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Introductory Jingle

Innovate UK KTN connecting for positive change.

Debra

Hi, everyone. Thanks for joining us and welcome to this new episode of the HydroGenerally Podcast Series brought to you by Innovate UK KTN. Today's podcast is about green hydrogen production. I'm joined by my colleague Simon Buckley, who looks after Zero Emission Mobility. Regulars will be used to our introduction information now, so I'll try and keep it brief. But for new listeners, the HydroGenerally Podcast Series is the voice of the Hydrogen Economy Innovation Network of Innovate UK KTN. We work across the value chain in all sectors trying to support an increased end user, clean hydrogen uptake. So if you're interested in finding out more, please visit the Innovate UK KTN website through the link in the description, where you will also find currently available episodes of the podcast and you can also sign up to receive our regular newsletters. Within HydroGenerally so far we've covered the rainbow of colours of hydrogen, we've discussed some of the sectors where it could be used, including aviation, maritime, and combustion for transportation. We've covered steam methane reforming and nuclear hydrogen as current and future ways of producing hydrogen. And today, we're continuing on that theme and discussing a way of producing clean hydrogen from renewable energy sources. So as I mentioned, we've got Simon Buckley joining us today for this podcast. Hi, Simon, could you please introduce yourself and share a little bit about your role at KTN? Then if you could introduce today's guest, we'll get started.

Simon

Hi, Debra, it's good to be back on this. I haven't been on one of these for a few episodes now. So I look after Zero Emission Mobility, Innovate UK KTN and as part of that hydrogen will play a role in a number of those sectors. My background is in heavy transportation, so refuse vehicles and 44 tonne trucks. So today we are joined by Chris Jackson, who is CEO and Founder of Protium and that's a company that is passionate about producing hydrogen from renewable energy, which is often referred to as green hydrogen. So thanks very much, Chris, for joining us. Could you tell us a little bit more about yourself and how you started Protium?

Chris

Sure. Well, thanks, Debra. Thank you, Simon, for having me. So yeah, my name is Christopher Jackson. I'm the CEO and Founder of Protium. Protium is a UK based, green hydrogen energy company, building dedicated and distributed green hydrogen for predominantly consumer facing businesses to decarbonize industrial heat and commercial transport. My story, I guess, is a bit all over the place, or esoteric I suppose is a polite way of describing it, came originally from the risk insurance and venture capital world when I first left university, did a two year master's abroad in energy, finance, German and economics. My professor in the first year was a gentleman called Marco Dell'Aquila, who fast forward to today is now my Chief Investment Officer at Protium and helped build the business with me. Prior to coming back to the UK and launching Protium in July 2019, I worked at the World Bank in Washington DC. So I did a number of pieces of work, but most famously led the

green hydrogen work and authored or I should say, co-authored their first ever green hydrogen paper, green hydrogen in developing countries, before coming back to UK, starting Protium and for fun starting my own podcasts on hydrogen, called Everything About Hydrogen, very creatively, and eventually became chair of the UK Hydrogen Fuel Cell Association for about a year and a half.

Debra

Thanks, Chris. That is quite an impressive CV. Sounds like we've made a very good choice of experts to help us on this episode. So can you explain to us what the difference between green hydrogen and hydrogen produced via a grid connection is?

Chris

Sure, and actually, I'll maybe challenge the premise of the question slightly there too, if I may. So what we're trying to do by using the moniker of green, is try and help the general public and frankly consumers, investors and regulators to nuance where we take electricity that comes from a renewable source, be that solar, be that wind, hydropower, geothermal, wave or tidal. And we use that renewable electron, that green electron, to separate water using a technology called an electrolyzer and a process called electrolysis, to separate water into hydrogen and oxygen. And of course, throughout that process, no carbon is used and hence we refer to it as green. Now, many projects and organisations will say that green should only be where you build solar or wind or hydro and connect to electrolyzer and there is no grid. But of course, there are many areas of the grid and many countries, that actually have almost 100% renewables or in fact, where commercially, we might be producing sun or wind in one part of a country and we are then contractually taking that electron, and we're then using it for a project elsewhere. And no one questions that a battery electric fleet operator, that has a green PPA, is green when they buy it from the grid. So I would challenge that there is necessarily a difference between green hydrogen and grid hydrogen. I think the nuance that you're right is if you don't contract it, and you don't have a fixed supply, and you can't say, that's the wind farm, or that's the solar farm, or that's the hydro site that I am using, and I can show that every minute that site was producing, I was also taking that power from the grid, then I think it's absolutely right for you to challenge and say, how can you call yourself green, if you're just buying from anyone that's producing?

Simon

Yeah, that's a very interesting nuance. And I guess the low carbon hydrogen standard kind of covers that. So if you produce it from good electricity, without looking at the different mix of where you're getting it from, then they just have a figure for that.

Chris

They do. And the UK, by the way, is a very strange regulatory market for this. Because in the UK, the Low Carbon Hydrogen Standard only applies to regulations that come through Bayes. So if I want to be eligible for the UK government's Contracts for Difference Mechanism, or their Electrolytic Hydrogen Support Competition, I have to meet the Low Carbon Hydrogen Standard. That will allow me to qualify if I buy wind or solar or hydro from an existing site and I take it through the grid. If I want to qualify, however, as green hydrogen for a development fuel under the Department for Transport, the Renewable Transport Fuel Obligation legislation has a different definition of what is green. Their definition requires you to build additional renewables, that is a renewable asset that did not exist prior to the time at

which you designated you would be using that to create renewable, green hydrogen. This comes back to a principle we'll probably touch on later, but it's kind of important and we think at Protium is really important, which is additionality. Not just taking the renewables that already exist today. But how do we actually put more renewables on the system? How do we integrate more renewables on the system? I don't know if we'll talk enough about it but the UK is actually much more pro additionality than Europe. And Europe just removed the requirement for additionality on green hydrogen, where the UK still puts a preference towards additionality. We can touch on that later but I think it's important for listeners to understand.

Simon

Yeah, that's a really interesting point you've made there. So there's a target to have 10 gigawatt of hydrogen production by 2030. How much green hydrogen can we produce by 2030 do you think?

Chris

Sure. So 10 gigawatts is always a strange target. Because gigawatt is not a measurement of energy. It's a measurement of capacity. So you know, you could have 10 gigawatts and produce running 10% of the time and have theoretically 1 gigawatt of production equivalent, or you could use it the whole time. So taking that aside for the moment. The fact of the matter is that green hydrogen is predominantly being used in applications where it's decarbonizing either industrial heat or transport. When we talk about the UK power system today, the UK power system is relatively small in the context of UK energy. So it roughly is around 20 to 25% of all final consumed energy in the UK, the balance is heat and transport. So the scale of demand required is enormous. People will say 10 gigawatts sounds ambitious because they'll think about offshore wind, onshore wind and solar. And say in the UK, we've put 40 gigawatts of capacity over 20 years, across three different technologies. How credible is it to do that with hydrogen? One might reply: Well, to do that we've added 20% of the UK power system is now renewable, but power is only 20% of the whole. So if we're serious about decarbonisation, what that really means is actually a much more fundamental scale up and acceleration of renewables across the space. So how do we get more renewables into the system? How do we build more offshore wind? How do we build more onshore solar, more onshore wind? We believe that it is very credible. Yeah, there are several government studies and newspaper reports on stranded wind and solar across the UK. There are deep concerns about how offshore wind from Scotland through ScotWind or from Wales, recently, there was a paper out today from the Welsh Government on grid, how is all that renewable going to be connected? Green hydrogen is one of the few options that allows us in the timeframe that we need to decarbonize, to actually absorb a huge amount of those green electrons that we have the capacity and capability to build, but we don't have the technical way of connecting to the grid today. So I think the challenge is really at this point, are more around how do we get customers and regulators familiar to understand what hygiene is and what value it can bring to the energy transition? How do we encourage electrolyzers and equipment manufacturers to scale up and to prioritise the UK market? Because we're in a global market, they don't need to sell to the UK, they could go to the US, which has a massive programme in place, they can go to Europe, they could go to Asia, they can go to the Middle East. And how do we train the skills in the UK so that we have the right combination of engineers, the right combination of finance people, project managers, policy, people communications, to be able to enable this ecosystem to move forwards? The target

is real and deliverable if we want to make it happen. I personally believe we won't decarbonize and reach our goals if we don't.

Debra

So you mentioned a number of sort of blockers that we can see at the moment, that may need to be removed in order to get to where we need to be really, in terms of green hydrogen production, which is 10 gigawatts and probably beyond. Do you see any other sort of key, you know, if you could sort of ask the government one thing to do to help, what would you ask them to help out with? Would it be sort of convening these groups of people to try and come to some sort of consensus? Or would it be something more granular than that?

Chris

So you're probably going to hate me, because when I think about policy, I tend to step back a little bit more macro. The fundamental problem we have with the energy transition is that there is a cost associated with the transition, that we as a society have not decided how we want to socialise and distribute. One of the most effective mechanisms for doing this would be to set a flat carbon price across the UK for all end industries, that is inescapable, backed by a carbon border adjustment price, and to scale it up over time and enshrine it in law with cross party consensus. You would then have technology neutrality and we wouldn't get into these debates of, do you subsidise batteries? Or do you subsidise heat pumps? Do you subsidise carbon capture? Or do you subsidise hydrogen? Because you'd have levelled the playing field. Now the problem with doing that is that you create a huge amount of cost on the end consumer. For various reasons and I'm not debating the pros and cons, we society, from a society perspective, has decided that's not fair. So that leads us to the more direct policy today, which is we don't want to create a level playing field and we're not sure how to distribute those costs. So how do we create enough incentives to help new technologies to overcome some of the market barriers and to get past some of the inherent advantages that the current fossil fuel system already has in place? Things like scale, things like 40 years of innovation, things like extensive training programmes, extensive financial market familiarity. So one suggestion we've had for the government is to look at things like the grid, and to say, right now, whether you're battery electric, or if you're green hydrogen, or you're heat pump, grid is an important part of what we do. And it's important for the UK PLC, because we should be encouraging people to put more power on the grid, not to go off the grid. The way we do that though, is actually perverse because we have these things called commodity charges, which are charges that the network has incurred to build the infrastructure that allows the grid to exist. These are one off expenses. But we socialise these costs over time and those are called non-commodity charges or grid feeds. What they've done in Germany and Austria is they've actually waived grid fees for certain technologies. That can reduce the cost from the power grid by up to a third. That actually can be the delta on a lot of price support and a lot of commercial business cases for the whole range of net zero technologies. It aligns with government messaging, because the government doesn't like long term price support because it can't budget out for 15 years, it likes one off payments. So if I could sit in front of the government today and say, how do you do something that's technology neutral, that is no regret, and that is a one off payment that doesn't commit a long term liability? They should be making a one off large payment to the grid operators for these amortised, socialised grid fees and waiving grid fees for a percentage of or a megawatt capacity amount of green hydrogen heat pumps and EV charging.

Simon

Thank you. So some of those points that you made are interesting and lead to a question about scale. So this is a question I often get asked by transport operators. Are they better to secure green hydrogen from a larger site where they have to transport the hydrogen in or are they better to produce that locally on site or very near their own site?

Chris

Yeah, great question, Simon. I think the challenge here is that the energy industry has communicated the energy transition really badly. We've tried to present to people that we're in a commodity market and that you're going to be able to buy everything really soon and that there's a really clear transparent price and you have people like S&P Platts that have a hydrogen index that I don't know how on earth they do it because it's totally made up. But it creates this impression that there is a commodity market for green hydrogen for energy, as an energy carrier and there isn't. How energy transitions start, is they start by a value driven proposition, which starts by specific customers and specific customer contexts. So if you are a haulier looking at, how do I go from using diesel HGVs today? You shouldn't be thinking about this as, do I buy big or do I buy small? Who do I do the offtake with? You should be kind of more fundamentally going, how's my fleet work today? How many drivers do I have? What routes are they doing? What are the relative trade offs then of me using a battery electric vehicle, which is going to take more time to charge, that potentially means I need more drivers, potentially means I can carry less weight, but might be cheaper, because there's less moving parts to it, the maintenance is lower. And then with hydrogen, you know, where are my routes that I'm going to run? And once you start thinking from that perspective, and going, okay, these are the longer distance routes that I need, this is the more haulage I need to carry, etc, then you start to go, where does the network come from? I think what we've been doing as a business is sitting with hauliers and trying to build networks around them. And doing this as a partnership and saying, we will build the sites with you and if it makes sense for us to build a large site and distribute hydrogen from there, we'll do that because we've sat with you, we've understood your use cases and we'll build that out with you. And if actually, you need a series of small sites together, we'll do that together. We've led a consortium along the M4 called High Hall. It covers the length of the M4. And the idea is to expand the number of HGV refuelling stations, as well as the supply of hydrogen so that we've got a really exciting network, working with initially, a dedicated set of customers and bringing in additional hauliers to learn from what we're doing, so we can scale that into other areas like the M5, the M6, the M1, the M72.

Debra

So you mentioned High Hall and you mentioned that they want to sort of scale that out to other motorways. Are there any other projects that you're working on right now that you would like to tell us a little bit more about?

Chris

Yeah, sure. For the listeners who don't know very much about Protium, we were the UK's second ever green hydrogen company. We are the largest green hydrogen company by people and dedicated resourcing at the moment and we have quite an extensive portfolio across the UK. Two sites are public one is in southwest Wales in Newport, which is our project with Budweiser, where we decarbonize their largest brewery in the UK, taking a billion pints of beer a year and making them all green and zero carbon. Our other large

project is in Teesside, which will be the largest permitted green hydrogen site in the UK, hopefully by the end of Q1 2023 up to 68 megawatt green hydrogen production facility, located in Teesside. We have two other projects in the northwest that we're in the process of developing as well and we have a more extensive portfolio that will be coming afterwards. But from those four projects, we'll be in a position to have significant volumes of green hydrogen along key arterial roads, from projects going into construction around 2024. We've got a second, third and fourth wave for projects that are then providing us with this more holistic, distributed network across the UK. I think this is the message that's really important to convey to Simon's question around hauliers and do you go big? Or do you go small? This is going to start through a series of distributed anchor customers. Then as this network starts to evolve around those customers and those needs, and people can see, why would I use hydrogen versus battery? When do they complement? When are they different? Then you'll start to see the cost starting to come through. Because for all of these industries, you need to demonstrate the value proposition first, and then cost will start to come down. But if you don't think that the value proposition is there, it doesn't matter how cheap you make it. If it takes too long to refuel, if you can't get enough drivers, if it can't carry the weight, you need it to carry, price is not the problem at that point. The problem is that it doesn't fit with the operational model and that's a much more fundamental question that should be at the heart of all energy transition decisions. How do we make these new technologies work or improve the way that businesses run their energy operations today?

Debra

Well, thanks, Chris. As usual, we've come to the end of our 20 minutes so fast, I still have 101 questions I'd like to know the answer to. But I'm really looking forward to hearing about the exciting future developments of this area, both from a technical point of view and from a commercial point of view. I think it's important to point out this is going to be vital to the development of the industry, both in the short and the longer term. So thank you so much for joining us, Chris and sharing your knowledge with our listeners. I'd like to thank you, Simon, for co-hosting.

Simon

Yeah, it's been a pleasure and a really interesting area. I have been chatting to Protium about High Hill quite a bit recently as well. So it's good to get a little bit more information. So thank you, Chris, for today and talking about what you're doing and thanks all for listening. All the links that have been mentioned by ourselves and Chris and the link to the Innovate UK KTN website have been added to the description. And as always, don't forget to join the Hydrogen Economy Innovation Network, or sign up to receive the newsletters and the updates. Thanks again for following us and goodbye.

Outro Jingle

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