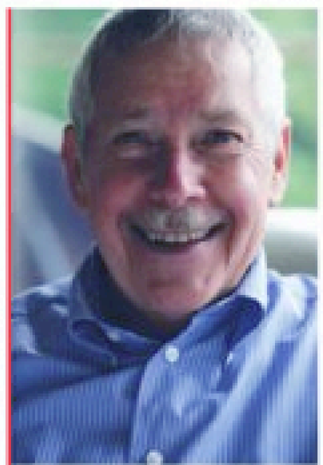
Another Roadside Attraction

The interstate highway system can accommodate both photovoltaic arrays and new transmission lines.

By JOHN REYNOLDS, FAIA



John Reynolds, FAIA, is chair of the American Solar Energy Society board. Contact him at chair@ases.org.

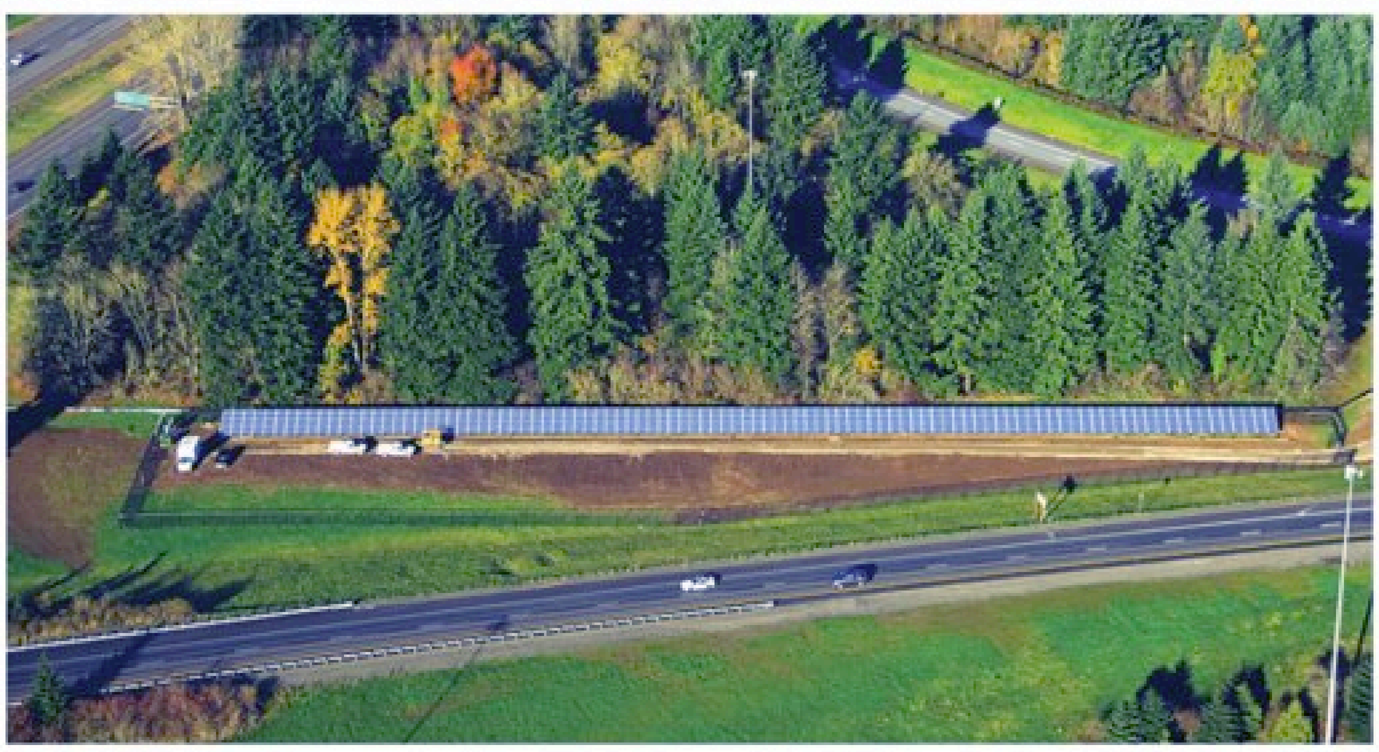
Photovoltaics (PV) demand huge swaths of real estate to generate a significant portion of the nation's electricity supply. Solar opponents ask, "Do we really want our farms and forests replaced by all that glass?" We answer, "There's enough roof area to meet the need." And we also have the nationwide highway right-of-way.

At the close of 2008, Oregon became the first state to utilize a stretch of interstate highway for a PV array, as reported in *SOLAR TODAY* ("Oregon PV Array to Offset Highway Lighting," November/December). The busy intersection of Interstate 5 and Interstate 205 in Tualatin, a suburb south of Portland, is now home to a 104-kilowatt array. Placed on racks at the northern edge of the wide and treeless right-of-way, the 600-foot-long, 5-foot-wide array faces due south at a tilt angle of 30° (latitude minus 15°).

Funded by a public-private partnership among the Oregon Department of Transportation (ODOT), Portland General Electric (PGE) and U.S. Bank, the array feeds power into the PGE grid. The project offsets about 28 percent of the power used to run the interchange's lighting, despite Oregon's gray winters and low electricity rates (ODOT pays about 6 cents per kilowatt-hour). The modules were made locally by SolarWorld (solarworld-usa.com) and the inverters by PV Powered (pvpowered.com) in Oregon. Some incentive funds came from the Energy Trust of Oregon (energytrust.org).

In Europe, solar arrays have been built along highways and railroads for many years. This is particularly evident in Switzerland and Germany, countries farther from the equator and with lower annual solar resources than most American states. Europe's high population density means that more electricity consumers are located near the roadway arrays, so distribution costs are lower. Open land is at a premium, and a large share of energy is imported at a high cost. These factors make roadside land more valuable for energy production and help to offset the cost of the array.

This 104-kilowatt roadside array in Tualatin, Ore., went live late last year.



GARY WEBER, ODOT

The U.S. interstate highway system offers a huge land area with largely unimpeded solar access. Outside cities, perhaps half the right-of-way corridor is unpaved. Few medians are planted with trees. The typical corridor is wide enough that shadows from trees and buildings on the southern edge wouldn't reach an array along the northern edge, even in winter. In urban areas, PV arrays can double as traffic-noise barriers, which will help to justify their cost and will help utilities meet the energy loads of neighborhoods adjacent to freeways. There is some tension between the need for vertical sound barriers and the near-horizontal arrangement of PV arrays; in Europe, this has been resolved by tilting PV arrays at a compromise angle of about 45°. Whatever the design, the array needs to be placed to avoid shadows from passing trucks. The design might use a vertical sound barrier topped with PV arrays.

For highways that run north-south, opportunities for PV arrays are less continuous. Overhead highway signs, where PV arrays can be added to the signs' existing racks, are good spots for unimpeded solar access. Bridges can be roofed with PV arrays that would shelter the roadway from snow, reduce corrosion from winter salting and extend the life of the substructure. As in the case of PV sound barriers, it is easier to justify PV when it can fulfill more than one purpose.

In either case, lining the northern edges of east-west highways or signs and bridges above north-south highways, there is the question of reflected glare. PV researchers work continually to improve the percent of incident sunlight that is absorbed rather than reflected; increased efficiency of capture equals decreased glare.

The continuous interstate right-of-way also offers a potential corridor for electricity transmission. This could be a distinct advantage, as we need more transmission lines to get renewably-generated electricity to urban markets. If underground, the transmission system is expensive but weather-protected. Advances in superconductors will make underground distribution more attractive, helping to maintain the required low temperatures. Using the interstate corridor will also reduce the pressure to carve new rights-of-way through national forests and other rural lands.

Someday, solar-powered pod cars may zip above the interstate highway system. In the meantime, let's use the modernization of our transport infrastructure to make our interstate system serve more than just cars and trucks.