Proposal
- ROW - Right-of-Way
- UAP - Utility Accommodation Policy

Executive Summary

The Minnesota Department of Transportation (MnDOT) along with the NextGen Highways (NGH) team released a feasibility study in 2022 to evaluate considerations for Next Generation Highways–highways that strategically co-locate buried high-voltage direct current (HVDC) transmission lines with fiber in highway right of way (ROW). With support from the Federal Highway Administration (FHWA), MnDOT hosted a Peer Exchange to continue analyzing this model and exploring ways to leverage highway ROW to meet future needs.

The two-day event was held in person June 28 - 29, 2022 in St. Paul, MN. Representatives attended from 15 federal and state agencies, as well as universities. The peer exchange used a variety of session formats–plenary, breakouts, open discussions, and Q&A to engage participants. Topics included:

- NextGen Highways
- ROW valuation
- Broadband
- Utility Accommodations Policies (UAPs)
- Legal Issues Surrounding ROW Use
- Fiber Placement
- Connected and Automated Vehicles (CAV)
- Intelligent Transportation Systems (ITS)
- National Electric Vehicle Infrastructure (NEVI)
- ROW Solar

Key Takeaways

- Participants came to the Peer Exchange to gain knowledge, explore implementation barriers/solutions, and gather best practices from other states.
- Peer Exchange participants agreed that the NextGen Highways model warranted further study.
- A need for communication and coordination became apparent to continue to advance topics–like transmission and fiber placement.
- There was a general consensus among Peer Exchange participants wishing for more federal guidance on these topics and greater consistency of the application of relevant state laws.
- Participants found the Peer Exchange valuable and suggested improvements for future events.
- During the Peer Exchange, agency representatives highlighted several *opportunities* for future work on this project related to costs, regulations, stakeholder engagement, education, asset ownership, and analyzing needs and impacts.

Next Steps

As a continuation of the feasibility study and Peer Exchange, MnDOT will work with partners to accomplish various next steps including:

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- Establishing a Plan to Address Regulatory Barriers
- Conducting a GIS Suitability Analysis
- Studying the Wisconsin DOT Transmission Playbook
- Exploring Transmission Construction/Maintenance
- Expanding Fiber and Communications Infrastructure Analysis
- Expanding Stakeholder Analysis
- Conducting a Formal Business Impacts and Risks Analysis
- Creating a Description of HVDC Infrastructure

Introduction

In 2021, the Minnesota Department of Transportation (MnDOT) joined a feasibility assessment with the NextGen Highways (NGH) team to evaluate technical and regulatory considerations for Next Generation Highways–highways that strategically co-locate buried high-voltage direct current (HVDC) transmission lines with fiber in highway right of way.

The NGH team–comprised of The Ray, NGI Consulting, Great Plains Institute, Satterfield Consulting, Tracy Warren, and 5 Lakes Energy–developed a comprehensive feasibility study to evaluate the potential for high-voltage direct current (HVDC) transmission to be buried in the highway ROW.

The NextGen Highways Feasibility Study: Buried High-Voltage Direct Current Transmission report was released in April 2022. This peer exchange represented a continuation of the analysis of impact and opportunities for DOTs presented by this model.

Held June 28-29, 2022, this two-day peer exchange engaged DOT experts across many functional areas to consider the integration of policy and practice for potential future transmission lines, Broadband Utility Accommodation, ITS, Right of Way, EV Charging infrastructure, Connected and Autonomous Vehicles, and Renewable Energy projects. Participants also evaluated the safety, statutory environment, and long-term planning implications of the NextGen Highways model. Policies such as dig once, resource sharing, valuation of the right of way, utility accommodation policy, public private partnerships were explored.

The increasing interest in leveraging existing highway rights of way for clean energy and connectivity projects offers opportunities to support the electrification of transportation, address insufficient transmission capacity and build for our transportation future by integrating electric and communications infrastructure into our existing transportation rights of way. To support federal and state goals for decarbonizing the economy and electrifying transportation, additional electricity transmission is needed to incorporate renewable resources, serve new loads–especially for EV charging–and improve grid reliability and resiliency.

Background

NextGen highways are highways planned, built, and maintained with the electric and telecommunications infrastructure strategically co-located in the highway right-of-way (ROW). Enabling electric transmission and fiber optic lines to be longitudinally sited within highway and interstate ROW can:

- **Build for the transportation future** by integrating electric and communications infrastructure into the existing transportation infrastructure;

- **Enable a clean energy economy** by building the transmission needed to affordably achieve 100 percent clean energy and by ensuring the electric grid can be rapidly expanded in transportation corridors to support electric vehicles charging needs;
- **Unleash economic development** by removing barriers that are currently holding back a trillion dollars of private investment in a clean energy economy that would create new jobs, services, and technologies;
- **Strengthen national security** by constructing an energy and communication backbone that is hardened against severe weather events to cyberattacks; and
- **Improve equity** by remedying the enduring air quality impacts of the interstate system, which disproportionately affect low-income communities and Black, Indigenous and people of color communities, and by increasing broadband access in rural and urban communities.

In partnership with the Minnesota Department of Transportation (MNDOT), the NextGen Highways (NGH) team developed a comprehensive feasibility study to evaluate the potential for high-voltage direct current (HVDC) transmission to be buried in the highway ROW. This study also sought to identify technical, regulatory, and economic barriers to deployment, where they existed.

MnDOT's internal working group consisted of 14 state offices, departments, and divisions representing transportation, sustainability, health, innovation, commerce, law, utilities, land management, and IT. These members expressed concerns regarding:

- Safety for passenger vehicles and highway maintenance and construction crews
- Future highway expansion needs
- Utility infrastructure relocation costs
- Impacts to adjacent infrastructure such as bridges
- Policy and jurisdictional restrictions

Through months of frequent communication and collaboration with MNDOT, the NGH team identified several key findings both for Minnesota specifically, and for the national context more broadly.

Minnesota-Specific Key Findings

1. No insurmountable barriers to expanded transmission and broadband were uncovered. Statutes, rules, policies, and Utility Accommodation guidance would need to be expanded and updated.
2. There was significant alignment between the NextGen Highways vision and MnDOT's existing goals, policies, and strategic plans.
3. A few barriers were found that would require statutory and/or policy changes (such as responsibility for utility relocation cost and state law prohibiting longitudinal siting of transmission within interstate highway ROW)
4. A few barriers found would require process changes (e.g., obtaining as-built utility location data, additional coordination steps prior to applying for a utility permit from MnDOT)
5. Key findings, opportunities, and challenges were identified across sixteen different topic areas (see Table 3 from the Feasibility Study)

National Key Findings

1. Buried HVDC transmission can be sited in Interstate and highway ROW after giving appropriate consideration to transmission system needs.

2. The State of Wisconsin has developed a playbook that can be used by other states to successfully site transmission in interstate and highway ROW.
3. Buried HVDC transmission can be cost-effective.

HVDC Technical Findings

1. Safety features for HVDC lines include: (1) burying underground, (2) surface and subsurface markings, (3) restricted access, (4) thick cable insulation, (5) conduit, (6) cable shield ground points, and (7) adherence to MnDOT's utility accommodation manual for permitting, construction, and environmental restoration and traffic control.

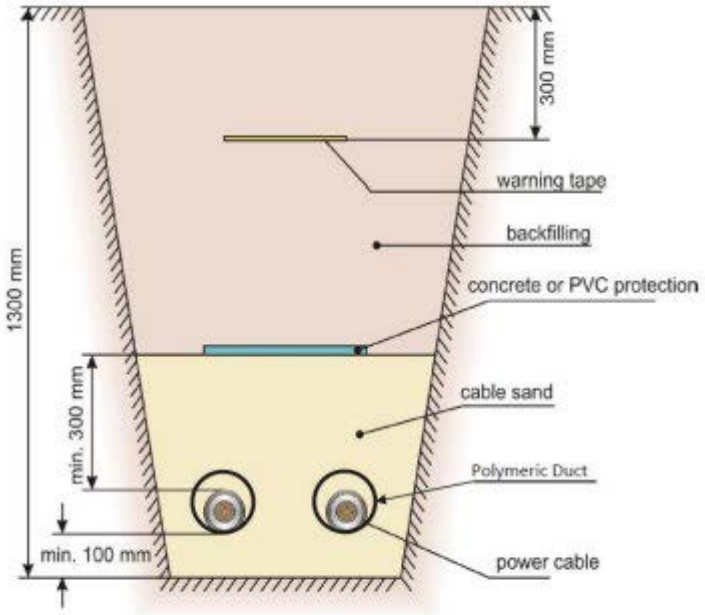


Figure courtesy of Southwire

2. A buried HVDC transmission line would not have any above ground infrastructure in the ROW. Associated HVDC converter stations would be placed well outside of the ROW.
3. Buried HVDC transmission lines have minimal impact on surrounding infrastructure. HVDC transmission lines do *not* erode surrounding pipes, disrupt nearby communication equipment, or negatively impact the functionality of health devices–such as pacemakers.

For a full review of study findings and supplemental information, please see the full Feasibility Study.

Peer Exchange Overview

The Minnesota Department of Transportation (MnDOT), with support from the Federal Highway Administration (FHWA), hosted a peer exchange focused on leveraging highway right-of-way (ROW) to meet future needs. This peer exchange offered MnDOT the opportunity to examine relevant technologies and policies in a concentrated setting alongside an outside panel of peers, stakeholders, and experts. The goal of this exchange was to facilitate sharing of ideas and best practices that can benefit all parties.

The two-day event was conducted in person in the City of St. Paul. The peer exchange hosted a series of plenary and breakout sessions, along with question-and-answer opportunities. Day 1 sessions covered:

Day 1

- Introduction to NextGen Highways Concept & Feasibility Study
- Discussion Breakouts: What Questions Do You Have on the NextGen Model?
- Broadband
- Modeling & Value of ROW
- Legal Issues in Emerging, Alternative and Commercial Uses of Right of Way
- Emerging Utility Accommodation Policies
- WisDOT's Transmission Playbook

At the conclusion of Day 1, participants expressed a desire for additional discussion sessions and opportunities to interact with one another. The Peer Exchange Team adjusted the Day 2 agenda to facilitate more open discussions and maximize the experience for participating agencies. Day 2 sessions included:

Day 2

- Addressing Barriers to Buried HVDC Transmission: MnDOT's Phase II Work Scope & Open Discussion
- Lightning Round I: A) CAV/ITS; B) EV Charging/NEVI; C) 5G
- Lightning Round II: A) Environmental Issues B) Solar, Rural Issues and Opportunities C) Relocation of Utilities
- Innovative Statute Roundtables
- Interactive Discussion on Action Items
- Key Takeaways Group Discussion

Participating Agencies

Participants and speakers attended representing 15 federal and state agencies, as well as universities. These guests included:

- FHWA

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- Joint Office of Energy and Transportation
- Arizona Department of Transportation
- Colorado Department of Transportation
- Delaware Department of Transportation
- Iowa Department of Transportation
- Maryland Department of Transportation
- Michigan Department of Transportation
- Minnesota Department of Transportation
- Missouri Department of Transportation
- North Dakota Department of Transportation
- Ohio Department of Transportation
- Utah Department of Transportation
- Wisconsin Department of Transportation
- University of Minnesota
- Iowa State University



The Peer Exchange Team

- Minnesota Department of Transportation
- The Ray
- NGI Consulting
- Great Plains Institute
- Satterfield Consulting
- Tracy Warren
- 5 Lakes Energy

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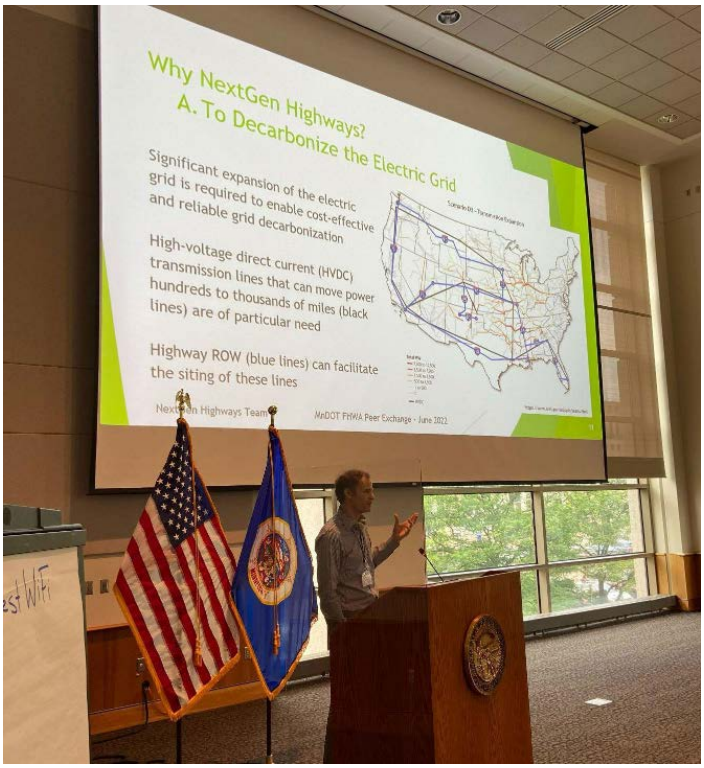
Peer Exchange Sessions

Day 1

Plenary Session: Introduction to NextGen Highways Concept & Feasibility Study

Speakers: Morgan Putnam - NGI Consulting and Jessica Oh - MnDOT

- MnDOT's Sustainable Transportation Advisory Council (STAC) recommended MnDOT participation and MnDOT joined the project as the DOT case study for the Feasibility Study
- Recent federal actions from FERC, Congress, US DOT and FHWA have spurred increased interest in leveraging highway ROW for energy and communications infrastructure
- NextGen Highways can enable grid decarbonization, accelerate transportation electrification, and expand broadband access in both urban and rural communities
- Siting is a major barrier to building new transmission, particularly interstate, interregional transmission that is needed for a modern, low-carbon, reliable and affordable grid.
- The NextGen Highways feasibility study found no insurmountable barriers to deploying buried transmission and fiber in interstate and highway ROW after making appropriate considerations for transportation safety and for future transportation maintenance and expansion needs.

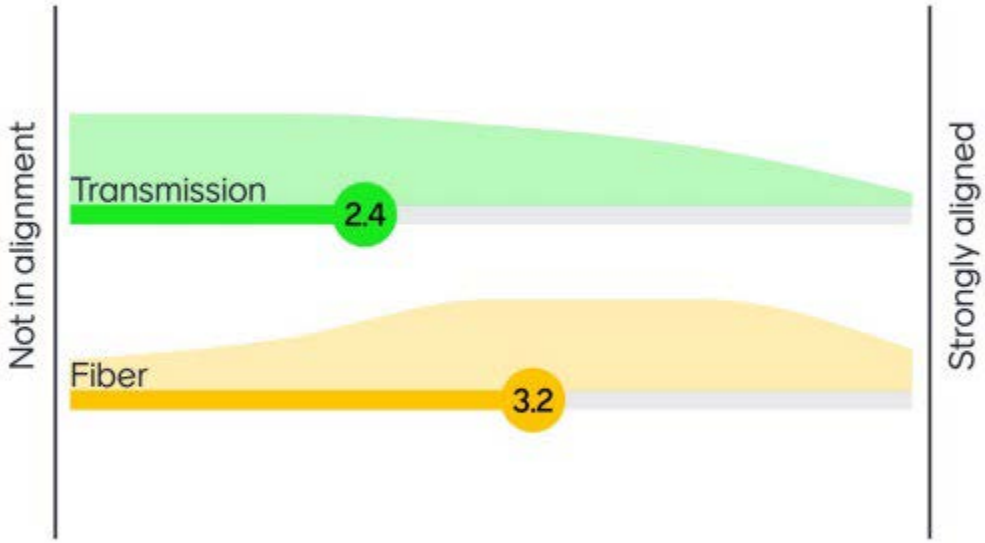


Discussion Breakout: What Questions Do You Have on the NextGen Model?

- How tested is HVDC technology? Where has it been deployed?
- How many cables are needed for AC transmission? What about HVDC transmission?
- Are transmission lines in service today mostly AC or DC?
- What are separation requirements for transmission from other utilities that might be in the ROW?
- How do you determine who gets access to the ROW?'
- How are geographic constraints handled? Would the line go around them outside the ROW?
- Who should be doing the education for policy makers and the public that is clearly needed?
- How will future highway maintenance and rebuilds be impacted by having transmission in the ROW?

Menti Questions & Results

- **Q: How well aligned is the NextGen Highways vision with your state's goals and interests?**
    - Results: (33 Responses)



Presentation Block: Broadband

Utah

Speaker: Lynne Yocom - Utah DOT

- Fiber is cheap to relocate and can be sited near the roadway within the ROW. Half of the relocation costs are covered by the State.
- Fiber experiences fewer hits near the edge of the pavement than when sited further back from the travel lane.
- Placing fiber underground or under the road also provides protection from delineator posts and signs. UT DOT determined that two feet of depth was optimal.
- Utah also places the fiber above the water management infrastructure and cap it to help with washouts exposing the fiber



Arizona

Speaker: Brad Burgess - Arizona DOT

- ADOT only owns a portion of the ROW in fee, the remainder of the ROW is owned by underlying landowners such as, but not limited to, BLM (Bureau of Land Management), USFS (United States Forest Service), ASLD (Arizona State Land Department), Tribal Nations, private landowners, and others.
    - Alleviating the need to check with private landowners for fiber within the ROW
    - Landowners can come to ADOT if they feel they need some additional compensation
- It is cheaper to micro-trench for broadband in AZ than plow

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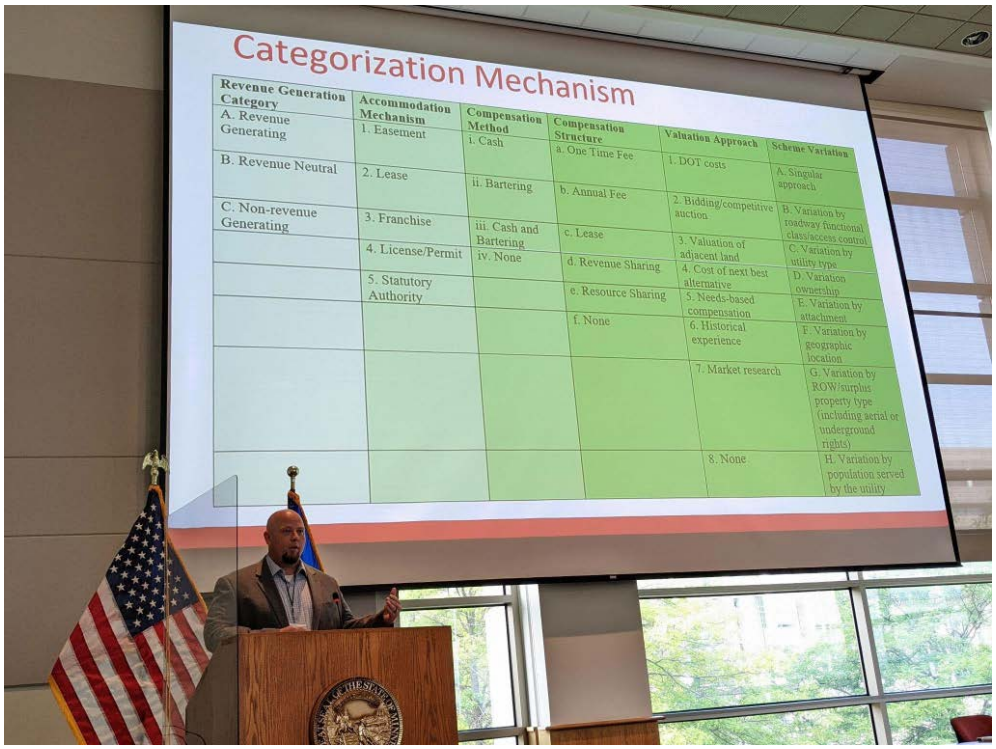


Presentation Block: Modeling & Value of ROW

Valuation of ROW Study

Speaker: Dr. Roy Sturgill - Iowa State University

- Working to identify best practices and guidelines for DOTs on how to evaluate and charge for the accommodation of utility and communication installations in public ROW.
- The research shows that each state has its own way, or multiple ways of accommodating utilities. There are efforts to build consistency among these processes. Utah, New Mexico, Arizona, Colorado, and Idaho are working on one such regional initiative.
- Demand for the ROW is growing. In the last 10-12 years, new and expanding needs have arisen related to cellular, broadband, CAV, EV needs etc.



Resource Sharing

Speaker: Bill Jackson - Maryland DOT

- Maryland DOT allows for non-exclusive use of its ROW, other real estate; and its existing communications infrastructure by a Public/Private entity.
- Activities include the installation, operation and maintenance of communications systems for the other entity in exchange for providing communications equipment, services, and/or monetary revenue/compensation to Maryland DOT.
- MDOT maintains a process to collect and review resource sharing proposals.

Partnership Models

Speaker: Anthony Buckley - Washington State DOT

- Tasked with building out, funding, and financing a 21st century transportation network
- The current state gas tax does not generate enough revenue to cover maintenance costs, so WS DOT is exploring new and innovative ways to generate revenue–such as leveraging real estate assets.



Lunch Session: Legal Issues in Emerging, Alternative and Commercial Uses of Right of Way

Speakers: Samantha Juneau and Jessica Oh - Minnesota DOT

- There have been an increasing number of requests related to alternative uses of the ROW, including outdoor dining, land bridges, greenspace, and art–to reclaim underutilized infrastructure as public space.
- There are two paths for ROW use: a ROW use agreement or a utility accommodation policy/plan. At a basic level, both avenues must be in the public interest, must not impact safety or operation, and must consider environmental effects.
- MnDOT's Transportation Commissioner and the Director of the Office of Land Management have the authority to grant certain variances for the use of trunk highway ROW, if certain conditions are met.
- While gas stations and automobile servicing are not allowed in the ROW, participants discussed the permissibility of EV charging. EV charging is still prohibited under automotive servicing. Generally the DOTs agreed that they did not want to own charging networks, but would be interested in hosting them for community benefit, if allowed.



Presentation Block: Emerging Utility Accommodation Policies

Michigan

Speaker: Scott Greene - Michigan DOT

- Michigan's Utility Accommodations Policy is currently being updated to reflect changes in State and Federal law.
- State Law - Public Act 368 of 1925 was amended to include broadband companies' access to the ROW. Small cell wireless was also mentioned as an "encroachment" of the ROW, requiring an annual fee for use.
- Federal Law - 23 CFR 645 named the position of Broadband utility coordinator and denoted the responsibilities of that position as facilitating broadband in the ROW and establishing a process for broadband companies to be notified.



Panel Discussion

Speakers: Bill Jackson - Maryland DOT; Scott Greene - Michigan DOT; Lynne Yocum - Utah DOT

Permits & Agreements

- Maryland permits infrastructure as a utility. A lease or other agreement must be in place to get a utility permit. Even if an entity is not a public utility, they are still required to file a permit.
- Utah uses fiber optic agreements to ensure that all parties know that relocation and maintenance items are taken care of.
- Parties may resist the concept of utility corridors, but it is one of the only options to accommodate utilities. It also saves private land-owners from having to go through the land acquisition process multiple times with different entities.

Costs & Fees

- If and how DOTs are able to recover costs associated with utility accommodation and maintenance was a key discussion topic.
- There is currently a lack of consistency in how utility fees are established across states and agencies.

EV Charging

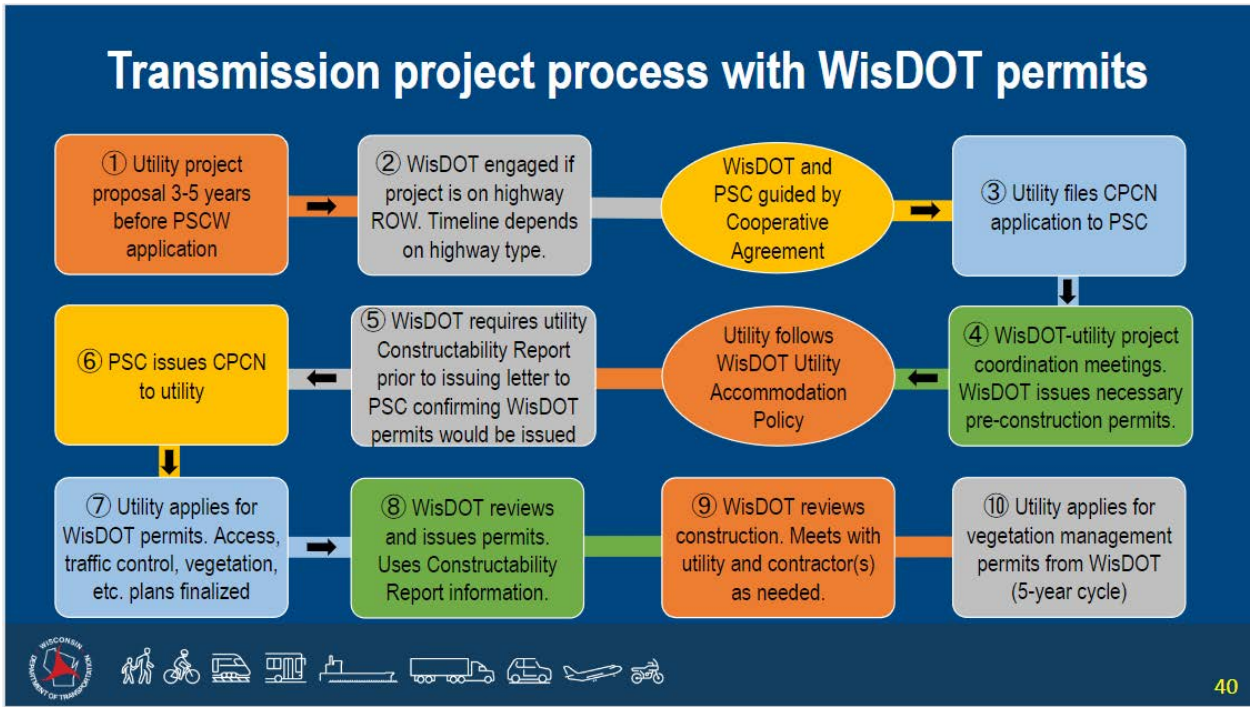
- According to Utah DOT most EV chargers in the state are funded with state money. The public wants electrification to go hand-in-hand with fiber.
- Understanding what funding was used to purchase a given property, helps determine what can be done on or with that property.
- Whether or not an electric utility can own vehicle chargers is determined by the states.



Plenary Session: Exploring Transmission in the ROW - WisDOT's Transmission Playbook

Speaker: Bob Fasick - Wisconsin DOT

- WisDOT's Utility Accommodation Policy guides the collaboration. Discuss project concepts, potential alignments, timing, traffic control, access, clear zone, guardrail, bridge clearances, blowout clearances, environmental, etc. including region office(s) review of future improvement projects
- Transmission crossings are allowed and permits are issued by regional offices. Longitudinal siting is also allowed and issued by the Central Office: Bureau of Highway Maintenance (CO). CO handles coordination with PSC.



- PSC handles all public engagement, not the DOT.
- WisDOT requires utility to prepare a constructability report during Certificate of Public Convenience and Necessity (CPCN) process
- WisDOT prefers freeway access via private property or from side roads rather than driving along the right-of-way line.
- There is no Dig Once policy in WI. They accommodate anyone and everyone.Once an aboveground pole is built, entities have to design around it for widening.

Day 2

Discussion Session: Addressing Barriers to Buried HVDC Transmission

Speaker: Morgan Putnam - NGI Consulting

This session included MnDOT's Phase II work as well as group and open discussion. Key takeaways from from those conversations are given below:

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MnDOT Phase II

- Formal Legal Analysis/ Legislative Plan (Plan to Address Statutory Barriers)
- GIS analysis of potential transmission routes
- Detailed discussion of Wisconsin DOT's transmission siting playbook
- Technical analysis of Transmission Construction & Maintenance Processes
- Expand fiber/communications infrastructure analysis
- Expand stakeholder analysis
- Environmental analysis process mapping: further engage Mn Department of Commerce/PUC Transmission Line Oversight and MnDOT's Utility Permitting leads
- Formal Business Impacts and Risks Analysis

Group Discussion



1. **What should be included in the scope of work for each of the Phase 2 work areas identified?**
    a. P3 risk analysis
    b. Cost analysis

c. Safety considerations - Look at the 40 year lifecycle of transmission, its common issues, maintenance needs, and costs.
d. Example interchange layouts and construction for HVDC projects

2. **Who should be engaged for each of the Phase 2 work areas identified?**
    a. Agencies need to include utilities in stakeholder analysis
    b. Be prepared for how to engage with legislators. Exploring best practices from other states can help inform these conversations
    c. Create messaging that is simple, reliable, and relatable when conducting stakeholder outreach.
    d. Bring utilities into the discussions early to understand their needs and requirements for projects
    e. 3rd Parties/non electric company equipment owners/operators
3. **Is there additional work that should be considered for Phase 2 (July-Dec) or a subsequent phase in 2023?**
    a. Up front and recoverable cost analysis as well as a breakdown of responsibilities by party.
    b. Utilize GIS to help understand whether aboveground or buried transmission is more suitable for a given area.
    c. Understanding policy, statutes, processes changes needed
    d. Guidance for determining whether aboveground vs buried HVDC is most appropriate for a given project
4. **What are your biggest concerns about fiber? about transmission?**
    a. When creating fee structures, do not leave money on the table, but also do not make it too difficult or expensive for partners to work with your organization.
    b. Having adequate and effective stakeholder engagement
    c. Safety and education

Lightning Round I

CAV/ITS

Speaker: Colin Castle - Michigan DOT

- MDOT and Cavnue are working to build North America's first Connected and Autonomous Vehicles (CAV) lane in Southeast Michigan. The partners identified I-94 as their first project and aim to have a commercial agreement in place for this project by 2023/2024

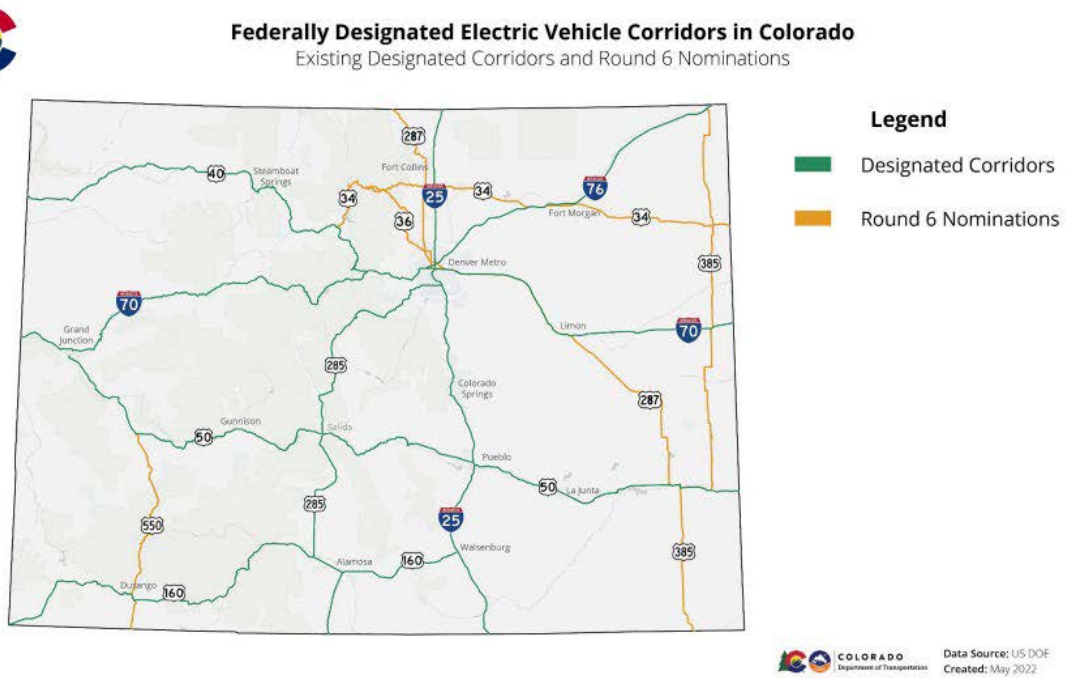


- Testing helps Original Equipment Manufacturers (OEMs) understand the complexity of their systems and the driving environment–such as road actors (pedestrians, motorcycles), infrastructure (signals, signage), and the environment (weather, lighting, striping).
- MDOT also released a Request for Proposal (RFP) to pilot inductive vehicle charging along a one-mile stretch of state roadway. The contract is in process.

EV Charging/NEVI

Speaker: Michael King - CO DOT

- IIJA provides $7.5 billion for new electric vehicle charging programs. $5 billion is allocated to the NEVI formula program, Colorado's allocation will be approximately $57 million over 5 years.
- Highlighted key requirements for NEVI formula program related to EV charging–such as being within 1-mile of federally-designated EV corridors, prioritizing rural areas, focusing on DC Fast, and having charging locations no more than 50 miles apart along a corridor.
    - It also outlines eligibility for battery storage, renewable generation, and other elements to manage demand charges and increase resiliency as well as the ability to reimburse O&M (up to 5 years)
- Using the of ROW for renewable energy generation supports multiple Colorado goals, like diversifying revenue, remaining within the emissions budgets set out by the new GHG standard, and creating new EV charging opportunities.



Lightning Round II - Discussion Session

Environmental Issues (Open Discussion)

Panelists: Louise Miltich, Tara Olds, and Stacy Kotch Egstad- MnDOT

- Provided an overview of the normal environmental review process.
- In the pre-process planning for transmission projects, it is important to break down silos and gather all environmental stakeholders together to discuss potential chokepoints.
- Wisconsin noted the benefit of having the same consulting firm work with them for 20 years. That consistency and institutional knowledge reduces unknowns on projects.
- Stormwater and erosion were key concerns for Peer Exchange participants.

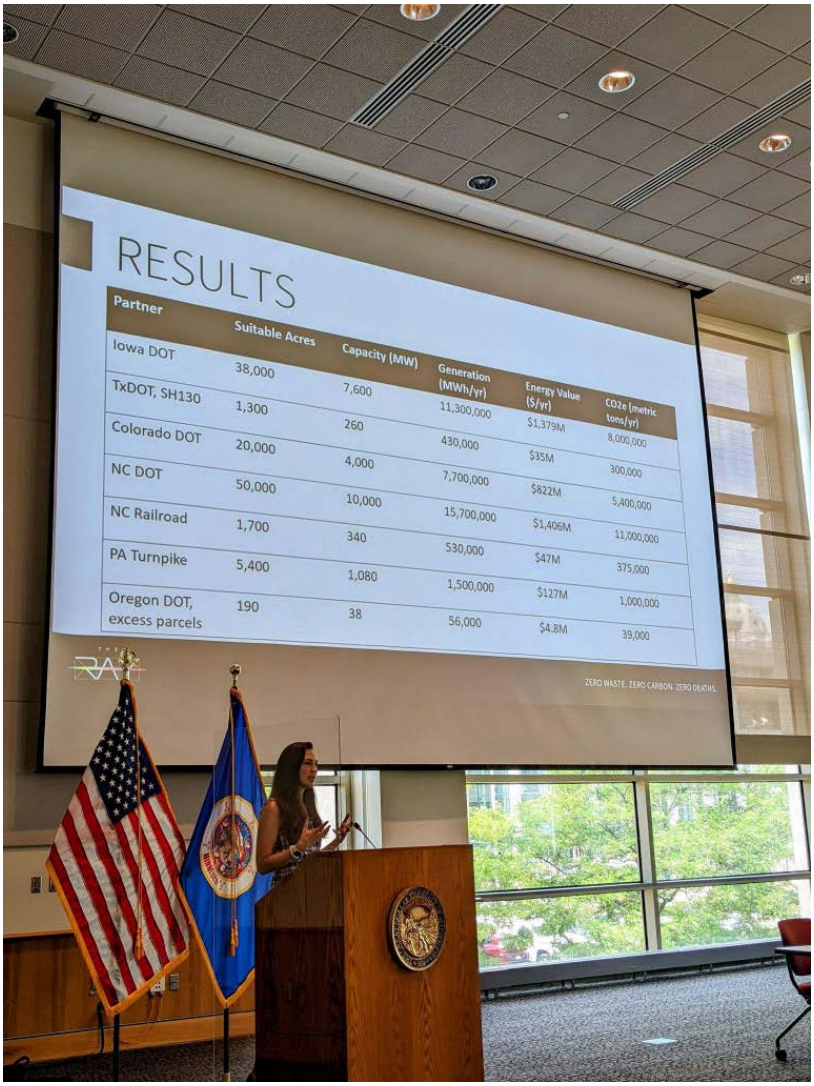
Solar, Rural Issues and Opportunities

Speaker: Laura Rogers - The Ray

- Solar can be installed to leverage the ROW as an asset for DOTs.
- The Ray facilitated the construction of a 1 MW solar array in a diamond intersection along Interstate 85 in West Georgia.
- Esri's solar mapping tool allows transportation agencies to quickly and accurately plan how to site solar in the transportation ROW, providing 3D visualization and estimations for solar energy generation, economic value, and greenhouse gas offsets.

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    - The energy generated can be used locally or tied back to the electricity grid.
    - The Ray has analyzed seven partners' GIS parcels for solar suitability to date.
- Transportation agencies can structure land use deals with solar developers in a variety of ways to meet their needs.



Panelists: Bill Jackson - Maryland DOT; Laura Rogers - The Ray

- Land Use Opportunities
- Lease: Establishes a property right
- License: Allows for operation and maintenance (O&M) only
- Power Purchase Agreement (PPA): A third-party developer installs, owns, and operates the energy system on a customer's property, while the customer purchases the system's electric output for a predetermined period.

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Discussion Session: Topical Breakouts & Action Items

This session consisted of open discussion of key takeaways and action items, broken out into three topical groups: utility accommodation policy, statutes, and regulations; broadband; and EV Charging and NEVI.

The large group share-out had two major themes:

- Consistency and clarity within guidance and communication
    - Prescriptive federal laws are still interpreted differently in all 50 states
    - Who has ultimate authority when there is a difference in interpretation?
    - 'DOTs will figure it out quickly once there is a mandate'. Wisconsin is an example.
- Relationship-building
    - Strengthen connection to different state agencies and utilities
    - Host more peer exchanges to share efficiencies, among states and various DOT departments

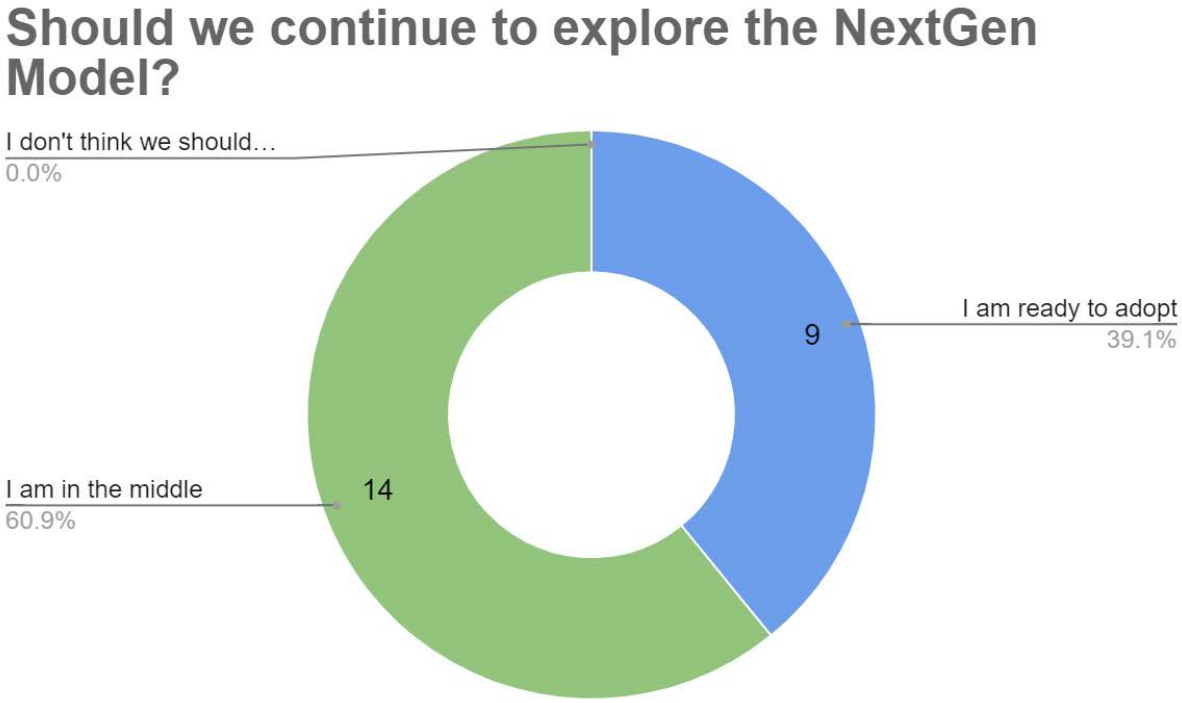
Peer Exchange Lessons Learned

Participants came to the Peer Exchange to gain knowledge, explore implementation barriers/solutions, and gather best practices from other states.

- Participants were most interested in the presentations on fiber placement, the Wisconsin Playbook for electric transmission co-location as well as various project experiences and insights from other states.
    - Each state case study achieved success through different means, so there are options to choose from. However, a little more consistency may benefit tracking purposes and coordination with utilities.
- There was also interest in valuation of the ROW. Participants voiced concerns about costs, resource sharing, and the ability to coordinate with utilities.
- A need to improve relationships with utilities, developers, and the private sector overall was also called out.

Peer Exchange participants agreed that the NextGen Highways model warranted further study.

- When asked at the conclusion of the Peer Exchange, whether the NextGen Highways model merited further exploration, respondents chose either 'yes' or 'maybe' - there was not a single respondent who chose to express doubt, even when given the opportunity to do so anonymously.



A need for communication and coordination became apparent to continue to advance topics–like transmission and fiber placement.

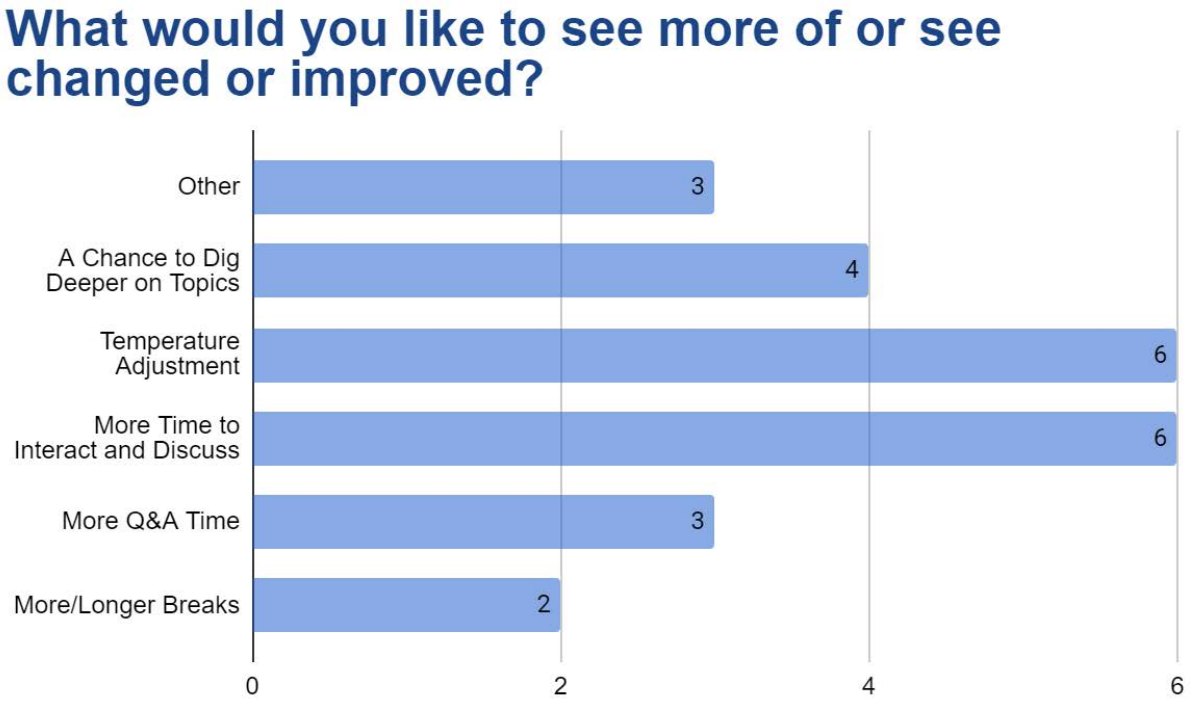
- Participants expressed a need for greater communication, collaboration, and education among agencies and stakeholders.
    - Agencies requested relatable, plain language resources that could be shared with their organizations to aid in the learning process.
    - Participants also agreed on the need for great communication with the public about the need for more energy infrastructure, like transmission lines.
- Agency representatives also believed that championing this technology within their organizations would be difficult, citing a need for greater collaboration.
    - One participant mentioned 'that the culture change [that would be needed] starts with events like these' because they foster the conversations and coordination.

There was a general consensus among Peer Exchange participants wishing for more federal guidance on these topics and greater consistency of the application of relevant state laws.

- Some participants favored legislative directives at the federal or state level, while others preferred for change to come from within the agencies themselves.
- Participants expressed a desire for federal clarification on a number of topics, including, ROW use for EVCS and EVSE.

Participants found the Peer Exchange valuable and suggested improvements for future events.

- Participants wanted to attend more Peer Exchanges in the future, especially focused on NEVI.
- Agency representatives enjoyed opportunities for open discussions and interactions. They mentioned wanting more discussion time for Day 2 and the project team adjusted the schedule to accommodate the request.
- Attendees requested follow up resources and events from the Peer Exchange team to create a space for continued dialogue and collaboration on these topics.
- A hybrid format was suggested for future events–allowing participants to attend virtually as well as in person.



During the Peer Exchange, agency representatives highlighted several *opportunities* for future work on this project:

- **Costs:** Public agency design costs; future design costs, relocation costs, cost recovery analysis; fee structure for sustainability and maintenance
- **Regulations:** Policy, statutes and processes changes are needed.
- **Stakeholder Engagement:** Start outreach work early with utility stakeholders; DOTs; those who can build/utilize HVDC; lawmakers that need to be informed

- **Education & Information Sharing:** Sharing accurate, relatable, and easily understandable information among states, stakeholders, and the public.
- **Needs Analysis:** Conduct a ROW needs analysis to help justify the costs and efforts
- **Ownership Models:** Exploration of various ownership models to understand risks and sustainability

Next Steps

This section includes an outline of the work to be conducted throughout Phases II, III, and IV of the project. This scope is not exhaustive and is subject to change as the needs of the project change.

- **Plan to Address Regulatory Barriers:** Understand the current state of practice in Minnesota and explore updates to statutes, rules, and UAPs through established processes. This will require engaging other state agencies as well as FHWA MN Division office and Senior Leadership Team.
- **Conduct a GIS Suitability Analysis:** Utilize GIS to review of the suitability of MnDOT's ROW for buried HVDC transmission and fiber in an interstate or highway corridor that would address known transmission needs
- **Study the Wisconsin DOT Transmission Playbook:** Facilitate a detailed discussion of the playbook as well as an analysis of above ground transmission to investigate transmission construction, maintenance, and relocation processes.
- **Explore Transmission Construction/Maintenance:** Delve into the HVDC construction process to understand the design and construction considerations in addition to the siting conditions and restrictions.
- **Expand the Fiber and Communications Infrastructure Analysis:** There is a growing need to improve broadband access including increased infrastructure demands created by ITS, CAV, and fiber. Known fiber gaps can be combined with corridor needs and opportunities for P3s. This effort will include stakeholder engagement and may necessitate statutory changes related to P3s.
- **Expand Stakeholder Analysis:** Utilize stakeholder mapping to identify state, local, tribal, and community organizations as well as utilities and private companies that should be involved.
- **Formal Business Impacts and Risks Analysis:** Conduct a formal impact and risk analysis to include various MnDOT offices.
- **Description of HVDC Infrastructure:** Provide a breakdown of the infrastructure that is included in the HVDC model. This description should also explain the potential impacts of HVDC on communities.

DEPARTMENT OF TRANSPORTATION

Appendix A: Attendee List

Name	Title	Organization
Brian Kary	Traffic Engineer, RTMC	Minnesota DOT
Elliott McFadden	MN Shared Mobility Coordinator	Minnesota DOT
Adeel Lari	Director of Innovative Finance	University of Minnesota
Alex Stoiaken	Data & GIS Coordinator	Minnesota DOT
Anna Pierce	Metropolitan Planning Program Coordinator	Minnesota DOT
Ann Driver	Permits Supervisor	Minnesota DOT
Anthony Buckley	Director of Innovative Partnerships	Washington State DOT
Bill Jackson	Assistant Statewide Utility Engineer	Maryland DOT
Bob Fasik	Statewide Right-of-Way Permits Engineer, Bureau of Highway Maintenance	Wisconsin DOT
Brad Burgess	Program Administrator, Broadband Office	Arizona DOT
Collin Castle	Fiber Manager	Michigan DOT
Deanne Pop	Utility Program Administrator	Iowa DOT
Eric Cimo	Utilities Engineer	Delaware DOT
James Hove	Social Scientist	U.S. DOT
Julie Groetsch	Assistant Office Director - Real Estate & Policy Development Section	Minnesota DOT

Kevin Brodie	FHWA Administrator	North Dakota DOT
Kyle Shelton	Director of Center for Transportation Studies	University of Minnesota, Center for Transportation Research
Lynn Yocum	Broadband Director	Utah DOT
Michael King	Assistant Director of Electrification of Energy, Office of Innovative Mobility	Colorado DOT
Niles Annelin	Policy Section Manager	Michigan DOT
Ray Shank	Highway Safety Division	Missouri DOT
Roy Sturgill	Professor in Construction and Engineering; TRB Chair for Utilities Committee	Iowa State University
Lise Trudeau	Transmission Siting	Minesota Department of Commerce
Morgan Putnam	Principal	NGI
Scott Greene	Division Administrator, Development Services Division	Michigan DOT
Jessica Oh	Strategic Partnerships Director	Minnesota DOT
Stacy Kotch Egstad	Routing and Siting Coordinator	Minnesota DOT
Fatema Haji Taki	Attorney	Minnesota DOT
Jeffrey Metcalf	Attorney	Minnesota DOT
Sam Juneau	Attorney	Minnesota DOT
Louise Miltich	Assistant Commissioner	Minnesota Department of Commerce
Cezar Panait	Analyst	MN Public Utility Commission
Tara Carson	Environmental Analysis	Minnesota DOT

Ralph Adair	Engineer, RTMC	Minnesota DOT
Terry Haukom	Engineer, RTMC	Minnesota DOT
Joseph Pignato	Office of Land Mgmt Director	Minnesota DOT
Abbi Ginsburg	ROW Engineer	FHWA
Laura Rogers	Manger	The Ray
Drew Gilmore	Right of Way Manager	Ohio DOT
William Stein	Safety Engineer	FHWA

DEPARTMENT OF TRANSPORTATION

Appendix B: Peer Exchange Agenda

FHWA MN Peer Exchange: Leveraging Highway ROW to Meet Future Needs- Electrification, CAV, and Transmission

Day 1: June 28, 2022 8:00 AM - 4:00 PM					
Session Start	**Session End**	**Min.**	**Title**	**Topics**	**Presenter/Facilitator**
8:00 AM	8:25	25	Welcome!	Introductions, Agenda & Logistics	Jessica Oh & Tim Sexton
8:25 AM	9:30 AM	65	Intro to NextGen Highways Model	Introduction to NextGen Highways	NextGen Highways Consulting Team:
9:30 AM	10:00 AM	30	Discussion	*Discussion Breakouts: NextGen Model*	Breakout at your table
10:00 AM	10:15 AM	15	Break	Break (15 Min)	
10:15 AM	11:00 AM	45	**Block A:** Broadband	Broadband: Presentations + Q and A (3 at 15, 10 min content with 5 min of questions- A) UT, B) MI, C) AZ	A) Lynne Yocum B) Scott Greene C) Brad Burgess
11:00 AM	12:00 PM	60	**Block B:** Modeling & Value of ROW	Modeling & Valuation of ROW: Presentations (3 at 15 min each) A) Valuation of ROW Study B) Resource Sharing, C) Partnership Models	A) Roy Sturgill B) Bill Jackson C) Anthony Buckley
12:00 PM	1:00 PM	60	Lunch Session	**Working Lunch Session:** Legal Issues in Emerging, Alternative and Commercial Uses of Right of Way	Sam Juneau
1:00 PM	2:15 PM	75	**Block C**: Emerging Utility Accom. Policies	Emerging Utility Accommodation Policies (3 presentations for 15 min + 5 min discussion) A) MD, B) MI, C) UT	A) Bill Jackson, B) Scott Greene C) Lynne Yocum
2:15 PM	2:30 PM	15	Break	Break (15 Min)	
2:30 PM	3:40 PM	70	Exploring Transmission in the ROW	WisDOT's Transmission Playbook	Bob Fasick
3:40 PM	4:00 PM	20	Wrap up	Wrap Up & Plus Delta for 15 min	Jessica Oh
4:00 PM	4:00 PM	0	End of Day	End of Day 1	
6:00 PM	6:00 PM- 7:30 PM		Optional Dutch Dinner	Dinner on your Own/Optional Group Dinners at 6:00 pm	

Day 2: June 28, 2022 8:00 AM - 3:30 PM					
Session Start	**Session End**	**Min**	**Title**	**Topics**	**Presenter/Facilitator**
8:00 AM	8:25 AM	25	Warm Up	Reflections from Day 1	Jessica Oh
8:25 AM	9:30 AM	65	Addressing Barriers to Buried HVDC Transmission	Addressing Barriers to Buried HVDC Transmission: Topics needed: Key Minnesota Findings	NextGen Highways Consulting Team
9:30 AM	10:30 AM	60	**Block D**	Lightening Round: 10 min presentation then 5 min discussion per topic A) CAV/ITS; B) EV Charging/NEVI; C) 5G	A) Collin Castle B) Michael King C) Open Discussion on 5G
10:30 AM	10:45 AM	15	Break	Break (15 Min)	
10:45 AM	11:30 AM	45	**Block E**	Lightening Round: 10 min presentation, then 5 min discussion per topic: A) Environmental Issues B) Solar & Rural Issues/ Opportunities C) Relocation of Utilities	A) Open Discussion B) Bill Jackson/Laura Rogers/Michael King, C) Open Discussion
11:30 AM	12:45 PM	75	Working Lunch: Innovative Statutes Sharing	Innovative Statute Roundtables: Bring an Innovative Statute that has advanced Sustainability, Alternative Use of ROW or Partnerships. Discussion: for new and innovate uses, where did you start, how did you engage relevant industries and how did you overcome political or industry opposition?	Jessica Oh/ Joe Pignato
12:45 PM	1:30 PM	45	Action Items	Interactive Discussion on Your Action Items	Laura Rogers
1:30 PM	1:45 PM	15	Break	Break (15 Min)	
1:45 PM	2:45 PM	60	Key Take Aways	Discuss Key Takeaways as a Group & Develop List of Questions for Federal Clarification, Top Themes for Peer Exchange Report, etc.	Jessica Oh & Tim Sexton
3:00 PM	3:15 PM	15	Evaluation	Wrap up and Evaluation	Jessica Oh
3:15 PM	3:30 PM	15	Closing	End of Day 2, depart for airport	-