File name: offshore_wind__iain_percy___invest_ni (1080p).mp4

Moderator questions in Bold, Respondents in Regular text.

KEY: **Unable to decipher** = (inaudible + timecode), **Phonetic spelling** (ph) + timecode), **Missed word** = (mw + timecode), **Talking over each other** = (talking over each other + timecode).

Iain Percy: Apologies. Well, first of all, thanks to Invest Northern Ireland for putting on this event. It's amazing to see so many people in the room, especially those who've travelled, and just to let you know, the weather's always like this in Belfast, never rains. Artemis Technology was founded about five years ago, in 2017, and our heritage, our background, was a-, was very different, it was as a racing team in the Americas Cup. Americas Cup is the sailing's equivalent of Formula 1, in that it's very much about the equipment, as opposed to the sailor. And I'm allowed to say that because I was one of the sailors and I had to learn, over the years, that I made very little difference to the result. But through my involvement with Americas Cup race teams, I went on to run those race teams, and therefore got more and more involved on the engineering side and the design side, and through that ten years running Americas Cup race teams, built a group that were very expert in a number of areas. But the ones probably most relevant here is around simulation and digital design. So, we went on, after 2017, with a very lofty goal to decarbonise maritime. It was mission, and one thing that we had learnt through our Americas Cup racing and through all my racing over the years is the first thing you have to do to win a race is understand what winning is. Understand what winning is in sailing sounds so easy, it's about being the fastest on the water but it wasn't ever about just being the fastest because imagine if you were a very nimble boat, you got ahead of a fast boat, that boat couldn't get past you. It was about games theory and more complexity. It wasn't just about fast in a straight because you had to manoeuvre.

So, when we looked at this mission of decarbonising maritime, we tried to think where, firstly, could we apply technologies that were unique, that were useful, that could give competitive advantage for ourselves and for the region but particularly, we looked at understanding what winning is for potential customers. So, most of our simulation turned out to be much more from your perspective, from what's winning for you, because only if it's right for our customers, would they ever buy it, and I went to talk when we were based out in San Francisco from Elon Musk, name-dropping badly here, but the first thing he said was, 'It doesn't really matter about the technology in our cars if people didn't want to buy them, if they didn't look good, you can't change anything if no-one wants to buy your vehicle.' And that really stuck with me, that it's vitally important that the products we bring to a sector like this need to work for you, and so understanding what working for this sector is really important. It was then a-, that's why, today, I guess, was so valuable. 'Cause learning about this huge industry, this huge growth opportunity, and us, this tiny, little part of it at the end, as, as potentially offering some solutions for maintenance of the wind-farms, but to have that context, to understand how big it is, to understand all the stakeholders involved is really, really important, and something we've been learning from our partners for a while now.

So, a little bit about our history, I said we came from a race team. Some of the expression of our simulation was the-, was the physical real-time simulator, which I'll touch on later, and then I've got these up now, 'cause it's slightly cheeky, given that we're only launching-, we haven't actually launched it today but it is a matter of days, the 11m demonstrator. And then crucially and relevantly to this meeting, we'll be launching a crew-transfer vessel for maintenance of wind-farms, that's zero emissions, in 2024, and that design's well underway and I'll show some of it. So, I talked about trying to understand and decarbonise maritime, find ways to do it. We looked-, at first, we, we were very fortunate to have good backing and we looked at a number of different areas, particularly around wind-propulsion of offshore freight transport, long distance wind propulsion, and we still work a lot in that field and consultants. But we were also, as I said, trying to model from your perspective and we were looking for payback times for customers that were reasonable. We-, and I know there are some government officials in the room but we didn't have a whole heap of faith in regulatory changes, fiscal changes happening fast enough to rely on that as a model for sales.

So, our business model was always about the products that we bring to market have to (a) have sustainable from an environmental standpoint, they have to make the difference, they have to track our mission but they have to be sustainable economically from the operator, and that's not include-, not take any subsidy or future support. Of course, we advocate heavily for it but we make sure our business model never relies on it, and that's really how we entered, having looked at a number of different fields, I touched on the off-, the wind-propulsion for large ships. We, we locked in on high-speed maritime transportation, and what do I mean by 'high speed'? I mean occasions where the cost of time is important, passengers generally are therefore involved but-, and particularly in the offshore wind sector, where the passengers are very highly-skilled, highly-paid engineers. So, the, the business modelling drove us to a solution where payback times are very fast for the operators. They met our goal of decarbonising maritime, and this really was the solution. So, the technology on the screen here is literally 500m away from you now, in our factory on the other side of Queen's Island. The battery has been produced ourselves over the last two years.

The boat, that boat on the screen there, in about five days' time, could charge from a dock and go out to all those offshore sites that we were seeing this morning, service the wind-farms and come back. That could happen next week, from a boat made, that is orders of magnitude further advanced than anywhere in the world, I'd say three to five years, and it was done here on Queen's Island. How was it done? Well, the main difference here is the boat flies above the water. That-, the first thing that does is reduce the drag dramatically, and one of the interesting things for me, I've spent my last ten years looking at performance data from simulated models of race boats, that's what I do, and the line is we're always trying to move-, in those days, we were trying to move the line up slightly, faster in any wind speed because we were always racing. So, we were trying to go a bit faster, and in-, this is a bit different, we're trying to drop the kilowatt hours per nautical mile at every speed, so we're always trying to drop in this. We iterate with designs in this digital world incredibly fast. We're seeing 50 candidates a day coming through in sweeps of data, and what I've noticed, stating the obvious to people like yourself, is the, the degree of variation, (a) we're in early stage of our CTV development, but it's also because of the feedback loop of battery weight on our product means if you lose a little bit of efficiency, the battery-, which we chose to

sometimes for cost reduction.

We're always talking about it as a derivative of our business models. But when we choose to take that hit, it's got a real feedback mechanism on CAPEX weight of initial battery, as well as operational costs from now a heavier boat, and so the variations are bigger than I'm used to seeing in the last ten years of observing simulated data. But getting back to the product, fundamentally, it's flying above the water, electric submerged drive-train, and again, developed by us here, and the development, as a few people have mentioned, is one third of the challenge, two thirds is getting things type-approved and classified with, like a lot of the stuff in the room, a new industry, with-, which a lot of the agencies are not used to. Takes a lot of education and working together in a very open way. I tend-, my, my background was in economics and-, before sport, so the graph on the right, for me, is where I live my world. I'm always trying to, as I say, build your business model and try and make your cost of life cheaper using our product than any alternative solution that I can find, model and simulate. That's the goal. So, fundamentally, this is the graphs I'm talking about, where we are always trying to drop the graphs, the, the green graph, we're always trying to get more and more efficiency. So-, but I'm, I'm always at pains to not mention some of the other stuff.

I was also a seafarer all my life, and when we used to go racing in San Francisco a few years back, in hydro-foiling race boats, I'd come in at the end of the day and you'd get off the boat, and, and slightly embarrassingly, we'd been followed by about five chase boats with 1,000 horsepower behind each boat, which, kind of, shows the efficiency of the boats we were sailing and the inefficiency of the whole thing. But they were driving behind us and they'd get off the boat, all the coaches and the statisticians, and they'd be holding their backs and they'd be saying, 'Oh, that was an awful day, it was so wavy,' and my thought would be, 'Was it? I didn't particularly notice the waves.' And that hovering above the waves gives such a more comfortable ride, and I think, through some of the applications, including offshore wind asset transfer, I think it's a real opportunity to give that comfort. Obviously, for us, the zero-emissions is central, that's the whole point here for us, and-, but the, the noise and the comfort is, is, is actually more important, and equally also the wake, and, and this is where we-, we're lucky to work with Belfast Harbour and other ports, get the advice from the end-user, is, is one of the other real advantages about flying above the water and the lift being taken below is you don't create a wake from the boat, or very minimal from the submerged hydrofoils. And that makes a huge advantage when you're trying to bring people, be it on a ferry or a crew-transfer vessel, back to shore, so another important point.

So, this is the 500m away, this is a building on Queen's Island here, and there's the two boats, and I, I think the significance really for me of that photo is there's two boats there and they're exact sister ships. The hull's also made in Denmark actually. The hulls were both brought in here and we rigged up one hull with our e-foiler propulsion system and one has two conventional gasoline outboards. And the reason for that is that demonstration, for us, is very important. You know, I'm a seafarer and you often talk about people who-, there's a cynicism to new technologies but there's absolutely good reason for that. When you go out to sea, you experience conditions that people who haven't done that won't ever know about, and

we've all been in situations where-, that hold scary positive memories and scary not positive memories. So, for us, it's really important that we demonstrate both the safety, all these claims about comfort, these claims about efficiency and so on. We thought, 'How are we going that?' Well, every single day we go on the water with the e-foiler, we go with the exact sister ship. We instrument up the exact sister ship with fibre-optics, with motion sensors, with power draw sensors, so we can give the like-with-like data. So, we're not going to be trying to say to you, 'This is how great our boat is on a perfect glassy day,' when you all know how being at sea is not like that. This will be like-with-like comparison.

Carrying on with that theme of it has to work for the end-user, we're trying to marry very advanced technologies with traditional requirements, and some of the things on the screen here, that's information. When you drive the e-foiler vessels, you just have a throttle and a steering wheel at first. It's exactly the same. Everything else is done autonomously, all the flight is done autonomously. You don't have to think about it. You don't have to decide or fly the boat, and having tried to fly the boat myself, I think that's probably a good idea. This was a really important project for us. We recognised that the offshore wind sector was so part of the future, it was what we all needed, it was so married with our intentions, but it was also served by a maintenance industry with the crew-transfer vessels that were heavily polluting, and there was a number of reasons for that. It wasn't just because of the high speed, because of the value of the cargo and the passengers and the technicians, it was also the bollard push, which I'll come on to, where full throttle is applied against the wind-farm to go nowhere. We found that, as a race team, fairly offensive operation for the environment, as much as for just general efficiency.

So, we've done a project to check the feasibility of a crew-transfer vessel, and an important part of that is using the 11m vessel we're-, that's just down the road, to run those exact operations. But it was also really important to simulate that bollard push, and that was really interesting for us, and if I go to the next slide, because I realise I'm definitely holding people from lunch, this was one of my favourite days in, in my career, and I've had a few highs, but this moment, we had a couple of hardened seafarers who are used to doing asset transfer on the North Sea. And we'd spent a lot of time simulating the bollard push, and the reason it was complex, actually, for us, the, the motion of our boat flying above the waves is a reasonably controlled simulation environment. You have waves, so it's like an aeroplane simulation with very bumpy skies really, which is harder than aeroplane simulation but not impossible. It's angle of attack on wings, interaction between wings, windage, there's not-, it's a reasonably contained simulation space but when a boat is actually in the water, it's a very high fidelity problem. You can imagine, a wave crashes onto the front bow, it pulls the bow way, then a bit of tide catches you, you've got swirling winds around the wind-farm, you've got swirling waves around the wind-farm. It's, it's an incredibly high fidelity problem. It's very hard, therefore, to simulate because everything is different. You can't just use simple rules, and when you have to have a human in the simulation, which we need to, we need to have the seafarers giving us feedback, you need to be able to run it in real time. So, that's really that-, that's, kind of, the challenge of real-time simulation, in a nutshell, there.

So, one of my favourite days was, I had these guys in who had doing the transfers in the North Sea, out to

the wind-farms, for a while, and we got them on, coming alongside a wind-farm on a typical really wavy, confused North, North Sea sea-state, so we really ripped it up, some big swells, some underlying chop, and asked them to come alongside the wind-farm. And I was up there, they crashed off a few waves, and they came out from the simulator and they said, 'Wow, that's exactly what it's like,' and I honestly didn't know that that's what they were going to say because it is, as I say, complex to simulate. And then I said, 'Well, I'll tell you what, let's try the engines in a different position. Let's flick to three engine configuration and we'll try it, and then you can use the user interface. Switch to that and you'll be in a different user interface and you can pull the wind-farm up, up to the wind-farm with a new engine.' They said, 'What do you mean?' I said, 'Well, we've got other designs. We can iterate, we can try different solutions,' and for me, that you could see the penny dropping, the power of our approach for them. It's some-, it's a journey we'd gone through in racing, gone through the hard way, by losing, to be honest, at times and eventually winning by learning the need to iterate designs faster, find solutions.

And I think, for me-, I think, for me, the offshore wind and some of the amazing, interesting talks I listened to today really have that similar problematic, in that you don't really know how you're gonna solve some of these problems. You just know it's really important to solve them, and for me, I-, that's-, that-, I love that environment, I love the challenges ahead of you all because you have to iterate fast. You have to simulate the problem and find solutions within an uncertain world. So, I've certainly really enjoyed this morning, so I thank Invest NI again for that. It's amazing to get together, for someone like us, at the end of chain, it's real honour to meet everyone. Some dates up on the-, up on the screen here. I think, as I said, I'll probably bring to that point, we talked-, the government launched a goal, by 2025, to have an offshore wind support vessel that was zero emissions. So, in five days, there'll be an offshore wind vessel made here that can service all the wind-farms in this region and come back to dock and fill up and go the next day with electricity. So, we're, we're really excited to be part of the solution but, for me, it's been really enjoyable listening to everyone today, so thank you.