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Climate Vision 2050 BCG podcast

Episode 1: Ballad of the Wind Rigger

What you're about to listen to is a work of imagination, but not fantasy, set in the year 2050.

(SFX: The hum of a futuristic unmanned drone with pulsing blades, the hiss of a pressurized cabin)

Sofia Rojas: Sofia here. Go ahead.

(slight pause)

Sofia Rojas: We're approaching the island.

(slight pause)

Sofia Rojas: Come again? SAILOR is showing an anomaly with Turbine 347?

(slight pause)

Sofia Rojas: Roger that. I'll look into it once I'm on the ground. Over and out.

Theme music starts

Host VO Narration: That was Sofia Rojas. She has allowed us to tap into her personal digital diary to share her experiences.

(Theme music melody kicks in and plays for a few second)

Host VO Narration: I'm your host Mutinta Banda and you're listening to Climate Vision 2050. We're exploring the people and places around the world that have helped us to move closer to our climate and sustainability goals today in 2050; the challenges we've faced, the technology that has made it possible and the crucial steps that still need to be taken.

News Clip: ...Between the 20s and 30s, we've added 1 billion people to the planet, further straining our energy resources...

News Clip: ...Political tensions are increasing as energy dominates as the weapon of choice...

News Clip: ...We simply don't have enough space on land, we need to look offshore to manage this crisis...

Host VO Narration: In this episode we'll visit the North Sea energy island. There are more than 50 of these all over the globe, but this is one of the oldest. When it launched in 2040, it was one of the first sustainable power plants that was able to create renewable energy, mine C02 directly from the atmosphere and combine them to produce the low-carbon fuels that power energy intensive vessels like our cargo ships, airplanes and space shuttles.

(Theme music trails off)

(SFX: The hum of a futuristic unmanned drone with pulsing blades, the hiss of a pressurized cabin)

Sofia Rojas: Looking out the window, I can see the island. It's uh… about the size of 18 football pitches. Real ones. Not the micro football pitches we have in the cities. I've been on newer islands at least three times the size of this but they are all doing the same thing. Here, our past behaviors meet our future hopes. The past is the Northern part of the island–the tiny towers, only 30 meters tall. They are direct air capture units that absolve the sins of energy past. They pluck CO2 out of the atmosphere and we store it in those blue domes for reuse. Right next to them are long green tanks. Those hold the energy of the future: low-carbon fuels that get sent out for shipping and aviation. But all around the island, those are the big towers, the wind turbines. Each one is about 300 meters tall, about three times the height of the Statue of Liberty. Those are the giants. And they power everything.

(SFX: Wind turbine blades to evoke the sense of these)

Host VO Narration: Sofia Rojas is an offshore technician specializing in the operations and maintenance of energy islands. Those turbines are generating enough energy to power over 10 million homes. And that's only from the first phase of the island. Further into the North Sea and the Baltic sea is an extension of this island that powers all of Northern Europe with clean renewable energy alongside onshore wind and solar.

Host VO Narration: Energy islands would not have been possible without groundbreaking technological advances from climate visionaries; unprecedented action; as well as continued protection, maintenance, and repair of the islands and the critical technologies they host.

Jacob Østergaard: Going to the energy islands is of course a very special experience for me. I've taken part in the whole journey from the very beginning, back to actually before 2020, when we started. I'm very proud when I go there and see these enormous constructions and all the wind turbines powering most of Northern Europe with clean energy.

Host VO Narration: That's Professor Jacob Østergaard [Jay-Cub Ooo-Stair-Gaurd], the head of the department of wind energy at Denmark Technical University. Professor Østergaard and his team of researchers were instrumental in the development of the North Sea energy islands.

Jacob Østergaard: I'm actually part of this because I always dreamt of building wind turbines. When I was a kid, I wanted to make these wonderful machines that could actually harvest energy, free energy from the wind.

Host VO Narration: Building the first artificial island in the North Sea was an enormous undertaking. An energy island of this scale had never been built before. Professor Østergaard and his team had to work through complex technical challenges like how to incorporate high voltage direct current transmission lines, or HVDC, on the island to bring energy back to shore. They also had to work on power to x concepts; storing surplus energy generated from the turbines to be put to use beyond just generating electricity.

Jacob Østergaard: We had to develop new technologies and new solutions, including HVDC. We had to find out how we could integrate power to X efficiently on these isolated systems on the islands. So, it was a lot of new things that had to be done. It was kind of a Mars mission for the energy system.

Host VO Narration: For over 5,000 years, humans have harnessed the energy of the wind. From powering the sails on our ships in antiquity to grinding grain and pumping water in the middle ages, the wind has been a powerful force for human progress. It was a unique combination of factors that came together to make harnessing wind on energy islands possible. Professor Østergaard takes us back to a time he remembers when the energy islands were still just a dream...

Jacob Østergaard: It began back around the 2020s, when we here at the university did some research in the energy islands together with the Danish transmission system operator. We did our research, and there was not too much fuss about it. But suddenly the Danish government–the minister at that time for climate and energy–suddenly came with the announcement that Denmark should build the world's first two energy islands, and suddenly everything picked up.

Host VO Narration: Denmark, along with other European nations, had at one time been extremely dependent on coal and natural gas. These nations weren't quick enough to act when the climate crisis became evident.

(Music or SFX transition here)

Host VO Narration: Mogens Holm [Moe-Gens Hole-m] is a power to x expert from BCG. He explains how the 2020s were an important decade in the uptake of renewables. Not just because the effects of climate change became increasingly evident through extreme weather events, but for political reasons as well.

Mogens Holm: 30 years ago, we actually had a war in Europe where Russia invaded Ukraine. Before the invasion we thought that we were going into the roaring 20s. But instead, we got COVID, followed by an energy crisis in Europe, which led to energy and security politics becoming one of the same. And that really accelerated renewables and the need for low-carbon molecules as an alternative to fossil fuels especially in hard-to-abate sectors, where renewable power is less suitable. We went from insufficient funded political ambitions to major commitments de-risking the markets and truly allowing for example, low-carbon fuels like hydrogen to scale.

News Clip: ...Millions of people have migrated over the past 10 years due to climate change...

News Clip: ...Today marks the end of the rolling blackouts in the region as renewables come online....

News Clip: ...The initiative is called AI for climate and it's all about robotics and climate change…

(SFX Light rain and distant ocean sounds. Perhaps some sounds of someone walking in rain gear - swish of raincoat and boots tapping on sheet metal)

Host VO Narration: Back at the North Sea energy island, Sofia touches down in an EVTOL [pronounced EEVEETOL], an autonomous single seater aircraft, and makes her way to the control center.

Sofia Rojas: There used to be so many people here. Now… there are just a handful of us left. Unless you count our flying friends. There are about a thousand of them. And the SAILOR watches over all of us.

Host VO Narration: A pilot used to have to drop off a whole crew of technicians to service offshore power facilities like this one. Today, it just takes a small staff and a variety of specialized robots and drones. The SAILOR stands for Simultaneous Artificial Intelligence Oversight and Record. It's a system that not only regulates every fixture, flange and filter, but also tracks every buoy, bird and breeze in half a square megameter.

(SFX: Control centre environment: hum of multiple computers/machines.)

Sofia Rojas: Ahoy, SAILOR… compile status report on Turbine 347.

(SFX: Hum of computers tick up a notch…)

Sofia Rojas: This might take a little while. But this should be able to locate our anomaly.

(SFX: Paper bag rustles…)

Sofia Rojas: When I was younger, I was stationed all over the world. The Sea of Japan island. The Gulf of Mannar island, between India and Sri Lanka. I would climb the tallest giants and do the repairs myself. I was a wind rigger. I used to love to be hundreds of meters in the air dangling by a rope off a turbine. Now that I'm older… I'm happy to let the drones do the work. It keeps my blood pressure down…

(SFX: Paper bag rustles)

Sofia Rojas: The climate crisis causes me a lot of anxiety. In Latin America where I'm from, hydropower is a huge source of electricity. There've been years we've had droughts and the dams can't produce energy. During those times, factories have to close, people lose their jobs and food becomes scarce. I've seen what happens when energy becomes scarce. People become desperate. When I had the opportunity to pursue my studies back home, I knew I wanted to get into renewables–hydroelectricity or wind power. Energy islands aren't a silver bullet by any means, but they're one piece of the puzzle.

Host VO Narration: According to BCG's Mogens Holm, one of the critical innovations in energy islands has been moving them more towards what's known as "floating concepts" as opposed to "fixed bottom". These turbines are placed on floating structures that are anchored to the seabed Floating concepts don't require shallow waters so they can be placed anywhere in the world where the wind is strong and stable.

Mogens Holm: We can now harness the great wind energy potential from open seas and truly decouple where we produce and consume low-carbon molecules, which has significantly reduced the production costs.

Host VO Narration: Being able to harness the strength and stability of the winds farther offshore allowed the energy islands to become increasingly cost-competitive with other types of energy production. But it isn't enough for these islands to produce only electricity. Mogens explains that it was important for wind energy to be put to work in other ways.

Mogens Holm: So the floating concept that we have here is basically a massive production of green renewables through wind power primarily. And we use that to generate hydrogen. And at the same time, we are also basically collecting from the air CO2. So that's what we also call direct air capture. And with the combination of the hydrogen and the CO2, we make green fuels that we are using in our transportation sector.

Host VO Narration: To make a significant impact on the climate crisis we needed our energy islands to use the renewable power produced to be put to work towards making low-carbon fuels such as hydrogen. We also needed the island to power direct air capture units to extract CO2 directly out of the atmosphere. The combination of hydrogen and CO2 allows us to create green fuels for transportation.

Mogens Holm: What you see around the island is some towers that are 30 meters tall, and you see the fans on that. That's actually where we collect our carbon. So that's where we have our massive units of direct air capture. Basically the transformation of the mining sector: for more than 150 years, we have always tried to drill downwards. Now, already from the start of this century, pioneers started saying, okay, why don't we look at the air right in front of us and pick every little molecule of carbon out of that?

Host VO Narration: The CO2 that is collected is then combined with hydrogen to produce the low-carbon fuels we are using today. When the CO2 is used in the fuels, it is again released into the atmosphere and the direct air capture units will capture it again and the process repeats. In this way, we've brought circularity into the process.

(Music transition)

Host VO Narration: Not everyone was supportive of the energy islands at first. Professor Østergaard explains some of the criticisms of the energy island projects.

Jacob Østergaard: Back in the 20s, there was part of the population and various interest organizations that were quite worried about the energy islands. One thing was the cost. They found it very expensive and they actually argued that we shouldn't build these energy islands and should find different ways with nuclear or other technologies to reduce the carbon emissions.

Host VO Narration: The initial investment from the Danish government in the North Sea energy island was 34 billion dollars. It was the largest construction project in the country's history at that time and it was heavily subsidized by taxpayers. The cost was a huge concern. But Professor Østergaard notes that there were additional issues.

Jacob Østergaard: The other thing was the environmental concern: that these constructions on sea would harm the nature at sea.

Host VO Narration: Professor Østergaard and his team at the university worked on programs to monitor the environmental impact of energy islands, in collaboration with NGOs focused on protecting biodiversity. More than 200 species of fish and more than 10 million birds call the North Sea home. The developers wanted to ensure that the energy islands would promote rather than harm the natural environment. This has been a huge priority that continues to be monitored today.

(Slight transition here)

Host VO Narration: Another issue was figuring out how to transport hydrogen safely and cheaply. It is extremely flammable. An important investment in renewable energy that helped spur the innovation of this and other technologies was the 2022 US Inflation Reduction Act; a monumental investment in renewable energy. Here's BCG's Mogens Holm.

Mogens Holm: It was 500 billion US dollars that was basically put into renewables and low-carbon technologies as an example. That made a big difference because it effectively de-risked the markets, which was the core bottleneck initially.

Host VO Narration: In the 2030s and 40s, the reliance on fossil fuels gradually faded as more and more countries invested heavily in renewable energy.

(SFX: Back in the control center environment: hum of multiple computers/machines. Occasional tapping/clicking of a remote and computerized whooshing sounds.)

Host VO Narration: Back at the control centre, SAILOR has finished running the status report on the anomaly identified. Sofia's augmented reality visor patches into remote cameras inside the turbine so she can investigate.

Sofia Rojas: So… If I separate this piece… and I move it over here… wait what? What is that mark on the generator? Hmm… I can't make it out. Looks almost like it's been damaged in some way but I can't quite tell. It could be damaged, or it be a broken connection with SAILOR… or worst case… (nervous chuckle) it could be a security breach. It's been ages since I've been out to one of the turbines, but it looks like I'll have to get closer to see if I can get a better look.

(SFX: Futuristic radio patching in.)

Sofia Rojas: Attention dispatch? I'll need a shuttle crew to ferry out to Turbine 347. Please assemble at the harbor.

Sofia Rojas: Maybe I'll get to do some wind rigging after all.

Host VO Narration: Another challenge with the energy islands according to BCG's Mogens Holm is the ongoing threat of attacks..

Mogens Holm: Some of these plants are quite big. So it's more security and energy being combined. So the security policy around them is different.

Host VO Narration: Cyber attacks are a threat on the island and governments have needed to continually update their cyber defenses against hackers. The SAILOR and drone software is continually updated against the most current threats. Professor Østergaard explains how that cybersecurity infrastructure was built into the designs.

Jacob Østergaard: When we built the energy islands, we of course also had some focus on protecting the systems toward cyber attacks. The whole IT infrastructure related to the energy islands was very carefully designed. So the most sensitive parts were protected against cyber attacks.

Host VO Narration: Communication and connectivity around the island is crucial. Today, Sofia and other offshore technicians are able to maintain connection to the team on shore, the turbines themselves and even to the turbine manufacturers around the globe to help troubleshoot issues without relying on antiquated and vulnerable technologies like satellite phones. Our offshore technicians like Sofia: are trained in how to work with the defense system and cybersecurity infrastructure.

(SFX Wind Blades Spinning, Sofia out on the boat with team, some buttons throughout for the tech she's using below)

Host VO Narration: Out in the North Sea, Sofia and her crew arrive under Turbine 347 as it powers down.

(Sound of the blades slowing down)

Host VO Narration: She walks across a gangplank and enters the base of the giant wind turbine. Once inside, she starts up the ladder.

(Sofia's voice is echoey inside the turbine ladder)

Sofia Rojas: Okay… I am definitely out of shape. It is a long climb to the top.

(Sound of the inside of the turbine room)

Sofia Rojas: The drones are good, but they can't detect everything. Sometimes you still need to get up close and personal…. I'm still not quite sure what I'm seeing there though. Ah… OK…

(SFX liquid seal breaking)

Sofia Rojas: Looks like a cracked valve that leaked onto a sensor. That's what caused the anomaly. Just wear and tear damage - not a security breach. This damage was probably exacerbated by some of the rough weather we've been having out here lately.

Sofia Rojas: That drone's going to work on getting that patched up while we're out here. Hopefully I don't freeze to death.

(Music transition here to Act III)

Host VO Narration: Without the world's energy islands, 2050 would look very different. We learned some important lessons…

News Clip: In 2030, over 10,000 US homes were retrofitted with flood resistant materials…

News Clip: ...2035 marks a year without a single hydrogen explosion, demonstrating great strides towards working with this flammable material...

News Clip: ...At COP 40, global leaders are meeting to discuss how to accelerate green technology...

Host VO Narration: According to BCG's Mogens Holm, producing low- carbon molecules on the energy islands was one of the greatest steps we could have taken toward climate stability through renewables production. But our work is far from over.

Mogens Holm: We still have climate challenges. We saw that, especially in the 20s and the 30s, we saw more, for instance, typhoons, we saw hurricanes, especially in the US and others, really increasing.

Host VO Narration: Professor Østergaard says that we could have accelerated the work on climate change even faster than we did. Given that we knew the effects that climate change was having on our world, we could have acted more quickly.

Jacob Østergaard: Looking back to the beginning of the 20s, my message back to myself and the others at that time would be to really boost the development and the innovation even faster than we actually did. A lot of the innovation was implemented in the 30s and in the 40s. And we could actually have done more back in the early days, which could have saved us from some of the challenges we met on our earlier stage.

Host VO Narration: Today, energy islands exist around the world. But what's next? One important issue is managing trade-offs. According to Mogens Holm, there's still more work to be done to ensure that we don't deplete rare earth materials used to produce the turbines.

Mogens Holm: So there's something still on the resources we are using. How could we be even more clever? Can we replace resources? Could we use other types of resources? So it's, basically, the sustainability and the life cycle part of this that is still an issue for us. And considering how we do that, using more new types of materials is certainly one of the elements for it–and a critical one.

(SFX ocean sounds)

Sofia Rojas: I'm back on the island now, at the recreation area by the old port. I have some friends who are getting off their shift here soon. There are not many wind riggers left, but when we DO see each other… we have a great time. We go fishing… if we're lucky we'll have a barbecue. Maybe just watch the sunset on the giants.

(SFX ocean sounds)

When the vikings sailed these waters, they thought that giants caused the wind and the waves… and that one day, they would end the world with fire and floods. Now… we have our own giants and with any luck… they might actually just save us.

(Music transition)

CREDITS

Host VO Narration:

You've been listening to Climate Vision 2050, a podcast from BCG that explores how the world radically reduced carbon emissions and saved itself from climate catastrophe.

Our narrator, Mutinta Banda is played by Atibo Onen.

Offshore technician Sofia Royas is played by Nicole Shalhoub.

You heard from our experts Jacob Østergaard, head of the department of wind energy at Denmark Technical University and BCG's Mogens Holm, a power-tox expert.

This podcast is produced in collaboration with Lower Street; a full-service podcast production agency that creates amazing shows for brands that want great not good.

BCG is a global consulting firm committed to climate and sustainability action. We understand there are many possible futures, and we hope you enjoy our journey through some of them in this series. Learn more about our work on climate and sustainability at bcg.com/climate.