“U.S. Wind Power Finally Gets Its Sea Legs” Excerpt Transcript

Excerpt from (September 2, 2016) episode of Science Friday.

JOHN DANKOSKY	This is Science Friday. I'm John Dankosky. Care to hazard a guess as to how many wind turbines there are on US soil? The answer, nearly 50,000. Yeah, we have 50,000 turbines on land. Now, how many do you think we've got operating out at sea, off shore? I'll give you a hint. The number is a bit smaller than that. OK, we've got one--one little tiny windmill, a junior-sized windmill, off the coast of Maine. Now that's going to change pretty soon, because this fall, a much larger project, five full-size turbines, are set to start spinning off the coast of Rhode Island. Maybe it'll give the naysayers who think "not in my backyard" a chance to see what these things look like. And since more states are signing on to install offshore wind farms, experts like my next guest say offshore wind could soon be blowing full speed ahead. Cristina Archer is an associate professor in the College of Earth, Ocean, and Environment at the University of Delaware in Newark. Welcome to Science Friday.
CRISTINA ARCHER	Thank you very much.
DANKOSKY	And Suzanne Tegen is section manager for wind and water deployment at the National Renewable Energy Labs Wind Technology Center near Boulder, Colorado, and she joins us today from KGNU. Welcome to the show.
SUZANNE TEGEN	Glad to be here.
DANKOSKY	There's a lot of places in the world where there's a lot more power. Why do you think it took so long, Dr. Archer?
ARCHER	Oh, yeah. It's complicated, obviously, why it took so long. The previous case was Cape Wind, perhaps well known to people. They were trying to install a farm in the Nantucket Sound, and the project started. They were sued every other day. So it did not happen. In Europe, meanwhile, we have hundreds and hundreds of turbines in the water already, and they've been operating for a long time. So it's a very exciting time, because it's finally happening in the US.
DANKOSKY	Well, Dr. Tegen, just explain a little bit how big this project is. I mean, we talk about five turbines, and we're celebrating this. If we like the idea of offshore wind and this is very exciting, this isn't a very big wind farm, is it?

TEGAN	No, this is not a very big wind farm when you look at other-- so European offshore wind farms. It does look big, if you're right up next to it. The towers are 175 meters high, and the hub height is 100 meters. So it will look big to people who haven't seen other ones. But, right, there are commonly wind farms that are a lot bigger than this. And this one is, like you said, only 30 megawatts and five turbines, where we can see them in Europe with 20 turbines or more.
DANKOSKY	And just so we understand, that 30 megawatts powers about how many houses?
TEGAN	Well, so that depends. Generally, we assume that one megawatt powers between 300 and 400 homes, but that's homes that are in-- that they have their residents in them for the whole year, whereas Block Island is much, much less populated in the wintertime. So they probably factored some of that in.
DANKOSKY	So Dr. Archer, are there some advantages to putting wind turbines off shore, rather than on land? I mean, we have a lot of land in the central part of the United States and out west, certainly, and a lot of wind. But we also have an awful lot of offshore capacity. We've run into problems in trying to site them off shore so far, but what do you say are the advantages to putting these turbines out at sea?
ARCHER	Well, for the East Coast, I would say it's almost your only wise choice. There isn't that much wind inland along the East Coast. We don't have really tall mountains. There's not-- the wind resource is not fantastic inland along the coast, and offshore, on the other hand, winds are whipping. It's a very good idea to do it offshore. In addition, the bathymetry, the depth of the ocean, is favorable also along the East Coast. The continental shelf is the right granite, and the depth is not very deep, so you can do foundations on a regular traditional way. So it's not-- you don't have to go to floating turbines or anything like that. So you get the combination of good, good wind and the right depth, so it's very favorable.
DANKOSKY	Suzanne Tegen, thank you so much. Also Cristina Archer. Thank you for joining us. How can we save some of the energy from a windy day to use another time when we really need it? Michael Kintner-Meyer has a few ideas. He's a staff scientist at the Pacific Northwest National Lab in Richland, Washington. Welcome to Science Friday.

MICHAEL KINTNER-MEYER	Good afternoon.
DANKOSKY	So first of all, how soon do you think we need to be thinking about storing all of this excess wind energy that we were just talking about?
KINTNER-MEYER	Well, storage has already been used. It's not really anything new. Regarding the integration and supporting the integration of variable renewables-- wind and solar-- we're starting to see some potential issues there with not having enough flexibility. So it is not necessarily an issue of not having enough capacity. It is often not having enough flexible capacity that is capable of ramping up very quickly when the wind comes down. And then likewise, being able to ramp down when the wind starts to blow again. And so we're seeing already some of these batteries, as well as non-battery solutions being deployed.
DANKOSKY	But a lot of the things we wanted to talk about here were not necessarily battery ideas. I mean, thermal storage and other ideas. I mean, for instance, there's a Canadian company investigating these concrete eggs that are underwater. Explain how those work.
KINTNER-MEYER	Yeah. The Canadian company technology is called Hydrostor. And so they're using actually balloons that they are deploying down at the bottom of the seashore, and blowing up with compressed air. So it is basically a compressed air energy storage solution. We have a big compressor blowing air into these balloons that are being exposed to the hydrostatic pressure down on the seafloor. And you pump them up during charging periods, and then, if you like to release the energy, you reversing the flow, and the pressurized air and the high pressure is then being expanded in a turbine to produce electricity. And so the interesting aspect of this technology is that you can deploy them pretty much anywhere, and the investor and manufacturer of this technology envisions to co-locate it with offshore wind deployment.
DANKOSKY	And that provides some of the flexibility you were talking about before.
KINTNER-MEYER	Exactly.
DANKOSKY	We have been using a pump tidal storage, where we converting electricity into potential energy by pumping water from a lower reservoir into an upper reservoir. And we can leave the water as long as we need it there, and when we need to discharge the storage, we reversing the flow. We opening up the spigot, and the water rushes down, turns the turbines, the water turbines, to generate electricity.

	And so we have about a 22 gigawatts of capacity in the United States, which is about 2% of the installed capacity in about 10 one-terawatt, or 10,000-gigawatt, system. And that is quite an amount. There are some developers out in the state of Nevada, and so they requested approval to build what they call an advanced rail energy storage system. So here again, the physical principle, very similar. You use electricity to turn it into potential energy by driving up an electrically-powered locomotive with rail cars that are filled with nothing but dirt up a hill. And by doing that, you storing energy and potential energy. And if you need the energy, you let the train roll down. You decelerating the train, and by decelerating it-- by braking it, basically-- you converting back the kinetic energy into electricity.
KINTNER-MEYER	I was going to say, it sounds like some of these ideas are fairly simple ideas. But they take up a lot of space and a lot of infrastructure. I guess I'm wondering, Doctor, if battery technology, you know, as small as we can possibly get them, isn't really the thing that we need to think about to be this flexible source of power, so that we don't have to worry about building all this stuff, you know, giant trains and pumping water up hills.
DANKOSKY	The challenge is that each of these different technologies, whether that is a battery-- like an electrochemical storage device or a mechanical storage device-- has certain advantages and disadvantages. So a electrochemical storage does not scale very well, cost-wise, with unit energy. So if you want to add more energy, you need to have more batteries. So in the pump tidal, what makes really up the energy is more water in the upper reservoir. So the water is relatively cheap.
KINTNER-MEYER	True. Yeah, well, you're making a pretty good case for some of these very simple technologies. Michael Kintner-Meyer is a staff scientist in the Pacific Northwest National Lab in Richland, Washington. Thanks so much for joining us today. I really appreciate it.
DANKOSKY	You're welcome. Thank you.