Transcript

23 August 2024, 01:04pm

Sew, Brandon 0:05
There you go. Yeah. So firstly, thank you for taking the time to take part. In my interview, I actually interviewed your colleague, Professor Valera Medina the other day because I was talking to him about conversion. So just a short introduction about myself and the project, just a fresh remind. My name is Brandon. I'm a current global sustainability solution student at the University of Exeter and my research project is all about understanding the barriers that are currently preventing the widespread adoption of green hydrogen in the UK.

Jemma Rowlandson 0:14
I'm.

Sew, Brandon 0:36
With a specific focus into the shipping industry because it's currently running like majority on fossil fuels and part of my research is to conduct expert interviews so people such as yourself and some people in industry to sort of gain first hand experiences insights into these barriers and I'm hoping to compare these with what the government have said in their reports and in their hydrogen strategy and hopefully produce a list of recommendations that are sort of.
Taken into account different sources of information to sort of provide, like, you know, critical analysis, holistic view of solutions.
Yeah, and that's my project. So just to begin with, can you sort of briefly introduce yourself, GW, shift your role within the organisation and what the GW shift aims to achieve?

Jemma Rowlandson 1:17
Sure. So my name is Jemma Rowlandson. I'm electorate at the University of Bristol. My PhD was in hydrogen storage, so that's where my expertise comes from.

Sew, Brandon 1:38
Mm hmm.

Jemma Rowlandson 1:42
GW shift you to test me on what it stands for. I think it's great. Western Supercluster, something. It's got quite a long acronym, but the idea is to at the moment a lot of the we've got a lot of expertise in the Southwest in terms of hydrogen, in terms of industry and academia, as well as startups. But it's all quite spread out at the moment.

Sew, Brandon 2:01
Hmm.

Jemma Rowlandson 2:04
And there's not a lot of people talking to each other. The idea behind GW Shift is we want to end up at the end of the project with a super cluster. So we've got all of these different aspects. I say civil partners as well, councils. So everyone is kind of networking and talking together and kind of moving forwards in terms of hydrogen technology. So that's the overarching aim of GW shift. And we've got a few different methods of doing this and we've got outreach, networking, we've got kind of short term grants as well.
And we've got a whole list of KPIs are on our website as well that you can you have a look at those there too.
So that is kind of the GW shift and my role is I'm one of the Co investigators, I'm the Co lead on the outreach and dissemination side as well with my colleague James Courtney and I'm leading on the storage theme itself.

Sew, Brandon 2:58
Yeah. Great. So in the UK's Clean Maritime Plan, the government sort of stated that in order to achieve greenhouse gas emission reductions, the use of alternative fuels such as hydrogen will be required. And it's obviously well established that hydrogen can be split into different colours. So looking at carbon capture, use and storage for blue hydrogen and electrolytic production using renewable energies for green hydrogen. So in your opinion, what role do you see blue and green hydrogen playing in the UK?
In the next couple of decades.
So pretty much from now until 2050.

Jemma Rowlandson 3:35

So the majority, I don't know the exact percentage actually, but I know the majority of our hydrogen in the UK is currently grey hydrogen rather than blue or green. There's a lot of debate in the industry about blue versus green. I know some of the people I've spoken to, the general feeling is it should be green. What's the point of blue? Because you're kind of just burying the problem away for later and it's cost costly.

However.

We don't necessarily have this right capacity for green hydrogen and you can adapt your grey hydrogen process to be blue hydrogen.

So there's a lot of debate going on. I think there's still a lot of debate going on that didn't come to a conclusion to that. People seem to kind of be doing things independently.

There is. I think there's a general feeling in the industry that they're not sure where the government's going and so they don't necessarily want to put a lot time and money and invest in something like building lots of electrolyzers only to then have the government change its tack kind of five years later, and that the government also, from what I've seen, seems to have the same almost the same but opposite thing, where they don't want to commit to kind of a vision and then have industry go on a different tack a bit later.

Sew, Brandon 4:47

Mm hmm mm.

Jemma Rowlandson 5:00

So there's almost as like tension between the two, where it's almost like who's going to jump first. At the moment, no one is jumping.

It's partly what we're hoping to address for GW shift, and also some of the other hydrogen's clusters too. So in terms of where it's going, I know the government's committed to, I think it's 5 gigawatts of green hydrogen.

That's actually not that much in terms of hydrogen and how much you actually need overall for energy.

Sew, Brandon 5:31

Yeah. So just building on some of the debates around blue hydrogen, I've recently interviewed Alex King, who works for Tower Group, and he sort of stated that.
For end use applications. So if you're using hydrogen in fuel cells for example, he said that blue hydrogen, the efficiencies of it are sometimes.
They're like not efficient enough to produce hydrogen for use in fuel cells, so there's I forgot the exact name for it, but there is a.
Current regulation of where for pen fuel cells the hydrogen needs to be around 99.97% pure.
So he said that, you know, blue hydrogen requires further cleaning for use for those end use applications which you know, results in more costs and more energy. And then there's also philosophical arguments that carbon capture doesn't actually work. And it was just it's just sort of a technique to solve, justify the continued use of fossil fuels.
So I just wanted to know what your thoughts are on those two debates, because they seem to be the most common that I've come across.

JR **Jemma Rowlandson** 6:43
I agree. I don't know too much about the composition of the blue hydrogen as it comes out, but I know it needs to be pure for PEM fuel cell because they get poisoned easily, so I can imagine that yeah, if it's not clean or as clean as it should be then that's going to be an issue. In the lab we're testing our hygiene storage materials and we use what we call 5 nines hydrogen. So it's 99.999% purity, which is very pure.
Although that hydrogen is unlikely to come from a green process, it's likely to be industrially produced from a grey process, so I don't actually. I think it very much depends on your process and where that hydrogen comes from, because you can get very pure hydrogen.
But it may need extra additional purification steps.

SB **Sew, Brandon** 7:29
Yeah.

JR **Jemma Rowlandson** 7:31
For that.
And in term, but there was the second part of the question again, sorry.

Sew, Brandon 7:35
It was just one of my lectures. James ****. I'm not sure if you've heard of him. He's based in Exeter. He has quite strong views about blue hydrogen and he has written some articles about saying that blue hydrogen is just sort of it doesn't actually work like it's, you know, it's like inherently unsustainable and it's just sort of a way to for fossil fuel companies to sort of justify their continued use in a way.

Jemma Rowlandson 7:38
Yeah, I'd agree with that. I'm what I would say as an addition though is.
So there is a debate over whether it's worth it because you got fossil fuel companies are kind of putting their weight behind it because it's the most, I guess, easily transferable to their current technology. However, I would say that there is also an argument to be made that you need the hydrogen available for your infrastructure and if we do not have the green hydrogen available and there is demand for hydrogen, there is demand for hydrogen. I know some industrial partners I've been speaking to not maritime, but I think automotive, they have issues sometimes getting hold of hydrogen.
So it's almost like.
It's probably better to have the hydrogen there, even if it's not the right kind of hydrogen than not to have it at all, because you will not get the development of the industry.

Sew, Brandon 8:56
Yeah.

Jemma Rowlandson 8:59
Though that is a contentious debate and I can see both sides.
And yeah, I think the companies do need to put more time and effort into developing green hydrogen solutions rather than just going, yeah, blue hydrogen. That will do. However, there is, I think there's still there's an argument for having something rather than nothing but, yeah, contentious, hard, hard to answer, I'm afraid. But yeah, I do. I do inherently agree with the sentiment.

Sew, Brandon 9:19

Yeah.
Yes.
Yeah, that's no, that's no, that's.
That's fine. Yeah. So just talking more about the policy and regulation side of hydrogen storage currently.
So as I mentioned, I talked to Alex King and he said that what he's focuses mainly on distribution, but what he does know is that on ships there is currently a requirement to store hydrogen above the deck, and that's due to safety concerns of hydrogen.
You know, being such a small molecule leaking through joins and seals, or if the steel isn't inappropriate grade, it can leak out of that. And you know, obviously that can cause catastrophic consequences if it reaches.
Engine rooms and just building on that, Professor Valera Medina said that, you know, compared to ammonia, which has been handled for over 100 years, hydrogen lacks the regulations. You know, the alarm systems and health and safety procedures on board.
So I'm not sure how much experience you have with maritime specifically, but I just wanted to know whether you have any first hand experiences of like gaps in policy or perhaps the lack in regulations in some of the work that you've done or?
All stuff that you've heard from industry partners?

JR **Jemma Rowlandson** 10:37
Not maritime specifically.
But I do. I do know this is an issue in terms of hydrogen regulation. What I believe they're doing at the moment is because a lot of the legislation hasn't been written, they're using natural gas legislation as a stopgap, which is that's quite sensible. They do have a lot in common, although there are there are some key differences in them as well in terms of safety.
But that tends to be the default at the moment is if it doesn't exist, they treat it as if they would natural gas.

SB **Sew, Brandon** 11:07
Mm hmm.

JR **Jemma Rowlandson** 11:09
Ammonia. Yeah, is definitely more widely handled and is actually not something we

talk about a lot in hydrogen and in certain areas of hydrogen, which is a bit weird. We seem to forget it exists sometimes which I think is a mistake because it can be very useful as well.
So with the I mean natural gas is exported via ship all over the world readily and all that infrastructure does exist.
I think that the issue of hydrogen if you're transporting as liquid is generally the temperature. It's much lower and you've got an energy cost associated with it there. But I do know that it's something they're seriously looking at, particularly in Australia for export to Japan.

SB **Sew, Brandon** 11:55
Hmm.

JR **Jemma Rowlandson** 11:56
So the technology they're investing in it, some of this technology does exist that is getting better, but it does need investment and it's almost links back to this industry government issue. You're not going to put the money in unless you know there's going to be a market for it in sort of 50-70 years time.
And that, I think is not guaranteed, which is more of the issue. I think that part of the technology I think it is there or it's almost there it just needs that push traction to make it more commercially viable.
But yeah, I think I'm more familiar with the automotive rather than the maritime sector. And so it may not be as it's applicable.

SB **Sew, Brandon** 12:35
Yeah.
No, that's fine. Yeah. It's still interesting to hear what you have to say.
So just regarding.
Developing green hydrogen in the UK and sort of developing a hydrogen economy. You've spoken a lot about how you know the techno economics of it and how it needs to be feasible and sort of how you can't just produce a supply. There's no demand.
So in your opinion, what do you think is the sort of main barrier that's preventing green hydrogen from really becoming widespread?

Jemma Rowlandson 13:10
It seems to be capacity at the moment, certainly from the people I've talked to in the Southwest.
They there's projects where they want hydrogen, but they can't get green hydrogen.

Sew, Brandon 13:21
OK.

Jemma Rowlandson 13:22
I don't actually know where the electrolyser plants are, probably university or similar, maybe Swansea, but there's yeah, it's capacity of green hydrogen generation. It's not available currently.
There's also, I think, something to be said for at the moment you need so you.
At the moment you go to an electrolyzer plant specifically and they would generate the hydrogen and you would then transport back from there, but often, especially in this geographically in the Southwest, we're quite dispersed. So it's great if you've got a nearby city or a nearby plant where you have that access. But if you're down in the depths of Cornwall like some of our industrial partners are, it's really hard to get your hydrogen all the way down there. So you need to think about more maybe more local production or other ways of transporting the hydrogen.

Sew, Brandon 13:54
Mm hmm.

Jemma Rowlandson 14:14
That are more economically feasible. I mean the electrolysis technology is there. It exists, it's at scale. They're doing it, which is great.
Their longevity is not bad as well. From what I understand, which is also good that you've got. I guess you've got capital costs associated with actually setting them up and you've got the cost of, you know if getting it to where it needs to be is one of the main the main issues distribution. And when you get there, you've also got to store it somewhere if you're producing it on demand, that's not necessarily an issue, but otherwise storage is a problem. The industry standard is compression in a gas

cylinder that's expensive. Gas cylinders are expensive. It depends if you need it stationary or not. And that opens a whole host of new questions as well.

SB **Sew, Brandon** 15:01
Yeah. So would you say the lack of infrastructure is pretty is like one of the biggest areas because you know you've talked about how a lot of especially in the Southwest, a lot of the projects are dispersed and you know there's the issue of transporting hydrogen. Do you think if the infrastructure was there, it would be better to sort of create these sort of?
Closed loop systems almost where the site of the electrolyzer is where?
Its end uses to sort of prevent issues of distribution and storage if it is produced where it's used or.

JR **Jemma Rowlandson** 15:39
Yeah, potentially. Or just making it easier or for kind of refilling of hydrogen.

SB **Sew, Brandon** 15:45
Hmm.

JR **Jemma Rowlandson** 15:46
But yeah, infrastructure is a big issue. It's probably one of the main barriers, infrastructure and associated to that cost of setting up the infrastructure.

SB **Sew, Brandon** 15:53
Yeah, OK. So looking more into the various methods of hydrogen storage. So you've obviously got pressure vessels that you've mentioned. There's also geological storage and storage via metal hydrides and a recurring theme regarding all of these, like the justifications for each method, they're all based on techno economic feasibility and this is perhaps probably the main reason why the government has invested funding into research and development for hydrogen storage.
So I know right now they have.
Their hydrogen storage and distribution supply chain funding competition.
So I wanted to think sorry, I wanted to hear your opinions on that. Whether you think it's enough funding to make a significant difference in developing hydrogen storage,

or do you think the government could be doing more with regards to?
You know their role in developing hydrogen.

Jemma Rowlandson 16:51
Have to remind me of how much money they put up for this competition at I can't remember.

Sew, Brandon 16:57
I don't have the exact figure, but I can find out very quickly.
It's £4.35 million for hydrogen storage and distribution, supply chain research and development.

Jemma Rowlandson 17:14
It's not really that much, to be honest.
In terms of the problem that exists so we can store hydrogen and we can sort it well in a compressed gas form, but that's got high energy costs associated with it.
The other popular method of storage, particularly for stationary applications, liquid hydrogen, but that's got an even bigger energy cost associated with it. I think about 1/3 of the energy that you put into it that is contained within the hydrogen goes just to liquefaction.

Sew, Brandon 17:35
Mm hmm.

Jemma Rowlandson 17:45
Of the hydrogen itself in that in that case it's expensive.
Yeah, I mean, certainly it's going to have an effect.
They're going to get some probably some interesting results from that, but really I say I need to, I would need to put more into, I know it exists this.
This funding scheme I haven't looked too much into it.

Sew, Brandon 18:12
Hmm.

Jemma Rowlandson 18:14

It's going to be dependent on who is aimed at as well. If it's in the industry versus academia, really at this point you want things that are facilitating industry because we need these solutions kind of 10 years ago or now rather than 50 years time, which in some of academic work is on that border, which is great. But you really want things at a high TRL, technology readiness level. And so you want industry, you want startups involved, you want all those kind of things. So it depends.
Kind of how they're distributing that money and where it's aimed at. As an example, the GW shift money that's actually distributed by the EPSRC, which is a funding body government actually is run by the government, but it gets money from the government.
It is a public funding body, but that money actually goes directly to the universities and it is kind of distributed to industry from there, so it doesn't go directly to industry, which in some ways is fine. We can work around that, but in other ways it's also a little bit of a barrier too, because it can't go directly to industry. It may not cater for what they need, it to cater for.
What you can spend it on is a bit more restricted.

SB **Sew, Brandon** 19:24
Yeah.

JR **Jemma Rowlandson** 19:25
We're making it work, but I would be curious if this government funding has similar limitations.

SB **Sew, Brandon** 19:33
Yeah. And then just lastly, so in terms of.
Addressing hydrogen storage and developing it, you know the government. They primarily focus on funding. You know, even though it's not a lot of funding, they have sort of made some sort of progress or attempted to. And in the hydrogen champion report that was produced, published last year, they aim to sort of provide the government with recommendations to develop a hydrogen economy. And the only recommendation they had in that relating to hydrogen storage was to develop a plan for hydrogen storage infrastructure, which I think.
You know, compared to the other components of the supply chain such as production, you know they don't really have a lot of focus on storage. So in your

opinion, is there an area that is slowing down? I know we've already mentioned this, but is there an area that is slowing down the development of hydrogen storage that you feel the government have not really focused on and they really should?

Jemma Rowlandson 20:31

So I guess the maybe the thing of hydrogen storage that is it does work is just expensive. That might be the main issue here.

In that there you can store your hydrogen in a variety of different ways.

But it does come at a cost at the moment, whereas in maybe some other aspects of hydrogen economy its more critical to develop things that actually work in the first place.

saying that sort of electrolyzers are working, distribution system, that certainly needs a lot of work.

It does seem to be one of these things that people are just like, yeah, we'll, we'll store it. We'll be fine. We'll get a gas cylinder. It'll be it'll be fine. And generally, yeah, it will be fine. You will. You will find a solution there.

I mean really, it needs more research for cheaper, more effective methods of storing hydrogen in quantity at scale. Caverns are a nice idea, but you are geologically limited by what you can do and think they were looking at some of the mines in Cornwall at one point, I don't know where they got to that. I think the answer might have been not suitable, but I can't remember it was a little while ago.

Compressed gas works fine. Liquid hydrogen works fine. Metal hydrides I hear different things from different people. Some people think they're wonderful, some people hate them.

They're probably not flexible at the moment as the other types of storage, but they are room temperature, or near that for actual storage, which is a massive advantage.

We've also got porous materials or kind of cryo-compressed hydrogen storage where you're densifying the hydrogen inside a material and then cooling it down so it kind of compresses it further or densifies it further. And again that's possible.

But that's you need kind of stationary storage for that kind of solution which is fine, but it limits what you're using it for. To be fair, a lot of our industrial partners, they they're looking at stationary storage, so they've got more flexibility because you're not so constrained with space necessarily. But for something like aviation or automotive that becomes trickier. For shipping there's a potential to maybe even use the hydrogen that you're storing to run the ship. I don't know how.

Advanced that is, but if that's the case, you might find some differences in regulation there as well.
Would be an interesting one and to especially as you get boil off if you have sort of liquid hydrogen. So you're going to lose that hydrogen anyway. You might as well use it for something useful.

SB **Sew, Brandon** 23:09
Yeah.
Yeah. OK. That's great. Yeah, that's all my questions I have for today. Thank you for taking the time to answer them.

JR **Jemma Rowlandson** 23:20
That is 1.

SB **Sew, Brandon** 23:26
Just lastly, is there anything? Are there any thoughts that you've had throughout this interview that you'd like to share that I didn't specifically ask for in my questions? I'd just like to hear if you had anything I should say, if you don't, then this is absolutely fine, of course.

JR **Jemma Rowlandson** 23:40
An area of I mean increasing interest. It might be worth knowing about is like they're calling it pink hydrogen, which is hydrogen from nuclear.

SB **Sew, Brandon** 23:48
Mm hmm.

JR **Jemma Rowlandson** 23:50
I think the traditional view of green hydrogen has been that you take your renewable energy, intermittent renewable energy. You feed that through an electrolyzer, you produce your hydrogen from your water and you store it.
An interesting way of thinking about it I heard was nuclear instead.
That you're using your nuclear as kind of a consistent or the I think the way to heat nuclear activity is a consistent way of producing lots of hydrogen rather than it being dependent on this sometimes intermittent issue.

Sew, Brandon 24:23
Mm hmm.

Jemma Rowlandson 24:28
And the other thing worth mentioning is hydrogen for peak shaving.
In national electricity grids where you've got times when you're over producing or renewable energy, you feed that into your electrolyzer or you'd get your power stations to do that. And then when you've got a dip and you need more energy in the system, you burn the hydrogen and put it back into the grid.
I mean, that's something to say actually as well. It's all about there's a lot of focus on fuel cells, but you can burn hydrogen just as easily, if not more easily. And the purity is not such an issue if you're doing combustion versus if you're doing a fuel cell reaction.

Sew, Brandon 25:02
Hmm.
OK. Umm, great. Yeah. Once again thank you for taking the time to do this interview. Please. I know I've said if you've lost the e-mail somewhere I can send you the information form again. The consent form. Oh, OK. Yeah. And that's fine. And then lastly, because you've obviously taken the time to participate.

Jemma Rowlandson 25:25
No, I've got it. It's all good. Yeah, I've got. Yeah.

Sew, Brandon 25:35
After I'm done with my report, I'll send you my dissertation project. Whether or not you read it, you know it's up. It's up to you, but I just thought it would be a good a good gesture, and obviously because you're obvious you're part of it, you're entitled to know what you know what I've said about your words and my discussions.
And yeah, that's everything for me, I think. Yeah. And then as you said, I will use the video just to sort of touch up the transcript to make it accurate and then I'll, I'll delete the videos like after I'm done with them. So yeah, that's everything for you.

Jemma Rowlandson 26:04

No worries. Sounds good. And yeah, look forward to seeing your report be interesting to see kind of the other discussions you've had. I hope this was somewhat useful to you.

SB **Sew, Brandon** 26:13
No. Yeah, it was useful.

JR **Jemma Rowlandson** 26:15
And yeah, yeah, good luck. I hope handy goes well.

SB **Sew, Brandon** 26:17
OK, thank you. Have a nice day.

JR **Jemma Rowlandson** 26:20
You too. Bye, Brandon.

SB **Sew, Brandon** 26:21
Bye bye.

Sew, Brandon stopped transcription