[sfx wind turbine]

**Sam Evans-Brown: Imagine a wind turbine. The big ones, that you’ve likely seen before.**

**If you’ve never stood right beneath one, this is what it sounds like.**

[sfx again]

**They can be noisier, when the weather is just right — or wrong as it were — but having stood right beneath several, I can tell you that generally speaking it’s actually a little uncanny how quiet they are.**

**Annie Ropeik: The big ones often look like they’re moving slowly, but the tip of each blade can be traveling faster than a hundred and fifty miles an hour.**

**Sam Evans-Brown: Something SO BIG, whispering along. Quieter than the traffic on a country road.**

[sfx and mux]

**Annie Ropeik: And they are big. It’s almost a little unsettling how big they are. The biggest in the world today are the size of New York City skyscrapers… specifically… almost exactly the size of the Trump World Tower.**

**Each blade is about the length of one and half Boeing 747s, slicing through the air impossibly fast.**

**Sam Evans-Brown: Is it any wonder that these machines… have become a symbol of the fight against climate change?**

**I remember back in college, being handed a poster for some climate rally… it was a bunch of silhouettes arranged like that iconic photograph of the soldiers who hoisted up the flag on Iwo Jima… but instead of the flag… they were pushing up a wind turbine.**

[Mux and SFX swell, then cut abruptly]

**Annie Ropeik: We’re going to talk about how they got to be so big — literally and symbolically… and to do that, there’s perhaps no better place to start than with Henrik Stiesdal.**

*SAM EVANS-BROWN: Give me just one moment. Let me go grab my headphones. So the real test will be, does the toddler come roaring into the room at top volume halfway through the interview? That'll that'll be the real test.*

*HENRIK STIESDAL: That sounds good. Um.*

**Annie Ropeik: The turbines with three blades up at the top. In the business that’s called the Danish Concept, and one of the very first such machines was built by Henrik Stiesdal.**

**The reason this design has taken over the world is because it’s the design that works. It’s the one that produces the most energy for the least money. Turbines that look like egg-beaters or double helixes or jet engines… they didn’t make the cut.**

**Sam Evans-Brown: Many people call Henrik the father of wind energy, but I get the sense that he’d be embarrassed by this moniker.**

[New music]

*HENRIK STIESDAL: I started making wind turbines all the way back in 1976.*

**Sam Evans-Brown: Henrik built his first turbines from junk -- stuff that was just lying around his family’s farm. And they were small. All three blades together were about 30 feet across.**

*So it's about 45 years ago now and ended up building a wind turbine for my parents farm that could deliver the power that they used. And I got kind of hooked.*

[Music]

*HENRIK STIESDAL: hooked on this concept of doing something new and ended up doing together with a friend, a couple of commercial machines.*

**Annie Ropeik: At the time they were still pretty small - though they generated a little more electricity than your average household would probably need.**

**He sold his design to a company that made cranes. That company was experimenting with wind turbines. But it wasn’t going great.**

**So in walks Henrik with his farm-junk turbine, and the Danish concept was born.**

**Sam Evans-Brown: That company? It’s name is Vestas.**

[slow ambi mux and SFX build]

*HENRIK STIESDAL: And they are actually still the largest wind company in the world. And they they started with a license of my technology back in 1979.*

**Sam Evans-Brown: Henrik did all of this before even starting college.**

[Music Post?]

**Annie Ropeik: Henrik Steisdal has been at the leading edge of this industry since its birth - from blades that looked like tiny airplane wings to blades bigger than airplanes themselves.**

**Annie Ropeik: And the major difference between the wind turbines we see today, and the ones that Henrik built in his teenage years, is they just keep getting bigger. Bigger than even Henrik could imagine.**

*SAM EVANS-BROWN: I'm curious if you have any thoughts about how big, how big you think they might wind up being?*

*HENRIK STIESDAL: Uhhh. The unfortunate thing is that I've been predicting where that ceiling is for. More than 30 years now, 35 years and all has been wrong.*

*HENRIK STIESDAL: In 1985, I went to an international conference as a speaker and stated very firmly that a commercial turbine's would never be bigger than 250 kilowatts.*

***Sam Evans-Brown: 250 kilowatts. GE just announced a model that’s 14 MEGAwatts***

*HENRIK STIESDAL: What is that, almost 60 times bigger?*

**Sam Evans-Brown: And that wasn’t the only time he was very publicly wrong. Five years later, he was off again, still way too low.**

[maybe a beat of music maybe not you decide!]

*HENRIK STIESDAL: So what I'm doing now is that I'm looking at the growth curve and if the curve continues, it will cross the 2030 line at a size of about 20 megawatts. Two hundred and seventy five meter large rotors. That's a big machine. And how it goes after that, nobody knows.*

**Sam Evans-Brown: A 275 meter rotor… the rotor is everything that spins — the blades tip-to-tip. And 275 meters is the length of three football fields. If that prediction is true, it would mean that ten years from now from tip to tip it would be the size of a giant, spinning sports complex.**

[SFX and mux swell]

**Annie Ropeik: It gets to a point where wind turbines are so big -- you can’t transport even the parts for them on land. Highways aren’t built for them, the turns are too tight. And actually -- that’s kind of convenient. Because the best winds -- the ones that will generate the most energy -- those winds are out at sea.**

[Music and seagull/turbine SFX]

**Sam Evans-Brown: Climate change is so big - so complicated -- that there’s no *one* solution. There are a ton of solutions. If we want to avoid the worst impacts of a warming earth, there are so … many … things humans need to change. All at the same time.**

**Annie Ropeik: Some of the technologies that people discuss as solutions might not happen at all. Others might not happen fast enough.**

**Sam Evans-Brown: But there is one thing that IS almost certainly gonna change here in the U.S. -- and it’s gonna change fast. We are at a real moment. ALL of the stars have aligned: the politics, the technology, the money. It’s coming.**

CNN Newsreel: Now to a dire warning about climate change…

Newsreel: The Biden administration wants offshore wind in US waters…

President Joe Biden from SOTU: There’s no reason why wind turbines can’t be built in Pittsburgh instead of Beijing. No reason.

Ziven Drake: It’s devastating, but on the uphand, it’s money in my pocket and job security for me and my people.

Jason Jarvis: You want to save the planet? You want to go green? Stop using so much electricity. The only thing I see about going green is money.

[music fade]

**Sam Evans-Brown: From New Hampshire Public Radio, this is WindFall, a special series from Outside/In.**

**Annie Ropeik: I’m Annie Ropeik. I lead NHPR’s climate reporting project, By Degrees.**

**Sam Evans-Brown: And I’m Sam Evans-Brown**

[music post and fade]

**Annie Ropeik: In the spring of this year, a landmark, attention-grabbing report came out… the kind of report that double underlines the thing that this podcast is all about.**

**It came from the International Energy Agency. The IEA represents dozens of countries, mostly rich ones, focused on energy security. Historically, the IEA** [**has been criticized**](https://cleantechnica.com/2017/09/06/iea-gets-hilariously-slammed-continuously-pessimistic-renewable-energy-forecasts/) **for repeatedly overestimating the cost of renewable energy in its forecasts… but this time even the kinda stodgy, kinda conservative IEA, came out with some really startling conclusions.**

*Fatih Birol: I will be blunt. Commitments alone are not enough. We need real change in the real world.*

**Sam Evans-Brown:** [**Here’s the IEA’s director**](https://www.iea.org/news/executive-director-speech-at-the-leaders-summit-on-climate)**, Fatih Birol, in April 2021. They said that to avoid the worst impacts of climate change, the world needs to stop looking for new fossil fuel supplies this year, and dramatically ramp down their use.**

*Fatih Birol: Emissions are on track for the second largest increase in history. We are not recovering from covid in a sustainable way. And we remain on a path of dangerous levels of global warming.*

**Annie Ropeik: But at the same time, the IEA also said that despite the pandemic, renewable energy is being built faster than ever.**

**So at a minimum, it seems some of the world is trying to pivot. And the one place that countries are looking to more and more - a source that many in the industry thought would never be cost-competitive — is offshore wind.**

*HENRIK STIESDAL: Now the world is changing. Now we are doing what we thought we couldn’t do.*

**Sam Evans-Brown: There’s this old picture of Henrik Stiesdal that I found, back when he was much younger. This was in the late 70s. He and his dad are standing over an early rotor lying in the grass and Henrik has this curly mass of blond hair on his head and is looking very seventies and unconcerned.**

**I got a little bit of that vibe when we talked over video call, too. He was in his office, and at one point put his feet up on the desk, revealing that he was wearing shorts that were of a very… shall we say… very european cut.**

**Sam Evans-Brown: After kickstarting the modern wind industry with his invention, Henrik Steisdal went on to have a long career in that industry. And along the way, he worked on basically every milestone in the development of the technology.**

**That includes having developed the world’s first offshore wind farm.**

*HENRIK STIESDAL: I’m about as biased as you can get - I built the first project in the world.*

*SAM EVANS-BROWN: which one was that?*

*HENRIK STIESDAL: That was called Vindeby.*

*SAM EVANS-BROWN: Vinda-bew*

*HENRIK STIESDAL: Yes, Vinda-blew in Danish, we would say. but I've learned to say so that it can be you can read it later on and say, oh, that was what that guy was saying.*

**Sam Evans-Brown: The first offshore wind farm in the world was built off the coast of Denmark in 1991. It was a demonstration project. Thirty years ago. It’s so long ago, that Vindeby actually already been torn down.**

*[Vindeby decommissioning story tape rises: All the dismantled components and foundations…*

**Sam Evans-Brown: Vindeby was project number one. And it is really hard to wrap your head around how much has changed over the last 30 years. The BIGNESS of offshore wind. Not just how big the turbines are now -- but also how many there are in the oceans, and how quickly the world is installing them.**

**So .. to help YOU picture it all… let’s say all that power put out by Vindeby is just one marble…**

[SFX Marble drop]

*[00:19:24-00:20:13] HENRIK STIESDAL: Actually took nine years until we built number two, that was built outside Copenhagen. It's called Middlegrunden and has twenty two megawatt turbines*

**Sam Evans-Brown: That’s eight Vindebys.**

[SFX Marble drop]

*And I think they're still the most photographed offshore project of them all.*

**Sam Evans-Brown: And they just kept getting bigger.**

*Then Nysted project with 72, two point three megawatt turbines*

**Sam Evans-Brown: That’s just more than 33 Vindebys.**

*[00:21:24-00:21:30] HENRIK STIESDAL: And then there's this big project called London Array. That's 630 megawatts.*

**Sam Evans-Brown: That one was finished in 2013, in UK waters. That’s 127 Vindebys.**

[SFX Marble drop]

**Sam Evans-Brown: Henrik retired after the London Array. It was the largest offshore wind farm in the world until 2018. Today the largest project in the world — Hornsea 1, another British project — is nearly 246 Vindebys.**

*[00:22:40-00:23:00] HENRIK STIESDAL: If you if you draw kind of like a curve or the first 25 years of offshore wind. Then that curve is very strongly sort of flat in the beginning and rising very steep in the end, it really starts rising is in around 2010. That's where it really takes speed. So it was indeed the inflection point.*

**Sam Evans-Brown: So the wind farms themselves are being built bigger and bigger. But if you really want to talk about bigness — you have to take in the whole picture. Not just the size of each turbine, or the size of each wind farm.**

**Just last year, China installed the equivalent of 606 Vindebys.**

**South Korea has plans to install a single project that will be another 1657 Vindebys.**

**It’s just massive. If you looked across the globe at the end of 2020 - there were thousands of turbines in the oceans. 35 GW. That’s more than 7,000 Vindebys.**

[SFX Marble drop]

[music]

**Annie Ropeik: But that’s the rest of the world… here in the US… it's a different story. You know how much offshore wind the U.S. has installed? Let me just put it this way….**

[SFX Marble drop]

*Bryan Wilson: You have an opportunity today to go out to the first offshore wind farm in the United States… there are a number of windfarms that have been in the water , primarily in Europe that have been in the water for well over 20 years, but this is the first in the United States.*

**Sam Evans-Brown: The United States has seven turbines in the ocean. SEVEN. Europe - more than 5,000...**

**America - seven.**

**Annie Ropeik: Two of them are in Virginia. And five of those seven are Deepwater Wind off Block Island, in Rhode Island, and Bryan Wilson is their manager.**

*[00:08:52-00:09:21] Bryan Wilson: So we're headed off to Block Island. The wind farm is located three miles off the shores of Blocher in state waters. It is again, a state project takes us about an hour to get there.*

**Annie Ropeik: Block Island Wind was the very first offshore wind farm to be built in the US - five years ago.**

**Sam Evans-Brown: But it’s just a demonstration project… kind of like a modern Vindeby… but just 30 years later.**

*The turbines are quite a sight to see. Everyone who arrives for the first time is pretty much awestruck, quite quite honestly. I know that their work all the time and I'm constantly awestruck. So it's a it's quite a sight to behold.*

*[mux]*

**Sam Evans-Brown: There are reasons why the U.S. is so far behind - reasons we’ll save for another episode. For now, I’ll just say - it’s got less to do with how windy the Atlantic Ocean is (because it’s very windy out there) and more to do with political winds, and how they shift.**

**Anyway … the Europeans and the Chinese got a huge head start, but there are benefits to coming second**

**Annie Ropeik: — or you know, fourth --**

**Sam Evans-Brown: The expensive days of developing a nascent technology are now passed. The European wind industry is mature. offshore wind is competing against other forms of power without subsidies in Europe… and is eager to get a foothold in the US.**

[music]

**Annie Ropeik: And certain states are eager to give it a foothold.**

**As part of their climate change plans, … 7 states on the East Coast have passed laws mandating that their utility companies buy energy from offshore wind projects - offshore wind projects that no American company has built yet.**

**So that’s opened the door for the European offshore wind giants to set up shop on this side of the pond.**

**With the laws in these seven states, in less than 10 years, the US could have more than 30 gigawatts of offshore wind installed… more than China has now… more than Europe has now…   
  
Sam Evans-Brown: [whisper] more than 6000 Vindebys**

[SFX dark Marble echo]

**Annie Ropeik: And those wind giants are bringing their money… that’s after a break**

MIDROLL

**Annie Ropeik: So, states are lining up to buy the electricity. European companies are eager to build the turbines. But the oceans — where the wind is blowing and where the turbines are gonna be built — those are federal waters.**

*Sam Evans-Brown: Ok so today is… the Bureau of Ocean Energy management… they are auctioning off three federal offshore wind development leases.*

**Annie Ropeik: We’ve told you about how big the wind turbines have gotten, and how big the wind industry has gotten, but there’s one more superlative ingredient needed before you can watch an industry be born: Big money. It’s at this auction that we see big industry spend big money to buy the right to develop America's (big!) oceans.**

**The Outside/In team watched this happen in real-time on the internet. The voices you’ll hear are Executive producer Erika Janik, and producer Justine Paradis, and Hannah McCarthy, cohost of our marvelous sister podcast Civics 101. They were looking at a map of the lease areas, South of Nantucket Massachusetts.**

*Sam Evans-Brown: So here’s the map. These have been sold already, and these three are the ones they’re selling. So we’ve got sort of like east, middle, west.*

*Hannah McCarthy: Which ones the windiest?*

*Sam Evans-Brown: oh I think they’re all pretty windy.*

**Annie Ropeik: It’s an auction. But instead of an auctioneer, barking out numbers, selling off paintings … or antiques … or busted old cars -- this is the federal government auctioning the right to develop the ocean.**

**For the people who watch this kind of thing, they had no idea what to expect. Sam called an analyst in Massachusetts, a guy named Bob Grace, who said his office was running a pool… betting on how much money the auction would raise.**

*Bob Grace: Price is Right rules, everybody guessed. And I’ve got uh… guesses for the max bid go anywhere from six million to six hundred million.*

*Sam Evans-Brown: [laughs] Six Hundred Million?!*

[music]

**Annie Ropeik: There just wasn’t much to compare this auction to. I mean, the U.S. had only done this a couple of times before. The first, a tiny holding company swooped in and bought an offshore lease for PEANUTS. Less than what a 3 bedroom home would cost in most of the United States.**

*It went for $150,000 bucks. And that was in 2015.*

*Justine Paradis: Nothing?*

*Erika Janik: That’s really cheap*

*Hannah McCarthy: Yeah for a huge swath of the ocean??*

**Annie Ropeik: But then just a few years later -- there was another auction -- for another lease. And it went for WAY more.**

*Sam Evans-Brown: This was in 2017*

*[gasps]*

*Hannah McCarthy: That’s more like it! [laughter]*

*Sam Evans-Brown: $42 million dollars*

*Hannah McCarthy: Somebody got windled! [laughter] I’m so sorry*

**Annie Ropeik: So in the auction they’re watching, there was this question: how serious IS the offshore wind industry? Is there real money on the table? Were they ready to throw down tens of millions again? Or just a few hundred thousand?**

[Price is Right music... briefly]

**Annie Ropeik: The auction started at 9am. There were 11 bidders... vying for 3 leases.**

**Annie Ropeik: The team was staring at a screen, watching a spreadsheet. There’s a column for each of three leases, and a row for the current top bid for each round. It’s a silent auction.**

**Every so often, they’d hit refresh, a new row would pop up, and they’d get excited.**

[excited noises from tape]

**Annie Ropeik: It was slow. But by six hours in, around 3pm, the bids had climbed. Each lease was higher than the highest bid from the previous auction.**

*Sam Evans-Brown: So we have passed the 42 million mark.*

*Hannah McCarthy: 47 million for pink, 30 for purple, 45 green.*

**Annie Ropeik: At this point companies were dropping out left and right… Still, a few stayed in, vying for those three leases. The numbers just kept climbing.**

*Sam Evans-Brown: It does feel like we’re closing in on the end. Because we’ve just got 4 companies left, and we’re kind of…*

*Justine Paradis: But we just had a $17 million dollar jump. Like are we really closing in on the end?*

*Hannah McCarthy: We are in the hundreds of millions here.*

**Annie Ropeik: The auction went on for two days… 32 rounds. The three lease areas sold for over $400 million dollars in total.**

**How much would companies be willing to spend ... to enter the American offshore wind market? A lot.**

[Music Rises and fades]

**Annie Ropeik: And here’s the thing… look at the companies that bought those leases.**

**Most of the 11 *bidders* were renewable energy companies. But most of the *winners*? They look a lot more like oil companies.**

**One lease was bought by a partnership that includes Shell. Another went to Equinor wind… which used to be called Statoil… the Norwegian national oil company.**

[music]

**Sam Evans-Brown: There is a lot of money moving into renewable energy… moving to try to combat climate change... And the companies with the most money, muscling into this space? Are some of the very companies that got us into this mess to begin with.**

**[Music again]**

**Annie Ropeik: So that’s where things stand.**

**… the technology has matured…**

**Sam Evans-Brown: … states have said they’ll buy the energy…**

**Annie Ropeik: … European companies are tripping over themselves to come to America…**

**Sam Evans-Brown: … and the ocean has been carved up and auctioned off for development…**

**Annie Ropeik: … and now capitalists with lots of money are falling over each other to get a piece.**

[pause, music]

**Sam Evans-Brown: Like it or not, all the pieces are in place for the birth of an all new American industry.**

[Music rises and ends]

**Annie Ropeik: But let’s just ask ourselves for a minute… how DID we get to this point?**

**How did the United States get so far behind Europe and China?**

**Why isn’t offshore wind already here?**

*Mitt Romney: This isn’t a decision about money. It’s not even a decision about power. It’s a decision about the environment.*

*Kennedy: What if one of the engine dies when you’re upwind of one of those…*

*Cheryl: What can we offer so that the tribe can stop fighting us on getting this project done? And I said there is no price.*

**Sam Evans-Brown: That’s next week, on WindFall**

[THEME]

**CREDITS**

**This episode of Windfall was written by me, Sam Evans-Brown, mixed by Taylor Quimby, fact-checked by Sara Sneath and produced by Jack Rodolico. It was edited by Erika Janik, Annie Ropeik, Justine Paradis, Taylor Quimby, Felix Poon and Hannah McCarthy.**

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