Right-of-Way Solar Program, Massachusetts

State departments of transportation (DOTs) oversee many different responsibilities—everything from cultivating highway safety to cleaning and clearing roadsides to performing construction and general repair projects. One key component that drives these operations is the need for significant electricity to power roadway signs and lights, maintenance buildings, rest areas, and other roadside facilities. This reliance on electricity is why when it comes to promoting energy security, State transportation agencies are increasingly exploring ways to facilitate and optimize energy production and application alongside State roadways.

The use of specific designated roadside land is important to providing necessary electricity for such facilities. Development of renewable resources in available areas along interstates within the United States (U.S.) has the potential to help states reduce energy and land maintenance costs, increase revenue to State DOTs without raising taxes, as well as increase local energy security and meet renewable energy and greenhouse gas emission reduction goals. DOTs own and maintain a considerable number of miles of right-of-way (ROW) along existing highways and freeways, covering thousands upon thousands of acres of land. Many State DOTs have chosen to meet a portion of their electricity needs by leveraging highway ROWs, installing various solar energy projects to benefit the greater transportation ecosystem.

What Is the Right-of-Way?

ROW is a type of publicly designated easement granted or reserved over the land or property within a city or county that is usually acquired for or devoted to transportation purposes. These transportation channels include highways, public footpaths, rail transport, canals, electrical transmission lines, oil and gas pipelines, or even bike trails. Adjacent land from private owners may be required to construct, or reconstruct, highways or bridges within the ROW.

An easement is a privilege or a right, distinct from ownership, to use in some way the land of another. Cities and counties are therefore not owners of the fee title to the property associated with the public ROW. The abutting property owners are the title holders; and the title typically extends to the centerline of the ROW. The ROW easement reaches beyond the improved roadway and can include sidewalks, parking strips, or turnouts and allows for limited right to pass or repass.

The public status of these ROW areas makes these areas appealing for energy development for a variety of reasons, including location and proximity to any electricity grid, general ease of access, lack of competing development efforts, and potential for State DOTs to reduce operating and maintenance costs, opportunistically creating new revenue streams.

Massachusetts Department of Transportation Explores Solar Power

Massachusetts Department of Transportation (MassDOT) began tapping into the potential of ROW solar in 2012 when it identified approximately 60 sites that could be used for solar power generation and vetting the most promising sites within the agency. MassDOT awarded a contract in 2014 for the development of 6 megawatts (MW) of ROW solar projects across multiple sites. The contractor has completed projects at eight sites totaling 4.3 MW; seven sites (3.75 MW) are located within the ROW, and another 550 kilowatts of solar canopies and rooftop solar panels are installed at the recently constructed Research and Materials Lab in Hopkinton.

In the summer of 2013, MassDOT issued a request for proposal to install photovoltaic (PV) generating facilities at multiple parcels within the State highway layout with a minimum of 6 MW aggregated capacity.

As of March 2020, MassDOT has developed approximately 4.3 MW of PV at eight sites across the State. These sites combine to generate approximately 5,300,000 kilowatt hours of energy annually, which is the equivalent to the average power consumption of about 875 homes in Massachusetts. Replacing that amount of electricity in the current ISO New England grid with solar power leads to 2.3 tons of CO2 emission reduction each year. MassDOT saves approximately $600,000 annually or $12 million over the 20-year contract period at the sites.

Solar project sites include:

- Framingham, I-90, Exit 10 North
- Framingham, I-90, Exit 10 South
- Framingham, I-90, Service Plaza
- Natick, I-90, Embankment
- Hopkinton, Research & Materials
- Plymouth, Route 3, Service Plaza
- Salisbury, Rabbit Road, Depot
- West Stockbridge, I-90, Former Toll Plaza

Benefits to State Departments of Transportation

As interest in renewable energy projects increases, State DOTs are championing these efforts to ensure that these initiatives meet their departments' missions and requirements. State DOTs have recognized many potential benefits of implementing solar energy projects:

- Identifying secondary purposes for ROWs – Many highway ROWs are free from development and already close to electrical loads. This makes them attractive locations for installing solar power equipment, facilities, and technologies.

- Saving money on electricity costs – Solar power installation helps State DOTs offset their electricity costs by directly powering department assets and facilities, e.g., roadside lighting or maintenance buildings.
- Producing clean energy and promoting energy security – In comparison to fossil fuels solar or wind energy can reduce harmful pollutants such as mercury, nitrous oxides, and heat-trapping carbon dioxide. Solar energy also helps DOTs meet State environmental goals and requirements and promotes energy security by diversifying energy generation and delivery methods.
- Fostering green jobs – Highway solar projects help promote the local green job market and the nation's growing clean energy economy. The U.S. solar industry employs more than 230,000 workers as of 2020. The growth of the solar workforce alongside the rise of solar energy have been major contributors to the U.S. energy supply and overall economy.

MassDOT is committed to supporting the development of renewable energy technologies. It recognizes that there are opportunities to utilize highway ROW and other MassDOT properties for installation and operation of renewable energy facilities for decentralized renewable energy production. Examples include, but are not limited to, solar energy projects and wind energy projects. MassDOT considers accommodation of renewable energy facilities in MassDOT ROW when such use and occupancy does not interfere with the flow of traffic, pedestrian access, and the safe operation of vehicles; does not otherwise impair the highway or its visual quality; and does not conflict with the provisions of Federal, State, or local laws and regulations.

MassDOT's solar projects were public-private partnerships and required no upfront funding from the State. It utilizes the public and private partnership business model to install PVs. The awarded contractor leases pre-approved MassDOT properties for solar facilities. MassDOT purchases power from the developer at fixed rates for the duration of the lease.

This arrangement allows the State agency to benefit financially in multiple ways:

- Zero upfront capital costs.
- Full utilization of Federal tax incentives through private partner.
- Positive cash flow from the difference between power purchased from the contractor and credits applied to the utility accounts.
- Lease revenue for the developer's use of state properties.

Public-Private Partnerships

Although DOTs can appropriate their own funds for developing alternative energy resources within the ROW, the availability of Federal tax credits and potential public-private partnerships (P3) can help minimize capital and operating costs. Through the P3 business model, the

awarded contractor leases pre-approved MassDOT properties for solar facilities. This arrangement provides multiple financial benefits:

- Zero upfront capital costs
- Full utilization of Federal tax incentives through the private partner
- Positive cash flow from the difference between power purchased from contractor and credits applied to utility accounts
- Lease revenue for the developer's use of state properties

MassDOT purchases power from the developer at fixed rates for the duration of the lease. The private partner develops, designs, constructs, commissions, operates, maintains, and decommissions the solar facilities at no up-front capital cost.

Under the negotiated power purchase rates and the current Massachusetts net metering policy, this program generated solar energy along state highway ROWs—and at least $15 million in savings over the 20-year contract period. Through this P3 program, multiple solar farms are being installed on otherwise non-constructable state properties within the highway layouts.

Solar Photovoltaic Systems

Solar power is cost-competitive or even cheaper than fossil fuel sources of electricity. As renewable energy technologies have matured, the business models serving public entities have expanded as well. Many State and local government agencies can work with private-sector partners to install renewable energy at no upfront cost to them and save money on their electricity use, all while helping the environment and serving the public.

Solar PV systems convert sunlight into electrical energy through an array of solar panels that connect to a building's electrical system and/or the electrical grid. PV systems range from small, rooftop-mounted, or building-integrated systems with capacities from a few to dozens of kilowatts to large utility-scale power stations of hundreds of megawatts. Operating silently, without any moving parts or environmental emissions, PV systems have developed from being niche market applications into a mature technology used for mainstream electricity generation.

Future Development

Looking ahead, MassDOT plans to determine which potential solar PV sites it wants to advance under a new State renewable energy incentive program that favors solar canopies. MassDOT plans to explore installing canopies at Park & Ride facilities. There are three Park & Ride in Southeastern Massachusetts that are hoped to advance under the Solar Massachusetts Renewable Target (SMART) program: Plymouth, New Bedford and Harwich. The three sites will

combine for approximately 1.2 MW of additional power-generating capacity in the form of solar carports installed over paved parking areas.

MassDOT continues to explore approved sites where economic benefits exist based on the new program guidelines and the utility territory in which those sites are located.

Resources:
Interstate Renewable Energy Council Job Census
Wikipedia: photovoltaic system
Mass.gov
Massachusetts Department of Transportation Highway Division
Mass.gov Blog