

Why your community's next solar panel project should be above a parking lot

They paved paradise? Then put up a solar canopy. BY CARLA DELGADO | PUBLISHED FEB 24, 2023 8:00 AM EST



Solar canopies provide electricity and shade, among other benefits. *Deposit Photos*

Solar canopies built above parking lots are an increasingly common sight around the country—you can already see these installed at [university campuses](#), [airports](#), and lots near [commercial office buildings](#). Because the sun is a renewable resource, these solar canopies reduce greenhouse gas (GHG) emissions associated with energy production.

The clean energy benefits are clear: A 32-acre solar carport canopy at Rutgers University in New Jersey, for instance, produces about [8.8 megawatts](#) of power, or about [\\$1.2 million in electricity](#). They also make use of existing space to generate clean energy rather than [occupying croplands, arid lands, and grasslands](#). There may be other perks to adding solar panels over parking lots, too. Research shows that the benefits of solar canopies can be taken a step further if electric vehicles (EVs) are able to charge right in the parking lot. People can tap into this potential by installing EV chargers in solar carports, which makes charging more accessible for owners and creates a small-scale local energy grid for the community. The expense of installation and other barriers, though, can make deployment challenging.

EV charging in the carport

A solar carport canopy with 286 solar modules is able to produce about 140 megawatt-hours of energy per year for EV charging, according to a new [Scientific Reports study](#). That's enough to provide electricity to more than 3,000 vehicles per month if each car parks for an hour. The authors say charging EVs this way can generate 94 percent lower total carbon dioxide emissions than electricity from traditional grid methods.

To maximize these benefits, smart technology that controls the timing and speed of charging is critical, says [Lynn Daniels](#), manager at RMI's Carbon-Free Transportation program who was not involved in the study. Smart charging allows users to [optimize energy consumption](#) by charging only when prices are cheaper due to low-energy demand or when more renewable energy is available on the grid.

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EV ownership is growing so swiftly that entire electric grids are at risk of being stressed. If most owners across the US Western region continue to charge their EVs during nighttime, peak electricity demand can increase by up to 25 percent, according to a [2022 Applied Energy study](#). Accessible daytime charging at work or public charging stations would help [address](#) this problem and reduce GHG emissions.

There are ways to maximize [emission reductions when smart-charging](#) electric vehicles, according to a recent report from RMI, a nonprofit organization focusing on sustainability. “Our report found that, today, charging one million EVs at the right times is equivalent to taking between 20,000 and 80,000 internal combustion engine vehicles off the road,” says Daniels. If EVs represent 25 percent of vehicles by 2030, “emissions-optimized smart charging,” he adds, would be the equivalent of removing an additional 5.73 million automobiles with combustion engines.

A source of revenue, goodwill, and more

Solar canopies provide vehicles with protection from rain, sleet, hail, and other inclement weather, says [Joshua M. Pearce](#), whose research specializes in solar photovoltaic technology and sustainable development at Western University in Canada. The shade they provide also means car owners may [require less cooling](#) from air conditioning at start-up because the vehicle didn’t stay under the sun. But that’s not all they can do.

A solar carport canopy with EV charging can be an opportunity for site owners to earn money if drivers have to pay a fee to charge their cars, says Daniels.

On the other hand, if businesses or large-scale retailers provide EV charging for free, Pearce says, that may develop goodwill with customers. Shoppers might spend more time and money while waiting for their cars to charge, allowing business owners to earn even more profit, he adds. And shopping centers have lots of potentially convertible areas: If Walmart deployed 11.1 gigawatts of solar

canopies over its 3,571 Supercenter parking lots in the US, that would provide more than [346,000 solar-powered EV charging stations](#) for 90 percent of Americans living within 15 miles of a store, according to a 2021 estimate.

[Related: [What you need to know about converting your home to solar](#)]

Solar canopies also save energy, since [about 5 percent of electricity](#) is lost each year as it travels from a power plant to your home or business. If the electricity the solar panels produce is used directly by the buildings they're connected to or the EVs charging in the parking lots, transmission losses can be reduced, says Pearce.

The widespread deployment of solar canopies across parking lots may be an opportunity to create a small-scale local energy grid as well. The electrical grid is [highly vulnerable](#) to natural disasters, intentional physical attacks, and cyberattacks. Solar systems in parking lots can be used as anchors for [microgrids](#)—local, autonomous power systems that can remain operational while the main grid is down—that could make communities more resilient, “similar to how the US military uses solar to [improve](#) national security,” says Pearce.

Logistics of transforming parking lots

Upfront capital costs are the primary roadblocks to solar-powered carports with EV charging, says Pearce. The physical structure needs to be taller and more robust than a conventional solar farm, requiring more materials like metal and concrete, he adds. EV chargers also cost money, increasing the price even further. Commercial EV charging stations can cost around [\\$2,500 to \\$40,000](#) for a single port. An installation often requires permits and approval from local authorities or inspectors, all of which are additional expenses and barriers to faster deployment.

The design of the solar array may be a challenge, too. “There’s a trade-off between right-sizing the solar array for current EV charging needs versus anticipated future demand and the costs of the solar array,” says Daniels. “The solar array design and location on the site can create significant variability in installation complexity and project costs.”

Daniels recommends raising awareness about the currently-available tax credits and other incentives, such as the [federal solar tax credit](#) that can deduct 30 percent of total commercial solar installation costs. There is a tax credit of [6 percent](#) (with a maximum credit of \$100,000 per unit) on commercial charging equipment as well, given that it is placed in a low-income community.

When it comes to new regulations, Pearce suggests that policymakers begin with a small step, like mandating solar-powered carports with EV charging capabilities for new surface parking or government-owned lots. After that, requirements for other locations like public universities could follow, he adds.

States or municipalities could also offer incentives other than the existing federal solar tax credit. To encourage state agencies, government offices, businesses, and nonprofits to install EV-charging solar canopies over parking lots, the Maryland Energy Administration's [Solar Canopy and Dual Use Technology Grant Program](#) is offering grants. In 2019, one of these grants enabled IKEA to [install](#) a 1.5-megawatt solar canopy with EV charging stations at its Baltimore store.

Moreover, offering low- or no-interest loans to small- and medium-sized businesses can help them “keep up with the big firms investing millions in solar now simply to make money,” says Pearce. In general, if the federal government hopes to break one of the biggest barriers to the installation of solar canopies with EV charging capabilities, reducing upfront costs would be the key.