

S2 E3 – The role of thermal generation in the UK’s energy mix

Baringa’s Energy Innovators Podcast

James:

Hello, and welcome to Baringa's Energy Innovators podcast, where we help you make sense of the energy transition's greatest challenges and opportunities. I'm James Constable and in this podcast series I speak with the leading industry experts to learn how they're putting people first and creating impact that lasts, to fuel their energy transition.

Hannah:

I just wanted to pick up on your point around the tests of ensuring that this really can be properly decarbonized. You've got to have a project that is in close proximity to the planned infrastructure assets that are going to facilitate that decarbonization. So, that is a CO₂ pipe that goes to a store, or a hydrogen pipe that goes to a planned blue hydrogen project and also to hydrogen storage. And obviously, that planned blue hydrogen project also needs a CO₂ pipe that goes to a store.

And I think that's an interesting question, because we've got a bunch of assets around the country which are not proximate to CO₂ stores or to the cluster of infrastructure that's developing around them. Well, we don't want to waste that grid capacity because we know that's like gold dust around the country as well. And in fact, it's got all of the others, it's got water, it's got the site, it's going to have planning. We've got a workforce, let's not forget the just transition and giving these people future jobs. So, we will find a way to facilitate through non-pipeline transport of CO₂ and ability to create a new power CCS project, for example, at this site.

James:

Hi, everyone. Thanks for joining. Today, we are joined by Hannah Bronwin, who is the director of business development for SSE Thermal, where she's responsible for growth of low-carbon thermal generation, hydrogen production and storage. And Chris Thackeray, who's our global CCS lead in Baringa. Today, we're going to be talking about the role of thermal generation in the future UK energy mix and some of the quite significant challenges facing the need for flexible generation as we move ahead with decarbonizing the system. It's a really interesting, very detailed conversation and I hope you enjoy.

Today, we're going to be talking about the decarbonization of thermal assets in GB and the role that thermal generation plays. Hannah, you are basically responsible for the growth of that thermal generation and that low carbon position, and hydrogen production and storage. Just a little bit of intro about Hannah. So, before joining SSE Thermal, Hannah worked at the Energy Systems Catapult, and before that at BEIS, which is obviously now DESNZ, where she was responsible for initiating the RAB model for financing new gigawatt scale nuclear. So, we won't necessarily touch on nuclear today, but that's super interesting. Yeah, so super.

Chris, do you want to give us a bit of an intro about yourself, why we're talking about this today, and any scene setting around the current policy landscape?

Chris:

Absolutely. So, I lead the practise on CCS advisory. So, I help policymakers, investors and developers to commercialise CCS projects. So, that involves advising around policy, commercial strategy and deal execution.

So, today's discussion is to cover decarbonization of the thermal fleet on the power system. So, government's got an ambition to decarbonize the grid by 2035, and crucially, that's subject to security of supply. So, that means that government needs to make decisions in order to both decarbonize the system but also keep the lights on and maintain sufficient electricity capacity to meet peak demand.

So, there needs to be a sufficient amount of capacity to meet winter peak demand, so a certain number of gigawatts above the peak demand, so that the system operator has enough options for balancing the system. The generation mix on the system is changing with coal plants, so, coal-fired power stations, almost gone from the system, an ageing gas and nuclear fleet with expected plant closures. And government intends to provide much of our bulk power with renewables, which is absolutely the right strategy given our abundant offshore resources. But it will also need to supplement this with interconnectors and flexible power sources such as storage and power generation from thermal sources.

So, it's crucial that we've got sufficient flexible capacity with long enough durations to have output to cover peak demand. Demand, of course, is forecast to increase substantially as we electrify transport and heat. And with the intermittency of renewables and an ageing fleet of generation, with an expected series of closures of large amounts of capacity, this will leave it likely that there's a substantial capacity gap to fill in order to meet that peak demand.

So, Baringa was recently commissioned by UK government to do analysis on this capacity gap for government. And the analysis suggests that the gap could be as high as 28 to 30 gigawatts by 2035, and that that gap could be emerging by 2028. So, to put that in context, today's gas fleet is just over 30 gigawatts. So, it's a substantial capacity need that the government will need to make decisions on investment policies to incentivize that build.

So, the government's, of course, got the capacity market to incentivize new capacity on a market-wide basis, but it's also got new mechanisms in place to incentivize investment in flexible power sources at scale, such as the Dispatchable Power Agreement for power CCS. It's minded to do a Dispatchable Power Agreement for hydrogen power, and it's looking at considerations around, for example, a cap and floor for long duration storage. So, it's developing these additional mechanisms to bring forward major levels of new firm, flexible low carbon power. SSE Thermal's a key player in this space with existing thermal assets and plans to decarbonize those assets. And that includes power CCS, it includes hydrogen production, generation and storage.

So, I think Hannah is the perfect person to have a conversation around these topics with, to understand whether what government is doing around policy is going to incentivize sufficient investment to both keep the lights on and to decarbonize the electricity system.

James:

Super. Thanks, Chris. Great overview as well. I mean, that's a lot covered there, but that's fantastic. So, my key takeaway from that is that we need thermal generation. Obviously, a load of other different flexible technologies as well to match that. So, really interesting to hear from SSE's position, how are you dealing with that? Because it's not an insignificant challenge, right, to decarbonize thermal assets and keep them profitable and working in the market?

Hannah:

Yeah, absolutely. So, I mean, first of all, to say, I really echo and agree with Chris's analysis of the situation. So, renewables will be the backbone of the future of energy system, and SSE is heavily invested in delivering that with behemoth projects like Dogger Bank, and Seagreen, and Berwick Banks, a very important offshore wind portfolio, but it's not always windy. And so, even with batteries and solar on the system, and that's an important part of our portfolio as well, we are going to need a significant amount of power with an on-off button that can run for more than two to four hours. And so, that's the challenge that the business is facing.

Thermal plants currently does a lot of the heavy lifting for that in the UK and in many other countries around the world, but we need to decarbonize that thermal plant. Now, fortunately, there are other technology solutions enabling us to do that. So, Chris mentioned power with carbon capture. So, that's basically take a CCGT, you put a carbon capture plant off the back of that, take the off-gas, strip out the CO₂ and then safely sequester that in depleted gas fields or aquifers. Fortunately, the UK has a lot of these.

Hydrogen for power is another option. So, you can fuel switch from natural gas to clean hydrogen, and that can then be burnt in a CCGT without releasing CO₂ into the atmosphere. And also, other forms of medium and long-duration storage like compressed air, liquid air, et cetera, probably slightly further down the line, but also very interesting. We're going to need all of these.

The CCC, the independent Climate Change Committee, produced a report in March of last year, which set out their view on what would be needed to deliver a reliable decarbonized power system. And they estimated around 17 gigawatts of low-carbon thermal plant would be needed to get to a net-zero power system by 2035. A mix of power CCS and hydrogen power.

James:

Is that current or is that incremental to the current position? So, that's the total-

Hannah:

Well, there is none of that currently on the system.

James:

There is none of that. Okay.

Hannah:

So, it's all incremental.

James:

Right. It's all incremental. Right.

Hannah:

And I guess, the challenge that we're facing, which Chris outlined there is, that is a heck of a lot of new capacity to bring online. If I put a grid application in now, I get the wrong side of 2035. So, how are we going to bring all of that about? It's not just about building the CCGTs, it's also to get to the decarbonized solution about building the whole value chain infrastructure. So, that's the carbon transport and storage systems for hydrogen for power, that's hydrogen production. A lot of that is going to be blue. So, actually, it also needs the carbon transport and storage systems. And again, the

CCC really focused in on that. Hydrogen pipelines themselves, and large-scale hydrogen storage and salt caverns.

So, you need all of this infrastructure and that we're only 10 years away from trying to deliver this. So, what we're seeing is we are running out of time, we know government is low on money, we're going to need a pragmatic solution to get there.

Chris:

So, many of those assets you just mentioned, so offshore CO₂ storage, hydrogen storage, hydrogen and CO₂ pipelines, even power plants, they take 7, 8, 9 years to develop from inception to delivery?

Hannah:

At least, probably. I mean, what? Three or four years to build an average CCGT. 10 years, at least, to develop a low carbon CCGT. Plus, as you say, you've got these other bits of the infrastructure and in some ways everyone is having to work together to knit these things together in a first of a kind value chain.

Chris:

So, is the decarbonization of power target in any way achievable? So, are we heavily relying on the subject security of supply after the comma?

Hannah:

I think, what we have to do is lean in to get as much of this built as quickly as possible. I think on the upside, we do have ... The technology is pretty much there. Power CCS, it's there. Hydrogen for power is developing, and there's OEMs developing that technology for large scale 100% hydrogen-fired CCGTs by 2030.

The instruments to support that, the business model, so the Dispatchable Power Agreement, which you mentioned, Chris, is there. The support models for the rest of the CO₂ value chain are there, they just need to be allocated at pace. And then, for hydrogen, it's a bit behind the curve, but it's catching up, and as you say, government's minded to issue a Dispatchable Power Agreement for hydrogen as well. Hydrogen production business model is obviously there. And transport and storage, those business models are being developed and refined in parallel with an allocation mechanism which is looking to kick off this year.

So, I think on the whole, we have got the tools that we need in the toolbox, but they need to be deployed a lot more quickly and we need to recognise that we might not get all of them deployed at the pace needed to get to that 17 gigawatts, give or take, by 2035.

James:

Yeah. I mean, it sounds like there's a lot of good work going on with market mechanisms and government incentives and support structures around all of this stuff, right? But when you combine this with other things that are also going on, this isn't happening in isolation. You've also got electrification of transport, you've got other renewables assets fighting for that same network capacity. You got all these other issues compounding the same problem, electrification of industry. Right?

So, all of this adding additional strain onto this lens that we're looking through. It sounds like a pretty sizable issue, right? It sounds like, I mean, maybe we aren't going to hit target unless there is a pretty serious intervention here.

Hannah:

Yeah. Well, go on, Chris.

Chris:

I think Hannah's point around, we've got a lot of the tools in the toolbox to deliver much of this requirement, is right. I think what government probably needs is two main things to deliver this. One is to ramp the ambition in this specific set of sectors. So, hydrogen to power, long duration storage and power CCS, particularly, to have a clear, ambitious ambition to deliver a certain level, not necessarily specific technologies, but certainly a level of firm, flexible low carbon power.

James:

And at the moment there's-

Chris:

There isn't.

James:

There isn't. Okay.

Chris:

No, there isn't. So, you've got power CCS has an ambition by the middle of this decade to have at least one power station. One power station is 800 megawatts out of that-

James:

70.

Chris:

... 30 gigawatt we're talking about by 2035.

James:

Sorry, 30. Yeah.

Chris:

And then to your point, James, about there's lots going on in other sectors, and lots of those other sectors have clear ambitions, and therefore, the capital and interest flows into those sectors where you do have clear ambition.

James:

Okay.

Chris:

So, it's important, whilst to keep a level of competition, not necessarily having specific technology targets, but at least to have a level of ambition for the outcome that you want to get. So, that's the firm low carbon flexible power, for me, is a really key element to this, and it'd be good to get Hannah's view on the investor, developer view on that kind of ambition.

I think the second thing is you need a level of funding allocated, ring-fenced for this kind of effort. So, the Dispatchable Power Agreement for power CCS is funded through consumer levies, very much like renewables. Presumably, other power models that come forward, Dispatchable Power Agreement for hydrogen, long-duration storage, et cetera, will be funded in a similar way. And there needs to be a funding settlement that sets out, yeah, you've got an ambition, but there's also the money from consumer levies to fund that, or other mechanisms that government wants to put in place. And what consumers are getting is power capacity and security of supply in a decarbonized way. So, it makes sense for consumers to pay for that funding, but there's not a clear line of sight for investors and for developers, at this point, on both the ambition and also the funding to achieve it.

James:

Yeah.

Hannah:

I agree with that. And I think that ambition is really important, not just for us as developers of the power assets themselves, but also for the other players in the value chain to know we should prioritise linking up with a power developer. So, if you've got a CO₂ transport and storage system that you're developing, power is actually not an easy emitter to absorb into that system. It's intermittent. By our very nature, we only want to turn on when it's not windy enough to otherwise generate the electricity. So, we're the flip side of the intermittency of wind. And that, actually, technically, is quite difficult for the CO₂ transport and storage systems to absorb. They will do it if government asks them to. If government sets out that this is something that we value, because we want to decarbonize the electricity sector, because we have an early target for decarbonizing the electricity sector, because we know that the whole of the rest of the energy system is reliant on electrification in order to decarbonize. And you can only do that if you get to a net-zero power system.

So, those signals, those ambitions, I think are really important. Obviously, they need to be backed by money and they need to be achievable. And we see with Scotland stepping back from their 2030 goal, it's not helpful to have a target that's not achievable. I think this is with insight, but it is a ... I guess, we've got a very big hill to climb and we've not gone quickly enough, so now it's very steep as well as very big. That would be my analogy here. And so, in doing that, I think we also need to think about incremental steps.

So, one of the things I think the UK has done really well is this cluster concept of building low carbon ecosystems around CO₂ clusters. That's a great move. But with the cluster-fed concept, I guess, the focus has been getting all of the ducks in a row at one go and going, "Right, we've got our ducks in a row, we're going to take cluster-fed." And I'm not sure we've got time to get all of our ducks in a row now. I think we might need to build infrastructure ahead of need. We might also need to build CCGTs that are decarb ready, that can run off natural gas, but then decarbonize as soon as the infrastructure is in place. And different locations might have the infrastructure ready first or the CCGTs ready first, but we're going to have to have that bit of flexibility in order to get to that 2035 target.

Chris:

So, there's a huge coordination problem there of building sufficient power stations under different policy mechanisms and getting all the financing and funding for those plants, whilst also coordinating with all the relevant networks, be that hydrogen fuel in, or be that CO₂ out. And so, that feels to me like a really difficult coordination problem to do all at such a great pace.

I think with respect to building the facilities, the power stations, the precedent of the dash for gas period, we built in excess of a gigawatt a year of gas-fired power stations. So, it can be done in terms of delivering the power plants, if you've got a pipeline and the right incentives. As in, a pipeline of projects and the right incentives, but it needs that clear ambition and funding and it needs maybe a bit of pragmatism around decarbonization at different points in time for the assets. So, you might want to build, as Hannah suggested, some assets that decarbonize later. You burn gas to begin with, and then decarbonize later. It resolves that coordination and timing problem a little bit.

James:

I totally get that. But you can see how that might be a little bit of a PR nightmare. Right? So, we're building out new thermal plant that will decarbonize later, whilst we're also investing heavily in offshore wind. So, you can see, if you were in maybe a political position or a policy position, that'd be quite a hard thing to maybe achieve. Right? Is that a fair ... Because, I mean, you'd know, right?

Chris:

I think it's a fair challenge. I think the reality, though, of the current situation is the base case is that we will build new gas-fired power stations through, say, the capacity market, and that will just be constructed wherever investors see a valuable investment case on the electricity system rather than any real commitment from government as to the decarbonization plan for that particular asset.

So, I wonder if there's a space for a conversation about, could you develop a mechanism or incentives to build stations that are committed to decarbonization and there is a commitment to that decarbonization plan with the necessary infrastructure to connect, be that a CO₂ pipeline or a hydrogen pipeline?

There's a similar policy mechanism that's been developed in Germany, where they have a similar policy problem. And Germany's a climate leader within Europe, but is seeing the need for flexible thermal power on an unabated basis that will then later be fueled by hydrogen. Germany's not currently planning to do power CCS, though, it will now be allowed. It's not within the plans for incentivizing investment.

So, I think that there's precedence, even in equally climate leading countries across Europe, as well, for these kind of mechanisms. So, for me, if we're going to meet that decarbonization ambition over the long term, i.e., 2050, whilst maintaining security of supply in the short to medium term, we're going to need to plug the capacity gap. And there's a really key point there, which is we've got to take consumers and citizens with us on that journey. Right? Because if you start to see power cuts because of decarbonization, that's going to be a really bad position to be in. Right?

And new gas-fired power stations are pretty efficient. They still have emissions, but they're much more efficient than the old coal-fired power stations or even old gas-fired power stations. And so, there's still a really positive story for wider decarbonization of the UK economy with the progress that we've made. And so, I think, maybe it's now time to be a little bit pragmatic and think about how can we maintain security of supply with some new assets but then with a commitment to decarbonization later.

James:

And how's that affecting your role within SSE on a daily, monthly basis in terms of the decisions you guys are making?

Hannah:

Yeah. So, I mean, I agree with what Chris has set out there and I think it's interesting, in the UK we have had the privilege of taking security of supply for granted for a long time now, and that is partly, I think, because we've got the 27 gigawatts, whatever it is, that's online at the moment, that will be ageing as we speak. And it's partly because the capacity market has actually worked to-date.

Now, we've got an interesting perspective, I think, as SSE, because we also have a business in Ireland, and Ireland has been in a very different situation. So, it's been household news over the last couple of years that they do have a security of supply crisis and that has led to emergency generation in parliament, emergency generation being built, and that's highly, highly suboptimal. So, we do need to wake up to the fact that this is a risk. It is not a risk that people will tolerate or that their elected politicians will tolerate, and therefore, action is needed.

And actually, the environment is changing a bit because whilst the capacity market has, in the UK, worked well to deliver the capacity that we needed, I think two things are different now. One is, the scale of the challenge is huge. So, this 30 gigawatt gap by 2035, and actually we've got 27 gigawatts of plant online at the moment, which just gives you a sense of the scale there of the challenge. It kind of indirectly managed to get our own Keadby 2 built, although we actually took FID slightly challenging decision. I'm sure I wasn't in the organisation at the time, but we took FID without a capacity market contract, but we probably wouldn't have done that if we hadn't had that mechanism there, and then we got a contract shortly after. That's it.

Eggborough has now got a capacity market contract and we'll see where that goes, but it hasn't actually managed to bring forwards large-scale CCGT in any really significant quantities. It's brought forwards much less efficient peaking plant, but that's not going to be enough to solve our problem. So, much bigger problem. In fact, we don't necessarily have the right tool to address that. I think that's one point I would make. And the obvious solution to that is lift the 75 pound cap on the cap mech. So, that is, I think, essential.

The other challenge is we do not want to bake in carbon to the system. In the past, the capacity market hasn't needed to be a low carbon tool, it hasn't been that, but that has to change, otherwise, we risk baking in emissions. And my concern ... I hear your point around the political challenge of saying we need to build more thermal fleet, and maybe two years ago I would've thought that's unthinkable, but our prime minister just came out and said that and no one really batted an eyelid and they went, "Yeah, that's true." Or, something a little bit more articulate than that. It amounted to something along those lines, I seem to recall.

So, actually, my concern is not that it's going to be politically unacceptable to say that this needs to get built. My concern is that people aren't going to focus on decarbonizing it enough, and that we need these really robust tests to make sure that we do not build something that isn't properly able to be decarbonized as quickly as possible. And that that needs to be really, really strict, that set of tests.

And, I guess, my other concern is that there perhaps isn't a level of realism sufficiently yet, around what is going to be needed to bring forwards that capacity. So, lifting the capacity market cap and showing a mechanism by which plants can off-ramp off the capacity market onto a low carbon instrument, so, a Dispatchable Power Agreement if it's power CCS. Or indeed, if it's hydrogen for power, if the government lands on that as a solution. So that you can switch track, essentially, from an unabated capacity market contract to an abated low carbon Dispatchable Power Agreement with

the same plants and by doing that, avoid baking in carbon emissions or having a generation of stranded assets.

Chris:

And I think what we're also saying here, and good to get your view of whether you agree with this, Hannah, is that government's got an increasing role to think about and plan for decarbonization of those kind of assets. Because if you are building assets through the capacity market and then we want to decarbonize those later, that decarbonization broadly looks like hydrogen to power or power CCS, and therefore, you need infrastructure that government is making a decision on building, in the particular location that it needs to be built to decarbonize those pretty large assets.

And so, government's got an increasing role, it seems, to think further ahead than, say, the capacity market, capacity timing. So, it currently sets a capacity target four years ahead. And so, it's got an increasing role to think further ahead and to think a little bit more deliberately about what assets need to be built where on the power system, but also on the low carbon infrastructure sides of hydrogen and CCS pipelines and storage.

James:

Okay. So, this isn't my area of deep understanding, but what I'm hearing, and you correct me if the summary is wrong, is effectively we think that there's an opportunity to build out additional gas thermal assets. And economically, that's an opportunity that exists, but actually-

Hannah:

Well, doesn't quite exist, is what I'm saying, but could exist.

James:

Could exist.

Hannah:

With a few tweaks.

James:

Yeah. With tweaks on the current policy landscape. Okay. But actually, your main concern is making sure that they are delivered in such a way that can be decarbonized in the future and are incentivized to put that, I'm assuming, additional CapEx in now, or to do that.

Hannah:

Yeah.

James:

Okay. And if no interventions are made or if there's no improvement, what is the kinds of facts we're working against? Is it that this won't happen?

Chris:

So, the Baringa analysis shows a capacity gap starting to emerge around about 2028, with our current analysis and assumptions. And that's based on policy that's already in place and it's based on a

committed build. So, it sees, for example, Net Zero Teesside power plant being built, but no more power CCS after that. Right? So, there absolutely is opportunity for government to procure more capacity both through the capacity market and through its new mechanisms. So, the power CCS mechanism, as well as additional things like interconnectors through the often cap and floor windows, and so on.

So, I think there really is an opportunity for government, right now, to increase that ambition, to try and seek that funding settlement that's required to fund this new infrastructure build out and to maintain security of supply, but do it in a way that does lead us to a path to long-term decarbonization. So, even if it's not 100% decarbonization by 2035, we're getting a significant level of decarbonization into the thermal fleet, that enables that longer run decarbonization of the whole economy by 2050. That should be the aim.

James:

Great. Great. And for you, Hannah, from your position?

Hannah:

Yeah. I just wanted to pick up on your point around the tests of ensuring that this really can be properly decarbonized. And I think, for me, you've got to have a project that is in close proximity to the planned infrastructure assets that are going to facilitate that decarbonization. So, that is a CO₂ pipe that goes to a store, or a hydrogen pipe that goes to a planned blue hydrogen project and also to a hydrogen storage. And obviously, that planned blue hydrogen project also needs a CO₂ pipe that goes to a store.

And so, quite quickly, you get very focused on regional planning and these kind of roles, because you look at the map and you just go, "That would work, that would work, that wouldn't work. That, question mark, depends whether the government's going to do something around CO₂ for dispersed sites," for example. And I think that's an interesting question because we've got a bunch of assets around the country which are not proximate to CO₂ stores or to the cluster infrastructure that's developing around them.

So, you've got a couple of choices as us, SSE, but also as government, when you look at that, you either say, "Well, that will run to the end of its life and then it will close. At which point, you've got a grid connection there, a brownfield site, but no ability to use that to bring in place new low carbon dispatchable generation." Or you say, "Well, we don't want to waste that grid capacity because we know that's like gold dust around the country as well. And, in fact, it's got all of the others, it's got water, it's got the site, it's going to have planning. And we've got a workforce, let's not forget the just transition and giving these people future jobs. So, we will find a way to facilitate through non-pipeline transport of CO₂ and ability to create a new power CCS project, for example, at this site."

James:

So, it all has to be joined up? All of that thinking-

Hannah:

It has to be joined up. And if you are not going to do that dispersed site solution for a CCS, then you've got to build twice the grid connection at Teesside, for example. And that comes down to a system planning set of decisions and choices. And, I suppose, the role of NESO, it's interesting because they are taking on ... There's strategic planning for electricity, gas, they will be given the

strategic planning for CCS. So, sorry, for hydrogen but not necessarily for CCS. I think it's that way round.

So, that's interesting because you've got three out of the four of the jigsaw puzzle pieces that I'm working with. And actually, I think they're also looking at regional energy planning or local area energy planning. A lot of these are the same concepts, but it needs to be applied at an industrial scale and thinking about this power sector challenge that we're discussing today.

Chris:

Such a crucial role that organization's going to play in the whole of the decarbonization effort, increasingly, to look across those different systems and to plan the relevant infrastructure that's required to enable it all. It seems like a really crucial role, and I think more of that being done by experts in network and system operator companies, the better, because they have the information and the capability to be able to do that. And it's great that government is delegating some of those roles into the National Electricity System Operator.

I think the institutional design across CCS, hydrogen and power decarbonization does need a bit of further thought. I think having the right roles and responsibilities around all of the metering arrangements and the settlements, and so on, around CCS, and all of the things needed to make the sector tick, still needs a bit of thought. And I know government's doing a lot of that work through the cluster sequencing programme and also through the CCS vision work that it's recently kicked off. So, that's all great to see.

But I think that institutional design piece does need further work and thought, and as Hannah mentioned, there's not certainty about who's going to be doing the CCS network planning. Is that going to be transmission and storage companies, or is it going to be a coordinated effort across the National Electricity System Operator?

James:

It sounds like there's a hell of a lot of, not just work to do, but also decisions to be made, in terms of how this is all going to be thrown together.

Chris:

It's not an easy challenge.

James:

Yeah, this sounds like one of the biggest challenges we have.

Hannah:

And one of the things I slightly worry about is, and you see in the CCS vision, this desire from government to step away from the CCS process. Now, I definitely think we can build on the success of the cluster process by clarifying the role of government and there are different places that you can draw the line there, but I do not think government can step out of the picture. Otherwise, who is making those decisions?

James:

Yeah, who's guiding it? How's it going to be thrown together? Yeah, okay.

Chris:

There's a decision-making role and then there's a funding and liability role, right? And I do think, over time, as much as possible whilst still maintaining the pace and scale of delivery, government stepping back from the funding role and also the liability underwriting role is going to be necessary to get to the kind of levels of deployment for CCS and for hydrogen that we need. So, more of that sitting with the private sector is absolutely going to be necessary. It can't all sit on government's balance sheet as a liability.

But doing that in a way that's deliberate and measured and maintains investability, whilst also ensuring that there's sufficient incentives through carbon pricing and product standards, is going to be necessary. And having the right decision-making framework is crucial as well, as Hannah mentioned. So, the right decisions, sitting in the right places, where the information is. I agree, though, that government is going to be a decision-maker in the CCS and hydrogen sector for a long time to come.

James:

Great. Well, I mean, what a fascinating area and it's going to be exciting to see how this builds out. Any parting words from you, Hannah?

Hannah:

Shall I give you my Christmas list?

James:

Yeah. Let's do it.

Hannah:

I mean, Christmas is too far away. Can we do it [inaudible 00:36:07]?

James:

Yeah, let's do it.

Hannah:

I think, recognise the size of the challenge and the need for incremental steps here. I think, Chris and I have both touched on that. And to do that, strong decarbonization tests for any unabated gas that is going to be brought forwards as an interim measure, so that we don't bake in carbon emissions. Addressing the changes that are needed for the capacity market in order to facilitate that, but also then the off-ramp into the low carbon business models. And then, critically investing alongside need, ahead of need. Don't let the perfect get in the way of the good, in all the surrounding infrastructure, including blue hydrogen, CO₂ storage and pipes. Pipes, pipes, pipes.

James:

Okay. You want more pipes? Great. And what about you, Chris?

Chris:

Yeah. So, look, I think as I said earlier on, setting a clear ambition for the outcomes that you want from your policy framework and your investment. So, in this context, thermal low carbon flexible

power, having a clear ambition about what level we need to procure, what level we need to deliver through investment and delivery is crucial.

I think, having a funding settlement that backs that up is absolutely crucial as well, so that investors can see the line of sight to an investible proposition. And I think deploying competition where it's needed and where it's possible, but not necessarily going down a route that is competition for competition's sake. I think some deliberate procurement of particular assets with that long-term planning view in mind. And then, keeping a pragmatic attitude to decarbonization in the short term, such that we can achieve our 2050 goals. So, allowing maybe some asset build of unabated gas that can then be deliberately decarbonized later.

James:

Great. Thank you, guys. Thanks, both. That was really interesting. And if you've got any questions, please reach out to Chris on the Baringa side, or Hannah. I'm sure, Hannah, if there's people out there in the market that want to hear more about what you're doing or want to work with you in SSE, that would be great. So, thank you, both.

Hannah:

Fantastic. Thank you.

Chris:

Thanks.