Going from WASTE . . . to SOLAR POWER WATTS

The closed Falmouth, Massachusetts, landfill features some imaginative junkyard art—and now has a new solar energy project.

Citizens Energy recently converted what company chairman Joseph P. Kennedy II called "trash and dirt"—a closed landfill in Massachusetts—into a clean energy project that is now delivering 4 MW of solar power to the town of Falmouth.

By Paul MacDonald

The timing for reinforcing a commitment to taking action on climate change could not have been much better with the Falmouth landfill solar project, commissioned earlier this year in the coastal Massachusetts town.

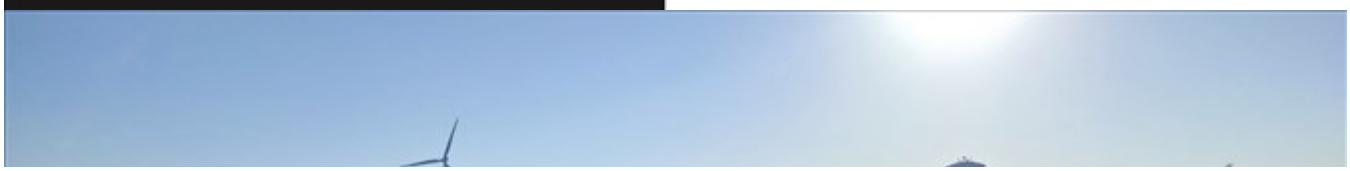
Less than a month later, U.S. President Donald Trump announced that he was pulling the U.S. out of the Paris Agreement on Climate Change.

At an opening ceremony for the 4-MW solar project earlier this year, Citizens Energy Chairman Joseph P. Kennedy II noted the contrast between the town of Falmouth's action on climate change and President Trump's then-threats to pull the U.S. out of the Paris Climate Accord—and the dismissal of EPA research scientists committed to halting global warming, and his plan to revoke the EPA "Clean Power Plan" aimed at achieving significant reductions in carbon emissions to comply with the country's Paris commitments.

"You know how important sea rise is going to be to our children and our children's children," said Kennedy, a former member of Congress. "I'm just so happy that Falmouth has the kind of political leadership that leads to good decisions based on science."

Kennedy then joined Falmouth business leaders and elected officials in turning on an electric switch to mark the flow of clean, green electric power from the utility-scale solar array, which was built by the company atop a now-closed landfill.

"It just means so much to all the members of the Kennedy family that we are able to find a way to give something back to this beautiful Cape," said Kennedy. "If you look out here behind us and see this wonderful field of what used to be just trash and dirt, but is now making energy for the people of this community."



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Citizens Energy, a Boston-based nonprofit, was selected to develop the solar array through a competitive bid process after a Falmouth Town Meeting voted overwhelmingly to support solar at the site. The process was overseen by the Falmouth Economic Development & Industrial Corporation, the local job creation agency.

The array occupies 16 acres of an inactive landfill, putting the property back to work for the benefit of local residents and businesses.

Emma Kosciak, director of solar development for Citizens Energy, said the Falmouth Economic Development & Industrial Corporation carried out a rigorous review process before selecting Citizens Energy—and that it was a good fit. Citizens was selected as the winning vendor to develop, design, finance, construct, and own the solar asset.

"From our perspective, we like working with public entities for a number of reasons, including that they are good long-term partners. And we were able to build the project on their landfill—we've become quite adept at landfill solar projects."

It was a positive project from a number of perspectives, she noted: re-using an older landfill, providing lease payments to the town of Falmouth, and selling reduced-cost energy to the town. Over the project's 20-year lifetime, it will return an estimated $14 million in economic benefits to the town.

Kosciak noted that Massachusetts has a solar incentives program called SRECS, which gives preferential treatment to building solar projects on landfills. The state has successfully encouraged the development of both landfills and other brownfields under the program.

"We actually built on landfills prior to there being any special incentives, so we were already familiar with what it takes with these projects," says Kosciak. "When they started offering incentives, that's when we started specifically targeting landfill solar projects—and we have become quite good at it."

The Falmouth Solar project is, in fact, Citizens' 15th solar array in Massachusetts and builds upon the company's $200 million portfolio representing 90 megawatts of power across 30 projects on the East Coast.

Doing solar projects on landfills and other brownfields involves some special skills, Kosciak says.

"There really are two main considerations," she says. "First and foremost is just getting comfortable with the environmental liability. As a company, we own this asset long term, and financing and insuring a project on a landfill is quite different than a greenfield project.

"And there are other unique aspects. When you build on a landfill, it comes with additional regulatory requirements, which means working with the state's department of environmental protection—so there are different layers of oversight that you need to be comfortable with, and there are different financial requirements as well." The state of Massachusetts, for example, requires financial assurances so it is not left cleaning up after a project that may not work out.

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"I know plenty of developers who do not want to build projects on landfills because they are not comfortable with those kinds of nuances," says Kosciak. "But we are, and are able to navigate our way through those different requirements and liabilities."

From a construction perspective, a landfill solar power project is very different from a greenfield project.

"You are dealing with a highly engineered landfill cap, and the entire design is meant to protect the waste mass below the surface to avoid any groundwater contamination. So we use low-ground-pressure equipment and have specific construction techniques related to that, such as when we place the ballast blocks for the racking. And there are usually some crane operations involved with installing the inverters, so we have to plan our construction protocols differently—we have to make sure we are not adding any point loads to the landfill surface and make sure we are not penetrating that cap."

Kosciak added that Citizens Energy carefully selects the contractors it works with. "When we select a contractor, their landfill experience and understanding of landfills is very important to us—that is a big consideration in our choice of contractor. Price is always important, but you need to get people with the right experience, who understand the environmental liability that we are working with, and are not going to have their people just driving trucks out anywhere on the landfill site."

The electrical contractor on the project was Boston-based Fischbach & Moore. The ground-mount ballasted racking for the project is from GameChange Solar, a leading manufacturer of fixed-tilt and tracker solar racking systems with over 2 GW sold. Solectria supplied four SGI XTM 750kW inverters for the project, and some 11,765 LG 340-watt monocrystalline panels were used.

Citizens Energy usually has an engineer on the construction site, whose job is to make sure things are done properly and that the landfill is being protected, says Kosciak.

"That is a big difference between building greenfield and building on a landfill," she says. "When we are building on a landfill, our number one priority is protection of the landfill and the integrity of its cap."

While there may be plenty of extras involved with a landfill solar project, due to the nature of the site, there's usually little required in the way of civil prep work.

There are no trees growing on the landfills—generally, there is no vegetation at all, says Kosciak. "They are usually very sunny, very exposed sections of land. You do get some topographical variability, and landfills settle over time. So we will bring in some gravel, to help make the landfill below the ballast blocks more level or to true up some areas where there might be some spaces."

Before they even start site work on a landfill project, though, they carry out extensive engineering calculations to estimate how much settlement there will be, and that can be dependent on the age of the fill. A newer landfill is going to settle more than an older landfill. Predictably, as landfills get older, there is less settlement.

"We expect a little bit of settlement—it's kind of like your house; as

it gets older, it continues to shift and settle in." She noted that the settling must be factored into the structural integrity of the installed system. "The racking systems are designed to have some flexibility, so if an area is settling, we can adjust some of the posts with the racking to make sure the solar panels are still straight."

The Falmouth site offered good accessibility in that the site is also the location of the town's transfer station. That being the case, the solar project is also very visible to anyone using the transfer station. "From an educational and awareness perspective, it's great," says Kosciak.

"Getting equipment and supplies to the site was very easy because of its location," she added. Citizens Energy also built some access roads on the landfill site itself as part of construction that they continue to use for maintenance purposes.

Kosciak said the town and its staff at the transfer station were very helpful in terms of coordinating activities at the solar project site. "They were great partners." Weather in this part of the country can be a bear, but they did not run into any significant weather issues, although construction was done in December. They were very conscious about getting the ballast blocks in as quickly as possible, because that can create risks, she says. "With building on a landfill, one of the dangers is the amount of vehicle traffic that you have. It can rut up the landfill and create a lot of mud. Pre-winter can be a dangerous time because it's raining, the ground gets muddy, and it can become a mess if you're not careful. We were very careful about getting the ballast blocks in on dry days and getting them in early.

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"Frozen is actually a good thing for landfill construction. If you have a lot of snow to deal with, that's not great, but I'd prefer working in frozen ground over muddy ground."

With the Falmouth project now complete, Citizens Energy is moving on to other projects, both in Massachusetts and other parts of the U.S. While it has done a number of solar landfill projects in Massachusetts in recent years, it has also worked on other renewable-related projects. Over the last decade, Citizens Energy has also developed wind farms and a major high-voltage transmission line in California bringing green energy from the desert into San Diego.

And the company, like many others involved in renewable energy, intends to push ahead with projects to help battle climate change, regardless of what is being done—or not being done—at the White House. e