Powering Tomorrow: Renewable Energy Rooted in Nature

STEVE LONG: Joe Czajkowski's family has been farming for generations.

JOE CZAIJKOWSKI: My family has always farmed. They farmed in Europe and they left in 1916 at the start of World War I and then they farmed here.

STEVE LONG: He always knew that he wanted to uphold that legacy.

JOE CZAIJKOWSKI: Even in kindergarten when they do Farmer in the Dell, they'd always pick me to be the farmer—everybody knew—and it's good because if you aim in one direction, maybe you'll get there. So, I was never confused like a squirrel crossing the road on where I was going, and that was okay.

STEVE LONG: He lives in Western Massachusetts, and like many other places, the economics of farming are difficult here.

JOE CZAIJKOWSKI: Two thirds of the farms in Massachusetts report a loss each year. The state of agriculture is almost always in a deflationary state. When I was a kid in the seventies, a hundred bushel yield of corn was a good yield. Now farms are—the average for our country is 180.

STEVE LONG: Joe has seen so many farmers struggle and many farms shut down.

JOE CZAIJKOWSKI: Farmers don't have pensions.

STEVE LONG: And that's one of the reasons why he tried something new on his farm.

JOE CZAIJKOWSKI: This is a dual-use agrivoltaic setup. It's on 2.3 acres, it provides power for about 35 homes and we also get the crops from underneath it.

STEVE LONG: Agrivoltaics—this is essentially using a piece of land for both agriculture and photovoltaics—commonly called solar panels, it's a revenue source for the farm that allows Joe to continue to do what he loves while also providing renewable energy to the community. And when we visited the site in February after some record

breaking snow, Joe was so proud to tell us how productive the panels were, even in the midst of winter.

JOE CZAIJKOWSKI: This field wouldn't be producing anything for anybody if it wasn't for the solar panels today. All these fields that are covered with snow aren't really contributing anything to our society right now. But because we have solar panels, it's putting out power to the neighborhood. So, some good is coming out on a bluebird day when, otherwise, there really wouldn't be any production from this field. But now it's still adding and contributing to our society.

STEVE LONG: You're listening to *Nature is the Solution*, a podcast from The Nature Conservancy. It's a show about how nature can solve some of our biggest challenges for people and nature. Because doom isn't the whole story. I'm Steve Long, director of policy and partnerships for The Nature Conservancy in Massachusetts. In my job, I think a lot about renewable energy, like solar and offshore wind. My work focuses on creating policies that encourage more of these projects to be built, and on making sure they end up in the right places.

My home base, Massachusetts, has mandated a transition to net-zero greenhouse gas emissions by 2050, which includes reducing the amount of energy we use, transitioning away from fossil fuels and increasing renewables, and making sure nature is healthy enough to suck up the remaining emissions.

We need more renewable energy here, but that energy infrastructure has to go somewhere and there's only so much land in Massachusetts. Much of it is already forests and farms that are providing their own essential benefits—storing carbon, protecting wildlife, growing food and giving people places to enjoy the outdoors.

So the question is: how do we meet our clean energy goals while still protecting the natural and working lands we depend on? This very question is the reason why we visited Joe Czajkowski's agrivoltaic farm in Hadley, Massachusetts. It’s a place where rows of solar panels rise above fields of vegetables, and energy production and agriculture happen on the same ground.

JAKE MARLEY: So this is the dual-use solar array that was designed and built by Hyperion Systems in collaboration with Joe Czajkowski Farm.

STEVE LONG: That’s Jake Marley, the solar developer who spearheaded the project, talking with our podcast producer, Jay Feinstein. I was with them that day, standing in more than a foot of snow in a field of solar panels, chatting over the steady hum of the

inverter in the background as it converted power from direct current—DC—to alternating current—AC.

JAY FEINSTEIN: Crops are grown here, but you're harvesting crops, you're also harvesting the sun.

JAKE MARLEY: Yes, yeah, that's exactly right. Hyperion—I should touch on this—was started by my late dad in 2011, and his idea at that time was food first, then energy. We can't take agricultural land in the Pioneer Valley, arable farmland, out of production for this single use. We all need food, we all need energy, so what is the compatible, or dual use, in finding that medium or balance?

JAY FEINSTEIN: What is behind that value of food first, then energy?

JAKE MARLEY: I really view agrivoltaics as a way to guarantee that this farmland is going to stay in farming production for 20 years, and that is a conservation, core conservation practice. So, it meets a lot of state goals all within one project: farm viability, conservation, energy production—regardless of hydrocarbon or renewable energy, we need energy generation here in the commonwealth—and then fourth is renewable energy. And all of those four really critical goals, commonwealth goals, are happening within one source of project funds and policy.

STEVE LONG: He walked us closer to the panels which are bifacial, which means they harness the sun's energy on both sides. This helps the array produce about a half a megawatt of energy, and that's clean energy that helps contribute to our renewable energy goals.

JAKE MARLEY: So on a day like today with a lot of snow cover, we're actually able to generate more power on the backside of the panels than we would on a summer day, when you can imagine there's a lot of dirt cover, soil cover and crops that don't have that irradiance like snow does.

JAY FEINSTEIN: Oh, so the sun reflects off of the snow?

JAKE MARLEY: Yes, yeah. There's a lot of reflectivity on a day like today compared to a summer day.

STEVE LONG: All that reflected light doesn’t just boost generation, it also translates into real dollars. Solar is one of the cheapest forms of energy and has already provided

significant economic benefits to the state. Jake points out a stat from the Massachusetts Department of Energy Resources or DOER.

JAKE MARLEY: DOER points to a day in June of this year where it's I think well over 90 degrees, and they're gonna have to turn on a peaker plant, and instead, we're able to dispatch power from battery energy storage, battery systems that are fueled by solar PV. And in one day, that saved rate payers in the commonwealth $8 million. That's significant.

STEVE LONG: To push those economic benefits even further, Massachusetts has layered on a unique incentive: it's called an "agrivoltaic adder," and it rewards projects that produce both power and crops on the same land. Massachusetts was actually the first state in the country to introduce this kind of policy, which it implemented in 2018.

JAKE MARLEY: I'm really encouraged to see its other markets are moving in this direction. New Jersey now has an agricultural adder. There are states that have different grants, so a different financial support for agrivoltaics, because they're recognizing the compatibility and the dual-use benefits, and the support for farm viability.

As Joe mentioned, farmers across the country are struggling. So New York State, as an example, has an agrivoltaic grant program, same with Colorado and similar in California. Agrivoltaics are happening across the country from Mass to California, Alaska, Hawaii and Puerto Rico.

STEVE LONG: This array might look a little different than a typical solar array. The panels are taller—7.5 feet to be exact—to accommodate tractors that can drive underneath. They're also slightly farther apart to accommodate the crops that grow in between, but otherwise, Joe says it doesn't alter the farming experience that much.

JOE CZAIJKOWSKI: When we operate equipment, we have to pay attention, but I would recommend people paying attention when they operate heavy equipment anywhere. The yields are very comparable. The only thing we miss is, we miss like a row right directly underneath the panels, but the second cash flow from the energy more than makes up for that.

STEVE LONG: And for Joe, it's not just about making the numbers work on his own farm. He's also thinking about what this means for the local economy.

JOE CZAIJKOWSKI: It's also good that the money stays in the community because when somebody pays their electric bill, some of that money comes down to the farm

across the street from them, rather than going to some oligarch in Russia or in the Middle East.

So the money stays in the community, and I can guarantee that the money gets spent in the community because that's how farmers—they have bills—so it helps the local community and also the towns get quite a bit of tax revenue from it.

STEVE LONG: All of that feeds into a broader vision Joe has for farming—and it goes beyond the usual buzzword of "sustainability."

JOE CZAIJKOWSKI: They talk a lot, in agriculture, about sustainability and I really don't think that that's a lofty enough goal, I think we can do better. In everybody's life, they try to make a difference and learn more and do a better job, or be creative. And I think to have farms aim for sustainability, that's like flatlining with your whole life, and that's not what people want.

I think we wanna leave the land in better shape than we found it, we measure that by checking our organic matter. We want to know that we're doing good things and we will leave it better than we found it for the next generation and generations to come. And there's a lot of APR land in the valley, and so that's gonna be farmland forever. So that land needs to be taken care of, especially well.

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STEVE LONG: APR stands for Agricultural Preservation Restriction—where the Department of Agriculture pays to keep farmland as farmland—and these exist because there is immense value in continuing to cultivate agricultural land here, just as there is immense value in building more renewable energy. Hence, the appeal of agrivoltaics.

Agrivoltaics is not the right fit for every farm. In some cases, the land is simply too valuable for growing food to justify putting solar panels on top of it. Joe calls his property "class 2 farmland" which is less productive than "prime farmland soils". And from a planning perspective, a big part of renewable energy siting is figuring out where energy infrastructure and grid interconnection is, to see where it makes the most sense to plug new projects into the grid. Joe's farm checks this box, too.

But when siting renewable energy projects, agrivoltaics are one option among many. We drove a few towns over, to Holyoke, Massachusetts, to check out another example of intentional solar siting.

BRANDON BARLOW: So to touch back on some safety points that we covered, essentially this is an active solar farm. We're generating power presently.

STEVE LONG: Mount Tom is a solar array that looks quite different from Joe Czajkowski's farm: at 22 acres, it's a much larger plot of land. The panels are also larger and much lower to the ground, which makes sense, they don't have to grow vegetables underneath.

BRANDON BARLOW: So we're standing on the very-most northern tip of the property, with the dam on the Connecticut River being at the far end of what used to be the Mount Tom coal plant.

STEVE LONG: It was a great place to site renewable energy because, like Joe's farm, it's not replacing a farm or forest. Brandon Barlow, the East Coast manager for the solar operations at the energy company ENGIE, explains as he gives us a tour.

BRANDON BARLOW: It's a retired coal plant. There's a lot of these old industrial properties across the country, and so this is a great way to repurpose it. It's a great way to utilize the existing infrastructure—the grid that's here—with HG&E, our partners that operate the grid here. And so, being able to repurpose this land that was otherwise not being utilized for renewable green energy reasons and to help Massachusetts achieve those stellar numbers is important.

STEVE LONG: There's something poetic about repurposing land that used to be a coal plant into a solar array. The landscape hasn't changed its job—it's still powering homes and businesses—but the way it does that work is cleaner, quieter and pointed toward a clean energy future.

The coal plant closed in 2014, and with it went a major employer for the town. But with solar panels now covering the site, a different kind of energy job has taken root, one that lets people stay in the community while helping power the region in a new way.

BRANDON BARLOW: We're hiring locals to mow it; we're hiring locals to plow it; we're hiring a local fence guy to fix the fence; and local electricians to come in, oftentimes local contractors to come in, and truck-roll the site for us and get those repairs made, to make sure our batteries are charging, to make sure HG&E has that power available to them; because now, especially that they're not generating via coal, they're entirely reliant on us to keep the meter turning.

STEVE LONG: The land sits between the Mount Tom State Reservation and the Connecticut River, so it provides habitat value and flood resilience. This is an example of the state's energy siting strategy, which encourages avoiding building on the most ecologically valuable portions of the site. And since most solar arrays are surrounded by a fence, which impacts wildlife movement, many solar developers have the opportunity to minimize those impacts by using fences that have openings that allow smaller critters to pass through, and by planting native vegetation for local wildlife.

BRANDON BARLOW: There's deer tracks in here; there's bear tracks in here; there's a bald eagle that's living on top of those power lines back there—they've got a nest.

STEVE LONG: And there's one last reason why Mount Tom was a good place to site solar: proximity to energy infrastructure. Madeleine Klein, managing director for policy & market strategy at ENGIE, explains.

MADELEINE KLEIN: So Mount Tom was a great place for solar because it was already an energy generator. It had all the transmission infrastructure that we needed in order to connect the solar power plant and transmit it to the grid. So, a lot of that electrical infrastructure was there and didn't need to be rebuilt. It was also a site where there weren't a lot of other options for what could go on that site because it had been a coal-fired plant for so long, and so, solar—maintaining its role as an energy generator through solar and storage—was really a great for that part of the part of the state. You know, we generally love it when we can put solar and energy storage in the built environment: on rooftops, on brown fields, next to factories, close to where the solar energy will actually be consumed—that's ideal.

[music]

STEVE LONG: We went out into the field one last time for this episode.

MICHAEL DECHIARA: If you decide halfway it's too muddy, we can turn around [laughs].

JAY FEINSTEIN: Yeah, I think we're both wearing boots, so…

STEVE LONG: We wanted to understand solar siting from the municipal side, so we met up with Michael DeChiara, a member of the Town Planning Board and the chair of the Energy and Climate Action Committee in Shutesbury, Massachusetts. On a rainy, muddy day, we trekked out to a solar array in his town.

Out there on the trail, Michael was quick to point out that not everyone is going to agree with every solar site. As we walked, he gestured toward a low, soggy area that looked a lot like wetlands—exactly the kind of thing that can raise red flags for people in the community.

MICHAEL DECHIARA: So this water that you're looking at didn't used to be here, and so, the installation of the solar on top of the hill changed the water flow. So, this house in particular now gets water in its basement where it didn't used to, and even the houses farther down, there's much more flooding along the road because the water just comes down; where when you had 30 acres of trees, they were stopping the flow, and they were sort of minimizing both the amount of water that was flowing and also the direction.

JAY FEINSTEIN: If I were to step into that, it would probably go up at least until my knees.

MICHAEL DECHIARA: Uh, it would be, it would be, you'd be wet.

STEVE LONG: You have to hike a bit through the woods to get to the solar site we were visiting, and for Michael, that's exactly the point.

MICHAEL DECHIARA: I'm glad we're doing this 'cause you can actually realize that we are, we're actually in the woods. You know?

JAY FEINSTEIN: We're building solar. Solar has to replace something else—Like, there's something else that's on the land and, in this case, it's woods.

MICHAEL DECHIARA: And more recently I've been thinking about it as, it used to be that we're trying to mitigate climate change—climate change is here—so anything that we're doing now has to be with resilience in mind. And trees in this instance, they sequester and store carbon; they clean water; they prevent erosion; and for the Boston area, they actually cool the Boston area because it's the temperatures and all are cooler in Boston 'cause of all the trees in Western Mass, which is overlooked.

So if you were to say, how do we address deployment of clean energy with resilience? You would design differently, than just cutting down 30 acres of trees and putting it in the woods, because it's not happening just in Shutesbury, it's happening all across New England, but all across Western Mass.

STEVE LONG: Michael is an advocate for building more solar; for meeting the state's renewable energy targets; for addressing climate change, but he wants more engagement when it comes to setting the policies that actually implement it. He wants to make sure that it's done right, in a way that considers the needs of people and nature.

MICHAEL DECHIARA: The reality is communities want to have solar; we want to be part of the solution; we just want it to fit appropriately. So, rather than cutting down 30 acres of trees to put 20 acres of panels like we're looking at, a small site where it's less of a footprint and less of an impact, that kind of strategic thinking would make sense.

There's a lot of places where you're not taking out prime forest land that actually has utility for resilience. Let's design this for resilience. There is, in my opinion, a myth out there in the solar industry that says that solar panels are better for the environment than trees. You know, if you look comparatively, the reality though is that no solar panel can sequester and store carbon.

STEVE LONG: In the end, Michael is asking policymakers to listen more to local municipalities when making regulations about solar siting because even in Massachusetts, which is a small state, the needs of each community are a little different. Boston is different from Western Mass; and within Western Mass, the historically industrial town of Holyoke looks different from the primarily forested town of Shutesbury.

Due to new regulations, solar siting in the state will fall more on municipalities going forward. With that, Michael advocates for more resources to go to municipalities to help make some of the crucial decisions they'll face. He points to a program that The Nature Conservancy was engaged with for municipal vulnerability preparedness, and says a similar model might make sense for renewable energy siting.

MICHAEL DECHIARA: The Nature Conservancy developed the curriculum to train people to be professional evaluators, to come up with MVP plans for municipalities. So they do this repeatedly and they have the expertise in the orientation, and so you could do the same thing with site suitability; that you would have a proposal that comes through in front of a town, and the town would say, okay, we're gonna charge the applicant for the cost of a trained consultant to do a site suitability assessment. It would provide some third-party objectivity, which everyone would appreciate.

STEVE LONG: After visiting all three sites, I sat down in the recording studio with Jay and my colleague, Andy Finton, senior conservation ecologist for The Nature Conservancy in Massachusetts. We unpacked what we've seen and dug into how The

Nature Conservancy thinks about renewable energy siting: where these projects belong, what tradeoffs they involve, and how we can meet our climate goals without sacrificing the lands and waters we depend on.

JAY FEINSTEIN: We need to meet our renewable energy targets for the state of Massachusetts, and that involves building more solar. But that's the question, there's only so much land in Massachusetts—there's only so much land in general—where should we prioritize these solar sites?

ANDY FINTON: That is the key question, Jay, and it's a giant puzzle. It's a question for all forms of development. How can we build what we need—solar as well as housing and other development—and have better outcomes for both people and nature? The approach we're taking, and this the approach the state is taking, is to use a systematic, science-based approach: what locations will have the least impact on nature and people? Where will we have the least impact on forests and forest carbon? The least impacts on biodiversity, the least impacts on communities that already have a lot of burdens?

STEVE LONG: And we also need to think about affordability as well. Where do we have an interconnection point to the grid? You can't just take a wire from a solar array and put it up on the nearest phone pole, you need a connection point.

JAY FEINSTEIN: So that leads me into this amazing, glossy piece of paper I have right in front of me—it's this glossy pamphlet I'm looking at—it's a BioMAP in action. Tell me if I'm right, this shows biodiversity across the state where there are clusters of biodiversity and maybe this can help inform the process?

ANDY FINTON: It's already been built into the process. The BioMAP is an integrated synthesis of rare species data, intact ecosystems and large functional landscapes. So it's all forms of biodiversity and the state is using that to say if you're impacting biodiversity, as defined by the BioMAP, we're gonna try to steer you away from that. Let's build in places that don't impact biodiversity as heavily.

JAY FEINSTEIN: And in the same way as there's a BioMAP, there's also all sorts of data on forest carbon and what places in the state are really good at storing carbon. Some old forests are storing a lot of carbon; maybe you don't want to cut down those trees for solar, maybe you look elsewhere.

ANDY FINTON: That's perfect, yeah. It’s not only where it's stored, but it's what forests have the potential to sequester, to absorb carbon from the atmosphere for the next 50 years as well. So those forests that both are storing and pulling carbon out of the

atmosphere, and we know where those are, and we're gonna—again, the state is using those data.

Every one of the criteria that are used for solar siting has data behind it, tools behind it: interactive maps so that you and I, as well as the solar developers and the state agencies, can figure out this parcel, this potential project, how impactful is it gonna be for biodiversity using the BioMAP forest carbon—using the forest carbon maps—et cetera.

JAY FEINSTEIN: So I'm looking at this beautiful BioMAP in action which is a paper pamphlet, but there are also all sorts of digital resources that were created in concert with The Nature Conservancy.

ANDY FINTON: So Biomap—you're looking at this glossy pamphlet—but BioMAP's real power is online and the interactive bio map. You can go to your town, you can go to your parcel that you own and find out exactly what biodiversity resources are there. That data was built into another interactive map for energy siting. So the BioMAP data is combined with forest carbon data, social and environmental burdens data, climate resilience data and agricultural resources data for one-stop shopping. A developer, anyone interested in developing solar, can go to that interactive site, either draw a polygon or upload the shape of their parcel and find out instantly the score, the impact score or the suitability score for that potential project.

JAY FEINSTEIN: And where would they find that?

ANDY FINTON: That map is on the website of the Executive Office of Energy and Environmental Affairs.

JAY FEINSTEIN: So we have all sorts of climate change goals: The Nature Conservancy aims to triple our renewable energy capacity by 2030, the state committed to reaching net zero emissions by 2050, and these resources we're talking about are essential here because they inform the policy that helps us get there. And this is one of the first times that data like this is incorporated into policy. Is that right?

STEVE LONG: It's a very new thing. The citing and permitting was not considering forest carbon or resilience before, and we've enhanced the way policy thinks about biodiversity, and it's really interesting. There's the scores that Andy described in the mapper and then communities have an opportunity to look at those scores and choose from a menu of options that can help avoid and minimize and mitigate those impacts.

JAY FEINSTEIN: So it's all really reflected in the policy.

STEVE LONG: That's what makes it real. You can have the best maps and the best science, but until you have some authority to make decisions on siding and permitting, until the state has the right incentives in place, it's not real.

JAY FEINSTEIN: So when we visited Michael DeChiara, he told us that one of the most important things to him is real community engagement in the solar siting process.

What needs to happen to make sure that communities are engaged and have a stake in this process?

STEVE LONG: There needs to be a real dialogue with people in the communities. Siting is not just about the science, it's also about community values. You can have the best science in the world, but you might not know about the history of a community. You might not know what's happening on the ground in a community. That is essential.

Also because the new siting and permitting paradigm is complicated, a lot of smaller cities and towns don't have the capacity or the expertise to make decisions. So there's going to be a lot of support needed and provided to those communities, and that should come in the form of what I hope will be third-party certified experts.

JAY FEINSTEIN: The Nature Conservancy's really advocating for a system like that. The Nature Conservancy wants to make sure that there is a system where there are professional evaluators.

STEVE LONG: Absolutely. Cities and towns oftentimes don't have the capacity or expertise to make the decisions required of them in this new setting and permitting paradigm, so they need the professional help; they need the people who have the science-based expertise that can help them evaluate where the solar should go in their community.

JAY FEINSTEIN: Michael also pointed out some of the externalities that come with solar installations. For example, he pointed out a piece of land that floods and didn't used to when the piece of land was covered by trees instead of panels. How could we build more solar but minimize impacts like that and how is that reflected in the policy?

STEVE LONG: So we need to have goals such as no net loss or nature-positive impact. No net loss is when you replace the loss of forest or land converted for development with equally ecologically valuable land and resources. Nature positive impact is when you go further and say plus one. So you may convert one acre of forest and you have to replace it with one or more acres of forest. We need to have a framework in place, and that's

called the mitigation hierarchy. First, we avoid; what we can't avoid, we minimize; and what we can't minimize, we mitigate.

JAY FEINSTEIN: It's rare for a place to be a hundred percent suitable for solar. Usually there's some sort of trade off and we have to really think carefully about what those trade offs are and how to approach that, and in the end, we just want this to be a net good.

STEVE LONG: Absolutely. I mean, as the podcast says, nature is the solution. We need to think about the values that nature provides, food, clean air, clean water, et cetera. And when development impacts those—what we call ecosystem services—it impacts both people and nature.

JAY FEINSTEIN: Andy and Steve, thank you so much for coming in.

ANDY FINTON: Thanks for having us.

STEVE LONG: Yeah, thank you very much. Really appreciate it

[music]

STEVE LONG: *Nature is the Solution* is a podcast from The Nature Conservancy. In our next episode, we unpack nature's climate toolkit. How can natural climate solutions move us forward towards our climate goals?

PETER ELLIS: I love thinking about natural climate solutions, not just because they're practical things that enable us to have a livable future for biodiversity and people. We need to rely on the powerful technology that nature has evolved over literally billions of years, and that's photosynthesis: the first form of carbon capture and storage that solved the last levels of toxic carbon dioxide in the atmosphere and created a livable planet for species to thrive.

STEVE LONG: For that episode and more, follow our show on Apple Podcasts, Spotify or wherever you listen. Thanks for listening to *Nature as the Solution*. I'm Steve Long.