

FHWA Renewable Energy in Highway Rights of Way Peer Exchange  
July 11–12, 2017  
Cambridge, MA

Summary Report



**FHWA-HEP-17-093**



U.S. Department of Transportation  
**Federal Highway Administration**

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## Introduction

This report summarizes a Federal Highway Administration (FHWA) peer exchange that was held on July 11-12, 2017 at the U.S. Department of Transportation Volpe Center in Cambridge, Massachusetts. The purpose of the peer exchange was to bring together practitioners to discuss issues related to and approaches for accommodating renewable energy technologies in highway rights-of-way (ROWs).

This report summarizes the presentations and discussions at the peer exchange. Presenters from State Departments of Transportation (DOTs) discussed existing and planned solar energy projects in highway ROWs in their respective states. Participants also discussed challenges and lessons learned from these projects. The peer exchange included a site visit to Massachusetts DOT solar energy projects along Interstate 90 in Framingham and Hopkinton, MA. Appendix A lists the peer exchange participants, and Appendix B provides the agenda.

The peer exchange built upon work by the FHWA Office of Real Estate Services and FHWA Office of Natural Environment to provide information and technical assistance to State DOTs about generating renewable energy in highway ROWs. In recent years this effort involved the development of a [briefing book](#) and a [report](#) on alternative uses of the ROW, including accommodating renewable energy technologies. In the near future, the FHWA Office of Natural Environment and the Volpe Center plan to publish white papers on solar noise barriers and sustainability practices at rest areas.

## Regulatory Environment

Rosemary Jones of the FHWA Office of Real Estate Services presented on Federal regulatory requirements that guide alternative uses of the highway ROW. For Federal-aid highway projects, ROW property must be devoted exclusively to public highway purposes,<sup>1</sup> but some exceptions exist. Non-highway uses may be approved by FHWA if the use is in the public interest, will not impair the highway, and will not impede the free and safe flow of traffic on the highway.<sup>2</sup>

The Federal definition for “utility” is broad in scope, and includes facilities that produce, transmit or distribute power and electricity which directly or indirectly serves the public. A small utility company servicing a small community or limited number of neighborhoods would normally meet the test of providing service to the public. In contrast, if a facility provides direct, dedicated services to a private corporation with no service to the public at large, the line would be considered private. If the line is for the use of a State or local governmental unit, then the line would be viewed as a utility facility.<sup>3</sup> Since the Federal definition for “utility” is so broad, FHWA allows the State’s more restrictive definition to determine qualification.

The FHWA-approved State Utility Accommodation Policy (UAP) regulates utility installations on all highways.<sup>4</sup> If the State definition of a utility includes renewable energy projects, a State can approve installation of these projects in accordance with the process outlined in the UAP without referral to FHWA. The State DOT then enters into written arrangements with a utility (generally in the form of special use permits or joint use agreements). The FHWA Division Office reviews and approves new UAPs and revisions to UAPs for compliance with Federal requirements.

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<sup>1</sup> 23 CFR 1.23(b)

<sup>2</sup> 23 U.S.C. 111

<sup>3</sup> 23 CFR 645.207

<sup>4</sup> 23 CFR 645 Subpart B

If a project does not qualify as a utility under State law, the project may request to use the ROW through a ROW Use Agreement (previously called Air Space Agreement),<sup>5</sup> which involves a site-specific Federal approval. Fair market rent is required for land, unless the project is in the public interest based on social, environmental, and economic considerations, in which case an exception must be approved. An application for a ROW Use Agreement approval must include planning and design details about the project, including provisions for maintenance access, terms of use, maps, plans, and sketches.

Due to the programmatic nature of the UAP, it is likely more straightforward for States to pursue renewable energy projects under this approach, rather than through a ROW Use Agreement. If renewable energy is not currently included in a State's UAP, the State could consider including it during a UAP update.

The FHWA Office of Real Estate Services maintains a [map](#) of ROW renewable energy projects, including solar, wind and hydroelectric projects. Peer exchange participants were encouraged to submit projects in their States for inclusion on the map.

### Peer Presentations

The peer exchange involved presentations from State DOT staff who discussed their agencies' planned and recently implemented highway ROW renewable energy projects. Practitioners from Massachusetts, Vermont, Maryland, Minnesota, Georgia, and Texas discussed their work and experiences.

#### **Massachusetts DOT – Donald Pettey and Lily Oliver**

In 2012, motivated by a State greenhouse gas emissions reductions law (the Massachusetts Global Warming Solutions Act) and State and Federal incentives for

solar energy, the Massachusetts DOT (MassDOT) started exploring the idea of ROW solar. To identify appropriate sites for solar panels, MassDOT staff, with support of a consultant, did a desktop review of 600 MassDOT properties and site visits to approximately 60 sites. They then vetted 16 of the most promising sites with the MassDOT real estate office. In July 2013, MassDOT issued a request for response (RFR) for the development of 6 megawatts (MW) of ROW solar projects across multiple sites. In October 2014, MassDOT awarded a contract and worked with the contractor to establish a master license agreement and power purchase agreement. Each project includes a site-specific addendum within the broader master license agreement.



*Figure 1: Solar panels at the Framingham Service Plaza on Interstate 90  
(Source: Volpe Center)*

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<sup>5</sup> 23 CFR 710.405





Figure 2: Solar canopy at a MassDOT training and research facility in Hopkinton (Source: Volpe Center)

The developer completed the first five solar projects representing 2.5 MW in 2015. Three additional sites representing 1.8 MW have been constructed and await utility interconnection (click [here](#) to view the real-time output of these sites). Six sites representing 3.5 MW will be part of a future phase, which MassDOT plans to implement after the State finalizes its next generation of renewable energy incentives. The projects were implemented as public private partnerships, in which the developer is responsible for project design, construction, operations, maintenance, and

decommissioning of the solar panels at the end of the contract. MassDOT did not put down any money up front; instead, the DOT leased the sites to the developer for 20-years, and agreed to purchase all of the energy generated. MassDOT also benefits from a net metering policy in which the agency sells power back to the grid at the retail rate. The developer benefits through the guaranteed sale of electricity to MassDOT and by taking advantage of State renewable energy credits and Federal tax incentives.

After MassDOT's presentation, peer exchange participants visited select MassDOT solar projects along the Massachusetts Turnpike (Interstate 90): a 318kW installation at the Framingham Service Plaza (see Figure 1), and a 490kW solar canopy over a parking lot at the MassDOT Research and Material Lab in Hopkinton off of I-90 (see Figure 2). Moving forward, MassDOT is interested in pursuing other ROW solar projects, including solar noise barriers, solar canopies at park and ride lots, integration with buildings as facilities are upgraded or reconstructed with goals of targeting zero net energy and LEED certifications, and adding a solar/storage component to electric vehicle charging stations.

### Vermont Agency of Transportation – Daniel Dutcher

The Vermont Agency of Transportation (VTrans) has developed several solar projects, totaling 330 kW of capacity. These include solar panels at the Rutland Airport, solar panels on 13 of VTrans's garages, and one ROW solar project at the Fair Haven Welcome Center on US Highway 4 (see Figure 3).

In 2016, VTrans developed a [Solar Plan](#) to explain to the public why VTrans is interested in investing in solar, describe a process for identifying suitable ROW solar sites, and outline information about financial and technological specifications. To better facilitate solar development in the ROW, VTrans amended its UAP by adding a new section on renewable energy generation. VTrans worked



Figure 3: Solar panels at the Fair Haven, Vermont Welcome Center (Source: VTrans)

with the FHWA Vermont Division on this update, using MassDOT's UAP as a model.

One challenge to ROW solar development in Vermont is current regulatory uncertainty about net metering. A new net metering rule that was passed in 2017 includes a 500 kW per customer limit. VTrans is considering whether a State agency with multiple locations should be considered a single customer or multiple customers. Additionally, the Vermont Department of Public Service (DPS) may change the net metering rules again in the next legislative session. Moving forward, VTrans plans to track any developments related to the net metering rules and to work with the DPS and the Department of Buildings and General Services to obtain clarity on the net metering program and identify projects that may be feasible without the benefit of net metering. They will also be organizing inter-agency coordination as part of the State energy planning process.

### **Maryland DOT – Laura Rogers**

The Maryland DOT is pursuing renewable energy opportunities across all of its business units. Several State programs encourage the use of renewable energy, including a renewable energy portfolio standard, a greenhouse gas reduction goal, a community solar pilot program, and a net metering/meter aggregation program. In 2016, the Maryland DOT conducted a preliminary solar evaluation in which it identified 86 sites for potential solar development, representing 60 MW of capacity. In June 2017, Maryland DOT released a Request for Proposals (RFP) through which it will prequalify master contractors to develop solar, geothermal, and microhydro projects on DOT property. The RFP will likely lead to Master Services Agreements with the selected contractor(s), while standard power purchase and lease agreements will be developed for each site. Maryland DOT plans to incur no upfront costs, and the selected contractor(s) will be responsible for operations and maintenance of the systems.

The Maryland DOT faces a challenge of lack of space for renewable energy projects. Due to regulations to protect and restore the Chesapeake Bay, the DOT discourages felling trees and is actively pursuing all available space to plant additional trees. To address these space limitations while expanding ROW renewable energy usage, the DOT is considering innovative solutions such as planting prairie grass mixes under solar panels to mitigate the impact of felling trees,<sup>6</sup> and developing solar noise barriers.

### **Minnesota DOT – Ryan Gaulke**

A 2007 State greenhouse gas emissions reductions law and a 2013 law requiring State agencies to obtain 1.5 percent of their electricity from solar power motivated the Minnesota DOT (MnDOT) to consider ROW solar. In 2014, MnDOT released a two-stage RFP; the first stage asked developers to identify potential sites for ROW solar, and the second stage involved site-specific proposals. In stage 1, six responders identified 33 sites, which MnDOT narrowed down to 4 responders and 16 sites based on site selection criteria and feedback from district-level staff. In the stage 2 RFP, MnDOT received responses from two developers about seven of the proposed sites. When MnDOT was ready to move forward with specific plans for the sites, it stopped hearing from the developers, who may have been concerned about the long time frame associated with the proposed agreement or the fact that some grants and incentives had expired.

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<sup>6</sup> Maryland stormwater regulations require treatment of 20 percent of impervious surfaces, and planting trees is the easiest, most cost effective way to meet this requirement. Although the Maryland DOT is considering planting prairie grass under solar panels, this option does not give it as many credits as planting trees.

Despite this setback, MnDOT has recently reinvigorated its solar development process with a few changes. A deadline in the State's solar garden program was approaching in 2016, and several developers approached MnDOT about implementing a project that would qualify for these incentives. One of the proposed projects is a solar canopy on a parking garage in downtown Minneapolis. MnDOT reached an agreement with a developer for the project just before the solar garden program's deadline. The developer now has two years to design and finance the project, and if the developer is unable to make the project profitable, it is allowed to leave the agreement.

MnDOT has learned several lessons through these experiences, such as the importance of educating staff and getting buy-in at the district level, and the value that a champion at the staff or leadership level can provide. Moving forward, MnDOT is considering putting together a solar energy plan, using a master license agreement, and/or hiring a consultant to help jump-start a larger ROW solar program.

### **Georgia DOT and The Ray – John Hibbard and Allie Kelly**

In 2014, the Georgia legislature named an 18-mile stretch of Interstate 85 (I-85) in west Georgia in honor of the late Ray C. Anderson, a leader in industrial sustainability. To align with its goals of enhancing environmental stewardship and sustainability, the Ray C. Anderson Foundation (Foundation) labeled the I-85 section "The Ray" to be a living laboratory for emerging innovations related to sustainable transportation. The Foundation set a goal for The Ray to become a "net zero" highway that eliminates



*Figure 4: The Wattway drivable solar road surface at the I-85 Visitor Information Center along The Ray (Source: The Ray)*

all deaths, waste, and carbon emissions. It has partnered with the Georgia DOT (GDOT) and other stakeholders to test innovations along the highway and at a visitor center on the highway segment.

Several of these innovations relate to ROW renewable energy. At the I-85 Visitor Information Center, The Ray has piloted a solar electric vehicle charging station and a drivable solar road surface called the

Wattway that is the first deployment of the technology outside of France (see Figure 4). The Ray has also planned a 1 MW solar ROW project that is expected to come online in 2018. Georgia Power plans to finance and build the project, which will supply electricity to the grid. The Ray is working with partners to design the project as a pollinator-friendly pilot, which will involve planting seed mixes that attract pollinators around the panels, rather than planting the typical turfgrass or covering the area with gravel. The project is currently proceeding despite a lack of State incentives and a highly regulated utility market that presents challenges to implementing ROW solar in Georgia.

The GDOT has worked closely with The Ray on these projects, and in many cases The Ray has been able to encourage GDOT to test strategies that it may not otherwise have had the funding or capacity to try. GDOT has also permitted these projects; for example, it allowed the Wattway through an encroachment permit. In the future, The Ray, in partnership with GDOT, is considering several additional innovations, including integrated solar noise barriers, ROW wind generation, and ROW farming.

### **Texas DOT – Beverly West**

Texas has abundant solar resources and volatile natural gas prices, which has motivated the Texas DOT (TxDOT) to explore renewable energy project possibilities. Since 2006, State agencies utilize a State procurement contract to purchase electricity in the deregulated market from retail electric providers, which typically use contract terms of up to four years. In 2015, TxDOT partnered with other state agencies to request a new state contract or changes to the current contract to allow expanded purchasing opportunities. In the meantime, TxDOT negotiated a new contract at a historic low rate (\$0.03/kWh for electricity, not including transmission charges) for 100 percent renewable sourced energy with the renewable energy credits to be placed in Texas. This led to TxDOT savings of \$5 million over the previous year. In 2017, a new statewide contract was implemented, which includes opportunities for power purchase agreements for wholesale renewable energy, coordinating on-site solar with energy contracts, and financial incentives for conserving energy during times of peak demand.

With this new electricity procurement contract in place, TxDOT can now more easily pursue ROW renewable energy opportunities. Accordingly, TxDOT is currently planning a ROW solar project in partnership with the Central Texas Regional Mobility Authority adjacent to Austin Bergstrom International Airport at the intersection of two State highways. The project will be the first highway ROW solar project in the State.

### **Key Takeaways**

Several key themes emerged during the peer exchange. Participants discussed the importance of obtaining buy-in across the agency for ROW renewable energy projects, from the leadership level to the field staff levels where personnel are familiar with the ROW sites where renewable projects could be implemented. Interagency coordination can also help agencies to implement ROW renewable energy projects; the DOT typically plays a leadership role since it owns the ROW, but agencies such as a department of energy, public utilities commission, or the department responsible for managing State buildings may have experience with developing renewable energy projects and be able to provide valuable advice and technical assistance.

Most of the ROW solar projects discussed by peer exchange participants are public private partnerships, where the developer finances the project up front and manages its operations and maintenance. States benefit from these arrangements by having a dedicated source of renewable energy to purchase at a guaranteed rate, and in some cases by taking advantage of State net metering incentives. These projects are profitable for developers because they get to take advantage of State and Federal incentives for renewable energy, and have a guaranteed source to sell the electricity to under a long-term contract. In several cases, States have signed master license agreements with contractors to develop multiple solar ROW projects, to which site-specific stipulations are added.

States have pursued different strategies to identify potential sites for ROW solar. In most cases, a State has done an evaluation of all (or a large number of) DOT sites using specific criteria, such as setback from the ROW, access for maintenance, and cardinal orientation and angle of inclination. In one State, the DOT let developers propose sites for ROW solar development. However, the State encountered challenges with this approach since the district offices did not have buy-in for the site selection. Some States with space constraints are considering alternate ways to implement ROW solar, such as solar panels on DOT buildings or solar noise barriers.



State incentives play an important role in determining whether a ROW solar project will be profitable. State net metering programs, where renewable energy can be sold back to the utility at the retail rate, have helped States make ROW projects pencil out. As solar power becomes more widespread and costs come down, many States are considering eliminating or changing their net metering policies.

At the conclusion of the peer exchange, participants were asked what resources from FHWA would help them implement ROW renewable energy projects. Participants suggested that technical assistance for FHWA Division Office staff would be helpful, so that when State DOTs have questions or need approvals the Division Offices would know the requirements and that FHWA headquarters is supportive. FHWA is considering publishing a Frequently Asked Questions document to clarify the requirements associated with ROW renewable energy.

## Appendix A: Participant List

Agency	Name
Vermont Agency of Transportation	Daniel D. Dutcher
Georgia DOT The Ray The Ray	John Hibbard Allie Kelly Harriet Langford
Texas DOT	Beverly West
Maryland DOT	Laura Rogers
Minnesota DOT	Ryan Gaulke
Massachusetts DOT	Lily Oliver Donald Pettet
FHWA Headquarters	Tina Hodges Rosemary Jones
FHWA Massachusetts Division	Nelson Hoffman Tomasz Janikula Jason Dvelis Joshua Grzegorzewski
USDOT Volpe Center	Amy Plovnick Carson Poe Mike Scarpino

## Appendix B: Agenda

### FHWA Renewable Energy in Highway Rights of Way Peer Exchange July 11–12, 2017

#### AGENDA

U.S. DOT Volpe Center, 55 Broadway, Cambridge, MA 02142  
Room: 2-1-20

**Objective:** Meaningful exchange among practitioners on issues and approaches for accommodating renewable energy technologies in highway rights-of-way.

**Goals:** Increased awareness of current practice and considerations related to accommodating renewable energy technologies in highway rights-of-way; enhanced community of practice.

#### ***Tuesday, July 11***

*Convene Volpe Center lobby at 8:30 am.*

*Please bring a photo ID. FHWA staff should bring their DOT badges.*

**Welcome and Introductions** 9:00 am

**State Presentations** 9:15 – 10:45

- Massachusetts Solar Highway Program
- Highway Renewable Energy in Vermont
- Highway Renewable Energy in Maryland

*Break 10:45 – 11:00 am*

**FHWA Presentation** 11:00 – 11:30

- Alternate Use of the Highway Right-of-Way

**Site Visits** 11:45 am – 3:00 pm

- Framingham Service Plaza Solar Array
- Hopkinton Materials and Research Lab Solar Canopies

#### ***Wednesday, July 12***

*Convene Volpe Center lobby at 8:30 am.*

*Please bring a photo ID. FHWA staff should bring their DOT badges.*

**Day 1 Recap** 9:00 am

**State Presentations** 9:15 – 10:45

- Innovation on “The Ray” in Georgia
- Highway Renewable Energy in Minnesota
- Highway Renewable Energy in Texas

*Break 10:45 – 11:00*

**Discussion** 11:00 – 11:45

- Drivers for highway renewable energy efforts
- Constraints and challenges
- Opportunities, gaps/needs analysis
- Revisit issues & questions from presentations and site visit(s)

**Closing Remarks and Next Steps** 11:45 – 12:00 pm

Adjourn 12 pm