**Breakthrough 2 Winner Showcase - Transcript**

**Chairs:**

**MH = Mark Hannis**

**CP = Caroline Pradier**

**CT = Catherine Thompson, Nesta Challenges**

**AG = Arlene Goode**

**CW = Caroline Wadsworth**

**Panellists:**

NR = Nikki Roach

TC = Tony Conway

KM = Keiron Maher

AB = Alan Brown

GW = George Warren

DE = David Elliott

SD = Simon Deacon

BH = Ben Hodge

IS = Ian Savage

HP = Helen Patterson

WP = Ed Parry

SR = Steve Riches

CS-W = Clive Surman-Wells

KF = Katrina Flavell

JB = Joby Boxall

CR = Chris Reese

PV = Pete Vale

LE = Laura Evans

**MH: Good morning everybody and welcome along to this showcase event. Apologies for the slightly late start, as always a couple of technical issues we had to work through, but thank you for being here and we're really pleased to see so many of you here. My name is Mark Hannis, and I work for Ofwat and I oversee our innovations, competitions and I’m joined today by various members of the Ofwat team, Nesta, Arup and Isle, who will form the delivery partnership. Before we get going, just wanted to run through a little bit of housekeeping and then we'll run through what the morning will look like. And so, you may have heard already but this webinar is being recorded and we're going to make the transcript available when we are finished, so hopefully that will be of use to you guys. And there will be opportunities to ask some questions of the winners, the entries that you hear about today, but we do ask that you use Zoom's Q&A function to submit these please, we've got quite a tight timetable to work through, and I think there's going to be the most efficient way of doing it. Moving on to the agenda for the day, this is how we anticipate the next few hours to pan out. I’m gonna reflect a little bit on how the competitions have progressed so far over the last 15 months or so and briefly look forward to the next few years. After that we've invited two of our judges to share some thoughts and reflections on their experiences of being involved in the Catalyst and Transform competitions. And then we're gonna get into the entries and we've tried to group them as sensibly as possible along the thematic lines, along certain thematic lines, with each entry having five minutes to showcase their wares and that five minute time limit is very important. As someone who finds it quite difficult to be concise with a tendency for rambling on and on I know how tough it can be to stick to time limits, but we need everyone to have their fair share of time, and also to be able to get out for lunch at around lunchtime, so please do try your very best to stick to those timings. So our first batch of entries will start just before 10 o'clock and then we've got a short break pencilled in for just after 11:00am before we go through the remaining entries, and we're aiming to finish with some closing remarks, are around 12:20ish. So that's the plan. Okay, so before we get going then, I just wanted to provide a very quick Ofwat perspective, reflecting on where we are with the fund and what comes next. So, in the last 12 to 15 months or so I think what we've been able to do has been really quite good, and when I say ‘we’ I mean all of us, companies, partner organisations, representative bodies, the delivery team, everyone who has had some sort of involvement in the fund. We've delivered four competitions and awarded £63 million in funding to 41 projects, we've seen over 100 different organisations listed as partners on entries. More than this though we've seen unprecedented collaboration between water companies and a greater coordination of efforts and ideas. And I think we've seen the beginnings of the shifting culture, I guess, that we had hoped the fund would bring and all this really before we've got going on the majority of our projects. There's definitely been a few learning moments along the way for us on the delivery side and we hope that we've taken on board that learning and that this will mean that are approached in years three to five of the fund is something that everyone can get behind. We've really appreciated, actually, the open and direct dialogue that we've enjoyed between ourselves and our delivery partners, and the water companies, particularly. And I think this has been really beneficial as we’ve listen to each other, we've shared experiences, and we've taken on board feedback, and I really hope that this will continue as we look forward. Speaking of which, a word on what's happening next. Breakthrough one and breakthrough two projects, we really hope to get them moving asap, we definitely hope that we’re through the worst of the wranglings over the financial arrangements of making sure that all parties get paid and we'll be able to do that in a more streamlined, swift way moving forward. So that's a top priority for us. We're gonna complete the pilot period evaluation over the next couple of months and share those results, reflecting on that at the moment and join together all those evaluative materials that you've been contributing to over the previous 12 months or so to produce an evaluation report, which we hope to publish in the summer in some guise. We’re also going to be publishing our decision on the consultation, which will determine what ‘22 to ‘25 looks like for the competitions and the funds, and I'll say a little bit more about this in a second, but our aim is to publish the consultation decision document in July, mid July we're aiming for but we'll see how that goes. And if we're able to do so we'd really like to be able to provide some certainty on the future of the fund beyond this. We've heard how important it is for water companies, in particular, but others too to be able to plan effectively with long lead in times and we've heard that and we recognize that we have a rather big role to play in this in terms of scheduling for our competitions, but also in providing some sense of what the future innovation landscape is gonna hold. So we will try our best to get some news out of that in the coming months as well if we can. And we’ll be spending the summer working towards our round three competitions, we expect Transform Catalyst to open in the autumn, so that'll be the immediate next competition that will come along. We are obviously consulting on some other bits and bobs as well, which I will go on and mention now. So a quick low down consultation it’s currently live, it's live until and open until the 17th of May, and this is all about years three to five of the fund and how we evolve it to remove barriers and open access where we can. And we put some proposals into the document, which we’d really value your views on, one of which includes the launch of a brand new competition, which will be free from some of the restrictions that have been in place so far. So there'll be no IPR requirements, no mandatory 10% rule etc, etc, it will be targeted at earliest stage innovations and open to anyone to enter. There are a number of other proposals as well, which we hope will also serve this desire to remove barriers and open access, including removing the need for catalyst entries, for example, to be led by a water company or a NAV and applying a more relaxed approach to IPR throughout our competition. So that's all I’ll say on that, please do take a look and offer your views, and with that I will hand over to Caroline who's going to lead us into the next part of the day. Thank you.**

**CP: Thank you, Mark. Good morning, everyone. My name is Caroline Pradier, I'm a Program Manager at Nesta Challenges and I’m responsible for innovation and water challenge and the catalyst stream of the breakthrough two challenge. This morning joining me we have two of our esteemed judges, Nikki Roach and Tony Conway who are gonna have a facilitated discussion on their experience as judges and the type of innovation they saw coming through. Before we kick start the conversation, Nikki would you like to briefly introduce yourself, please?**

NR: Yes, course, thank you. Good morning. So, I’m Nikki Roach, I'm the immediate past President, which basically is a posh way of saying ‘the last President’ of CIWEM and I’m also a Director and Co-founder of Axia Origin. It's lovely to be here.

**CP: Thank you. Tony?**

TC: My name is Tony Conway. I’m a professor at the University of Sheffield and a Director of the Water Industry Forum and British Water and a former water company Executive Director.

**CP: Great, thank you, welcome both. So I’m gonna take you through a couple of questions and maybe you can take turns answering and really give your views. One thing to note is that Tony sat on both of our panels for Catalyst and Transform so he has a bit of an oversight of the entire streams. So, looking at the type of innovation we funded this time around, what really stood out and excited you most about these initiatives and what would you like to see more in future rounds? Niki, would you like to start?**

NR: Yeah, of course, thank you. Lots of things, I mean corporate blimey, it was a really good set of entries to read through, it was really enjoyable, I’m sure Tony would agree. For me, some of the big things that stood out was really heartening to see that the innovators were thinking about the stuff that I think are the really important topics, so things like ‘resource recovery’ really thinking about the circular economy, thinking about customers, thinking about climate change. It's great that, you know, you can draw a really clear line between the innovations that are coming through that are using customer money, and those topics that are really important to the sector. And I think another thing that stood out to me was both a challenge and the enabler that regulation poses, so throughout all of the innovations I think you could see an element of where regulation is potentially a barrier sometimes and the innovators are having to work around it, but also where it's catalysing innovation. So, for me it was really interesting just to see that. But I think most importantly, it was recognizing that for many of the entries they're thinking in much more of a systems-based way so it's not, you know, it's not a single technology solution it's thinking much more about the role about innovation and much bigger system and I think that's really important.

**CP: Thank you. Tony?**

TC: Yeah, I think just a very personal reflection. I just found it immensely energizing and uplifting, you just saw the range of opportunities that the submissions were tapping into and you felt that it was just really in step with what the industry needs, with what customers needs, what the environment needs, and what society needs. So it just felt that this could make a real difference. Now, this is an innovation challenge, so there’s no guarantees. There’s something else I was very heartened by, was that the winning entries had clearly put a lot of time and effort, not only to developing a really good idea or a really good concept, but actually thinking through how to develop that and translate it to deliver innovation. Perhaps some of those that didn’t get through, that hadn't put as much, even through they might be a great idea, hadn't put as much thought into taking an idea and developing it into a really usable piece of innovation. And I just found the hard work that had been put into that really, really high. And there was some really elegant thinking, really elegant thinking. I remember one, which is all about CHP plants and taking exhaust emissions and carbon capture, it was just so elegant. There was others that were really bold and ambitious and well thought through, which, you know, if they work out, and they give themselves every chance to work out, it would really move the needle and create real benefits. And so, just yeah, a great experience, where people clearly worked hard to achieve, really to make it easy for the judges to say yes.

**CP: Thank you. So you've both been involved as judges since our first rounds of competition, which is really enriching for us, so have you seen any trends in the sector on like how the sector is approaching these competitions, or what about how they think about innovation, more broadly? Tony, you can go first.**

TC: Okay, I think my first observation will be about the skilfulness of the collaboration. At the University of Sheffield we did a research project looking at what's the factors that influence effective, collaborative innovation. I think quite a few people think that collaboration is an activity, you know, something that you just do. Whereas it's a skill that's got to be learned and I’ve certainly detected, over my sort of period of involvement an increasing level of skilfulness in the collaboration, particularly highlight the focus with academia, you see a very effective partnering on that. I think another trend which I saw was exploiting digital, you know, digital touches kind of virtually everything in water and it's easy to kind of run away with technology stuff when it's what turns you on, but this was effective use of digital to exploit opportunity to deliver insight that’s actionable. So I thought that was good. I think not every project by any means, but there's increasing tendency to be more audacious and more bold, and the more of that the better, as long as it's coupled with well thought through plans.

**CP: Thank you. Nikki?**

NR: Yeah, thanks Caroline. Maybe just to build on that a little bit and perhaps a little more maybe on the kind of more practical entry side of things. I think I’ve certainly seen, as you'd expect, the quality of the entries just every round has just got stronger and stronger. I think I’m also seeing I think more of an approach to risk, which is, as Tony said, bold and that's what we want the innovation from to be I think isn't it, you know that's the whole point. But being mindful that's not just bold and really expensive but actually how do we manage the process in a way that says, ‘okay, I'd we want to be really audacious we might need to think about some stage gates in this so that we…’. And I think that's where the fund, you know, hopefully direction of the fund is going as well, which enables innovators to be really audacious, but not need to feel like I need to ask for a huge sum of money in order to do this actually, there's a mechanism by which we can come back more often and we can be really clear about risk. That doesn't mean low risk, in fact far from it, I think as a judging panel we were always pushing each other to think, are they taking enough risk, is this pushing the boundaries enough, is it really innovative. But doing that, in a way that also makes it easy, I guess, for us as a panel to be able to award that cash with confidence because it's still customer money at the end of the day. So for me, I think I’m seeing a trend towards and yeah towards more of a sense of that from the entries and just superb quality and we definitely got a sense as a panel as to just how much work goes into getting the entries to this this point really.

**CP: Thank you, very good to hear. As we've just heard from Mark, there's quite a few more years of competitions ahead of us, including some possible changes as outlined in our consultation. And so looking ahead to future rounds, do you have any advice for innovators who might be thinking about getting involved? And what about for innovators who might be new to the sector, because we know that it's sometimes a bit difficult to bridge that gap between the water sector and the outsides innovation world. Yeah, go for it, Tony.**

TC: I think this big, bold, ambitious thing actually comes through time and time again, and at the same time as being bold ambitious work hard to make sure that you are articulating good plans to turn a great concept to a great idea through a development phase into something that delivers real value. So the two things absolutely go hand-in-hand. I think people, organisations, bodies outside the water sector, absolutely, you know, it's kind of the Donald Rumsfeld thing isn't it, ‘we don't know what we don't know’. So, you know, if more experiences and insights from outside the sector can undoubtedly help and work hard to form the right partnerships so that, you know, you’re getting the best of both worlds water sector knowledge and an external insight. And I think my last piece of advice would be just to make it easy for judges to say yes, be bold and ambitious, have a really high-quality plan, articulate the benefits clearly, make it easy for the judges to say yes, ‘cause that’s what we want to actually do.

**CP: Thank you. Nikki?**

NR**:** Well, that's great Tony, thanks, so what am I gonna add to that, really. I think what I would say is that it will be great to see some new faces, actually. I feel like and as Tony said we've got some great collaborations happening, we've definitely seen a trend towards, you know, NGOs working alongside consultancies and water companies, and that's brilliant. And I guess it is the Donald Rumsfeld, you know, who's not here, who's missing, who do we not even think might be missing, and how do we encourage those innovators. So there's a job for those innovators to find us, but how do we go out and find them. And as a sector, how do we really think about making sure that our entries are diverse in thoughts, but also, you know, really representative of the communities that we're serving. And so that we know that we're innovating for those communities. So I think, for me, I would be really keen to ensure that the next round of entries are increasingly diverse and representative and that really think about, it'd be great to see some completely new faces, as well as the excellent skills we've already got in a sector. And so, for me, I’d be really interested to look at the intersection between water and everything else, because it connects with everything else. So what can we learn from healthcare, what can we learn from energy, what can we learn from public health, for example, you know and where can we bring some of those skills into the water sector. So finding people who didn't even think they might have anything to offer for water and encouraging them to join us, so I think it's our responsibility as a sector as much as it is the responsibility of those innovators to come to the competition really. So that's what I’d be keen to see more of. And I guess the final thing, building and Tony’s point, for me tell a really compelling story, it really helps the judges If your narrative is really clear and we understand within the first two minutes why this is innovative and why we'd be fools not to award the cash. So I think, making sure that's really strong and really clear is really important.

**CP: Great, thank you so much both. I think we can end on a nice call-to-action for everyone involved, but who wants to get involved in the competition go outside look for new people and new ideas and yeah, make sure it's all for the benefit of, you know, customer, the environment and society. So thank you. Thank you for your time this morning, I hope it was an interesting conversation for everyone. Also it's an opportunity again to thank all of the judges and assessors who are involved in this process because, ultimately, they are the one helping us make these decisions and allocate funding to all these amazing projects. So yeah, thank you again. And now it's time to actually hear from our winners and so, Catherine, I’m handing it to you and the first panel. Thank you everyone.**

**CT: Thank you very much. Elettra, if you wanna roll the videos for our first group of Resilient communities winners.**

*This project towards incentivization for Community centric rain water management will encourage come into is to adopt rate or to get your tools and solutions in order to preventing rainwater from entering the sewer network when it rains heavily excess water runs off people's homes and driveways. This can lead to surface water flooding and flooding from sewers because in distressing consequences to people's souls and businesses overloading of the sewer system getting turned lead to Polish into the environment. The project will encourage the widespread adoption of rainwater capture methods at the grassroots level by encouraging customers to upset the Bamboo area by rainwater storage. It will test and measure how communities can be incentivized to take these measures to help protect properties and the environment. Customers expect say, clean water, all times, and therefore we need to better understand how water quality fluctuates as it passes to an aging water networks, which is the pipes and reservoirs a consortium of water companies suppliers and academics and now introducing Europe's largest deployment of water quality and leakage centres coupled with state of the art analytics to help improve that customer service. Our aim is to better understand the dynamic relationship between water quality in network assets and from that reduce customer contacts identify cost efficiencies and enhance operational decision making. The project also includes behavioural science, research to assess how we can engage the information from these digitize solutions with the customer and therefore take communication with a custom place to another level. The outcome will be to establish a roadmap for future water quality management. Water scarcity environmental capacity and flood risk have never been higher on the agenda and the height of by the varying pressures of climate change, development, population growth and nature decline we need to do things differently integrated water management, provides an innovative solution to this challenge by combining blue green infrastructure technologies and pave change initiatives to make the most of the opportunities to improve people's lives. It is being done elsewhere in the world, but remains a novel in the UK, with few examples which is inhibiting policy support and developer uptake. These berries are not around technology they're focused on areas such as enabling processes value capture behaviours and funding finance, as well as the continuity of as ownership and operation. Our partnership project enabling what smart communities will use a variety of demonstrate sites across multiple development scenarios to rethink what different parties value in relation to water rethink how assets are delivered and managed and rethink the roles of different actors in the development cycle supporting communities in the environment to thrive through the project partners extensive network will share experiences and make recommendations to drive system level change so integrated water management becomes the new norm for housing development.*

**CT: Thanks very much. I’m now going to invite my four panellists to please turn your videos and feel free to unmute yourself as well. Welcome, and I’m actually gonna ask you all to just briefly introduce yourself, I'm gonna start with you, Kieron, and also give us a brief update your project as well as unfortunately we don’t have a video. So please feel free to just 30 seconds on Tap Water Forensics.**

KM: Yeah sure, good morning everyone. So Tap Water Forensics is about improving the tools we have for use to investigate failures. We currently have methods that aren't very efficient in terms of working out the true root cause of failure, so what we're aiming to do is bring in genetic sequencing as a standardised tool for the water industry. In it we're hoping to revolutionise water quality investigations in the same way that DNA evidence revolutionised criminal investigations.

**CT: Fantastic. Kieron, can you just briefly introduce yourself?**

KM: Oh, sorry, I’m Kieron Maher. So I’m from Seven Trent Water, so the partners in project are the centre for Ecology and Hydrology along with Anglian Water, Welsh Water, United Utilities and we've also got Thames, Southern Water and SouthWest Water supporting us as well.

**CT: Fantastic. Alan?**

AB: Hi, everyone. My name is Alan Brown. I'm Head of Water Quality and Assurance for Northumbrian Water, which includes the Essex and Suffolk region. So this project is around water quality as a service treatment to tap and multiple partners involved in this, primarily Siemens and the University of Sheffield but also the water companies such as Anglian, Scottish, South East, Welsh and I think that's about it and ourselves obviously and then all those sort of all the support partners as well, so hopefully we'll get into a bit more detail in a minute.

**CT: Fantastic. George?**

GW: Morning, everybody. I'm George Warren. I'm Anglian Water integrate water management lead, you've already heard about out project but yeah it's all about trynna break down the barriers to integrated water management.

**CT: And David?**

DE: Yeah, good morning. David Elliot. I used to be an Executive Director at Wessex Water for many years, leading on strategy, environment and asset planning, then became the Founder of Indepen environmental services trading platform. So I’ve tried a lot of innovation approaches in my lifetime, I'm now a partner independent advising water companies on strategy.

**CT: Fantastic. And finally, my name is Catherine. I work as part of the delivery team focusing on breakthrough challenge of the transform team, in particular. I’m gonna remind everyone who's listening, please feel free to submit your questions via Q&A for our resilient communities team. We're gonna just have a chat until around 25 past, but then we'll come to your questions, so please get thinking and pop those into the Zoom Q&A function. And then I’m going to ask our panel to kick us off. So thinking about resilience, what are the major challenges you feel are facing the sector right now and what these look like over the coming years. Any volunteers to kick us off? Kieron?**

KM: Yeah, I’m happy to go, I think, for me probably the biggest challenge is gonna be climate change. And there's two main elements, one is flooding, flooding of customers homes services but also spills that intense rainstorms create. And then on the completely opposite side to that it's maintaining the supply and demand balance in the face of climate change, so both in the long term with the change in rainfall patterns, the need to leave more water in the rivers to protect the ecology. But also in very short term, where we were seeing very hot and dry weather demand increases and one of the challenges we are going to face is how do we keep up with that short term, large increase in demand, certainly larger up terms and we've seen in the historic events like in 1976 and the big drought there. S the demands on the pressure of treatments, but also the distribution network is so much higher.

**CT: George, I'm sure you’re gonna completely disagree with that?**

GW: Kieron, thank you. I 100% agree that climate change is gonna to be one of the biggest issues and certainly were it's link to CSO spills and the likes. I was actually going to pick up on maybe the current thinking around neutrality and results of water neutrality issues that certain regions are facing right now. I think for those that are unfamiliar with neutrality its about ensuring there's no net increase in nutrient loading in a particular catchment, which obviously growth and new residential buildings brings. And looking at the opportunities that the water sector holds in order to offer opportunities to produce those nutrient loadings. Particularly looking at where effluent can potentially be utilised as water sources and potentially as nutrient phosphorus for agriculture. And then on the water neutrality side, which certainly dam in certain parts of the country that nutrient neutrality’s led to water neutrality and the likes, and this is becoming more and more likely in certain parts of the country, certainly we're seeing were a thoroughly water stress region, construction licenses are being reduced. And we agree that these construction licenses should be reduced to sustainable levels and we need to think differently, but we're probably more risk on the basis that we have some time constraint preferences so the Environment Agency are proposing, rightly so on those reductions which means any new growth has to deliver water neutrality. We think that in our project looking at enable our communities help reduce their water consumption for a new development and look at alternative water they can really start driving down water use actively. So I was gonna pick out nutrient and water neutrality and I hope I haven’t stolen everyone else’s thunder!.

AB: Do you want me to go next, Catherine?

**C: Yeah, sure.**

AB: I suppose I completely endorsed everything that Kieron and George have said. I think I was just going to answer the question posed in the context of our submission on this one. It's looking at water quality and the challenge we have around that, you know, clearly we've got this kind of balance to achieve around the cost of improvement, kind of keeping customer bills down. But also kind of meeting an increasing customer expectation, I suppose regulator expectation, you know, fewer deviations in quality, fewer events that occur. I suppose this is kind of the fundamental basis behind what we put forward here, which is around, you know, suppose respecting all those issues that the other guys have discussed which has kind of increased the challenge to us. But I suppose, our view is from a treatment point of view we've got huge amounts of monitoring but then the water disappears down the network of tens of thousands of kilometres of pipe and actually other than flowing pressure, historically, the water sector hasn't had a lot of intelligence, or data sort of emanating from that. So it's how do we actually step into that space and actually understand the dynamics of the water as it travels from source to tap in a way that we can kind of be less reactive, be more almost predictive and intervening or anticipate at an earlier stage. And it's kind of minimising the defects, if you look at it from that, you know, from a system point of view to help us be more sort of sufficient from an operational point of view, you know, in terms of our capital interventions. But also making sure that the information that we're providing to customers kind of meets their expectation and the kind of the Apple and the Amazon markets, how does the water sector kind of step into that space and make sure it's kind of on the front foot all the time. So I think I’ll stop at that point.

DE: I’ll pick up now. So I can't disagree with any of the former comments, I think actually climate change is probably one of the biggest challenges we've got. But, but just actually in many ways, I think the biggest challenge for the sector is how it evolves to these issues, so if we think about why the water sector was privatized 30 years ago was to bring in financing to meet European directors and build capacity. So it was a very asset centric mindset at privatisation, where the future, to some degree, was relatively certain, because the European Directors were known and predicted or at least sign posted so many of the solutions were fairly obvious in terms of asset creation. I think the big change now is the future is very different from that past, the future and much more about how do we adapt to future uncertainties, and how do we mitigate against them in any way. So it's much more about adaptation and mitigation against massive uncertainties. And in a world where we are allegedly…I think it's fairly certain that we're ready they're consuming generally, the planet B suggests we're in the UK consuming two planets per year, at a rate of two planets per year, I can't see a world of adaptation or the mitigation where we don't start to address societal behaviours in the way our systems are managed. And I think the biggest challenge and question for me is how suited is the current business model to that future challenge and how do we operationalise innovation much more rapidly to get there, ‘cause time is not on our side.

**CT: So what I’ve heard from you all is climate change in a particular changes participation patterns are really kind of some of the key challenges facing our sector and there's a wide range of different ways that you're all responding to these. Thinking about, for example, participation patterns and how that affects water quality in a bit more detail, I’d love just to hear a bit more about kind of how the roles that you feel that water company, developers, regulates, innovators have in responding to the challenges. And perhaps I’m going to ask each of you to kick that off with, how your project is responding to the challenges that you set out? And I think I’m going to put you on the spot, George, what's one of these new water smart communities going to look like and how is that gonna mean that we can better respond to climate change and the changes in weather patterns we're having here in England and Wales?**

GW: You won’t be surprised to hear, Catherine, that's the same question we've been asking ourselves in the project, what on earth does a water smart community look like. So enabling our water smart communities project in fact focuses in on these three aspects. Key things are, rethinking value, rethinking assets and rethinking roles. And the key to this is going to be gaining in a greater understanding of what people value and that will enable us to change our behaviours an identify those benefits and the value that delivered. You know, we're seeing housing developments going on constantly and that is a sort of, as Kieron mentioned, climate change, increase in precipitation and increase in public awareness, as a result of climate change is only gonna heighten the amount of water that's going to, or flow at least, of water going into the systems and needing to potentially CSO increase in flood risk. And what we want to see is that water communities actually start to manage that water, slow the flow but also look at that as a potential resource. You know we are talking about this increase in rainfall and saying, you know, look at it from a flood risk and a detrimental impact it might have but actually can provide a great resource, you know, actually David's project really looks at how we can capture that and get people on the ground to be part of that solution. I think, you know, one of the key things is trying to get this across both, so you're looking at both the private industry and also the professional industry trying to get us all to agree that actually we need to think about this slightly differently, rethink our roles and responsibilities, addressing certain emissions, and inhibitions and changes it from a legal regulatory and policy perspective. But then you've got the customer who ultimately are going to be the ones that drive that demand from the housing developments to do more, and how do we, how do we get customers to actually want this. Now, certainly when you take customers around some of these developments that have integrated water management and that are considered water smart communities that space is very much ‘I want one of those’, like, ‘I want to live in a place like this, why can't we have elements of this within our house’. But it's getting that out there, the message out to get people to see it a bit more, seeing it as the regular housing in that respect. And allowing builders and developers to actually not be scared of it, understand what the parameters are, what the costs involved, what the risks are. And try to remove some of those barriers, you know, understand getting a regulator for those non plus water supplies, ensuring that water companies are happy to adopt and own and operate those assets. That's going to be the key here, so I feel like I'm harping on here but ostensibly we need the professional industry to work through how we can actually, all agree where our benefits, where our values lie to ensure we can deliver this and maybe so changes to regulation but ultimately we also need the customers to drive that demand.

**CT: So, David, how are we gonna make customers want these?**

DE: Yeah, thank you, thank you for the introduction, George, and I think we’re the sort of other part of that that equation in many ways. I think increasingly we're trying to encourage customers to think of rain water as a precious resource and actually in many ways, on a daily basis instead, every time it rains we throw it away from our properties, and this is a very societal challenge I think in terms of behaviours and the ambition to help protect the environment and your local communities from the consequences of that. Somewhat, irrespective of the water company, this is about people's relationship with rainwater and how important that relationship is. So if you think about the CSO debate as an example, that's been something that’s been building for a decade or more, started with some very discreet communities like Surfers Against Sewage and some of the rivers trusts. But over time that role of activism in engaging communities and bringing communities to a belief that CSOs should no longer exist, has been a very powerful community incentive and driver. And what we're trying to do is best mechanisms or using that power of activism and community engagement to grow communities around the concept of looking after the rain water on their land. And what we're trying to do is find out, we're trying to design this from the eyes of the customer, so how would they get involved, how could they get involved and why would it be a benefit for them, rather than from a water company or otherwise. So we have to reduce those points of friction from customers to get involved. And then the second part about it is how do we ensure that storage is maintained over the year so that when the rainfall hits we put the design storage we need, which is the sort of enduring part once we've got them on board and that's really what we're trying to test.

**CT: Fantastic, thank you very much, David. I’m now going to go over to our to our “tap and tap water into people’s homes” pair. So again, Kieron, I’m gonna ask you to just kick us off. How is your project going to help respond to the issues we've talked about earlier and how is it looking at that tap water play a role in that?**

KM: Okay, so I think in two ways. I think the climate change you're going to be asked to start to find new sources of water that may be more difficult to treat and more challenging. Whether that's water recovered from some mine drainage or even water reuse so it's understanding this project will help us understand if those treatment process we're putting in place are effective. In the shorter term the project we've done is designed to enable us to find the root cause of failures, so particularly coliform failures much faster than we currently can do. So when you're hitting peak demand the last thing you can afford to do is have service reservoirs or contact tanks out of service while you're trying to carry out remedial work that may not be required to cure ingress, it may actually not be the source of the problem. So by speeding up that process will enable us to keep more of our water treatment assets in service, so we can hit that peak demand when customers need the water.

**CT: Alan?**

AB: Okay, so I suppose two parts to the question. I think Tony mentioned in his introduction around collaboration and I think, you know, it's an often-used word but I suppose, what does it, how does it apply in this circumstance. You know, we're looking at kind of quite a significant deployment of sensors across a system, or network, over in the Teeside area. I think it'd be really easy to kind of look at this and say let's just look, you know, the goal is improving water quality, but actually you know do we just look solely at water quality, or do we look at the inter- dependencies and some of the influences on that. So I think in terms of this kind of the approach we've looked much more broadly at what can influence water quality, so this is kind of why we brought in sort of leakage information, artificial intelligence around that, the pressure transients as well as your traditional water quality sensors. So what you've got is a sort of a more integrated analytics package going around which the data we can derive sort of intelligence, I suppose, and potential decision making on that. So I suppose it's that diversity of view of how do you kind of go wider on this on the supply chain with academia, etc, to understand actually what value can drive. ‘Cause I think in the first instance, we always said this wasn't a goer or unless you could define a value framework, and we could, I think we've identified about four or five really key elements that we think we can kind of drive that value through. I think the other aspect is keep coming back to this customer and, you know, I suppose we've done research in the past that says, you know customers largely are apathetic to water quality, you know, safe water’s implicit, if you like, and it only when they get to the end of the tether that the kind of contact as but very much of the view that kind of as we move forward within the sector we've got to stop kind of using the customer as a barometer of our performance, you know, around discoloration, taste and odour and various other water quality influences and, actually, how can we get the customer to understand the value of water more, engage a little bit more with the information that we're hoping to derive from this work. So I think what we're also doing is putting some behavioural science within our proposal, so we understand actually how do customers want to interact with real time data, would it caused them greater anxiety, would it give them greater confidence, you know. It's kind of understanding where that balance sits so we can really kind of drive that aspect with a customer forward as well.

GW: It's a really interesting point, Alan, actually, in terms of bringing that value to customers that the value that water, not necessarily in terms of finance but actually understand that droplet comes out of their tap is very much linked to that in the street that they’ve just walk the dogs pass it was very much linked to the water body that they might go swimming in, and the beach. I think, Alan, your point about collaboration, that really comes to the fore in this first project and these projects that you've all been speaking about it's really key to getting that diversity of thought and attitudes towards it. And like you said, bringing in academia certainly I appreciate, sorry to harp on about our project, in particular, but bringing in a whole host of different elements so when people tend to talk about development they think about private development, large home builder but actually local authority building is very different looking more at the operational expenditure aspect, the long term costs. And then the communities you’ve got huge amounts of communities involved in building their own properties and there it's a very different models, you know, it's looking at more the value and the quality of goods that are being delivered. And it's just a very different attitude towards development and therefore different attitudes towards, you know, what they're happy to pay in terms of costs. But, yeah, you're certainly seeing that there's a variety of degrees of people's attitudes towards that value of water and it's trying to get everyone to understand actually it's not about what that water bill come through it's actually more than just the water bill.

**CT: We have not question from our audience, if you're watching please feel free to ask any questions. I’m now going to put our panellists on the spot with an unprepared question around, so we're going 25 years into the future, so kind of around 2050, all of your projects have been delivered completely successfully and you've achieved as much as you possibly could hope that you wanted to achieve, along with we've also got a few other projects from our round one as well. So water neutrality at NAV sites 3,000 homes, you're looking at ways to be more water neutral on the south coast and we've also got fair water which is another project looking at kind of how the water and heating mix comes to the fore. Tell me what the future’s gonna be like for a customer in a home and just focusing on the project. I'm going to start with our team, so Alan, what's the customer’s life going to look like in 2050 with your projects successfully delivered?**

AB: I think the confidence in tap water will be at its highest level, and you know, whilst bottled water is still a complimentary option there, you know, I think customers will see that environmentally, it is beneficial to drink from the tap and will do so knowing what we deliver day in, day out, is under really good control and that trust in the product exists.

**CT: Kieron?**

KM: I think, focusing in on that particular product I think it's a confidence that we again the water quality is there, is assured and that we're in full control of our assets and using them as efficiently as possible. So, hopefully, in the future, even despite climate change, less water restrictions, less issues with low pressure when we're having hot weather demand and things like that.

**CT: David? I'm a customer, what have I got to store my rain water?**

DE: Well, I think what I’d like in the future, I think what we need is a water system which everyone values, from customers to farmers, everyone who uses water in the system values it, both in terms of the amount of it available to us and the quality of it, in terms of making sure that it’s regenerative and sustainable in use so that we're protecting future generations as well. And that involves a world where we're all working together on common outcomes around protecting the water environment for current and future generations.

GW: And I'm gonna suggest that people are not going to be flushing their toilets with drinking water, I think we'll get to a point where it’s the right quality for the right use and we're not necessarily seeing that all water coming out of people's sinks and showers is waste actually, it's a resource still. And that the public realm is part of that treatment so utilising nature based solutions as part of that solution as well.

**CT: Thank you very much, we received a great question from the audience which we can pick up in the next group. But thank you very, very much to our panellists and best of luck in delivering your projects and hopefully we can see that future come to reality. I’m now going to pass over to Arlene who's going to take us into a panel looking at unlocking our data. So Arlene and the videos for that as well. Thank you so much everybody.**

KM: Thank you.

**AG: Hi everyone. We are now moving on to the next session, which is on unlocking our data. Elettra, if we can roll the videos, please.**

*Most people know that turning on the taps activates a complex process for water flows through a network of pipes and into our homes and businesses. Most people don't know, whoever is the critical role that data plays enabling this from identifying customers who might need support to identify new source of leaks data is truly the lifeblood which allows water companies to provide benefit to customers society and our environment. In 2020 stream, a group of 11 water companies came together to ask two questions one, how do we enable our data and insight to flow justice seamlessly as our water does and to how many we transparently share that data with the world to enable cross sector innovators to build upon it to drive further public benefit. From now until 2024 Stream will design and deliver the network of data pipes necessary to securely publish open data at scale, bringing together organisations and their data to drive innovation project will bring together nine water companies with the latest sub seasonal forecasting systems developed by the metal face to explore the relationship between weather patterns and impact on water and wastewater systems traditional demand forecasting using 10 day weather forecast give short notice of any potential increases in demand levels. This impinges on what the company's ability to react in a timely way to prevent customer impact, using the metaphor system that predicts the current of large high and low pressure systems. A tool can be developed to communicate the risk of that impact occurring against climatic average the risk assessment received on the 18th of January 2021 clearly identified increased risk of high demand in early February, giving ample time to prepare and mitigate against customer impact. The project will also explore wastewater applications and develop models that increase predictability and improve operational management in priority areas such as surface water flooding priority services registers provide customers and vulnerable circumstances with free support from their utility suppliers. Currently, each supply a horse and maintains individual PSI registers, which require customers to register and update multiple times with many versions of the truth. So, support for all will see the worlds of water power data collaborate and to design build and demonstrate a working cross sector psl platform capable of security sharing this sensitive data. This project will make a huge difference to communities, we serve as utility providers and hours to proactively help those customers when they need it most will take away the effort needed from customers and vulnerable circumstances to receive the support that we can offer and have a really positive impact in terms of customer service. Terms walters leading a bit with seven trends and the national digital twin program to unlock digital twins for the water industry. Digital twins are becoming prevalent in all industries and global digital twin market size was valued at 8 billion in 2021 and is projected to reach 180 billion by 2030 water companies are already using digital twins to unlock new data driven innovations which improve our services and how we manage our network in order to increase reliability and reduce costs across the business for customers by using the information management framework and the Gemini principles developed by the Centre for digital bill Britain we can create an interoperable standard and make great headway towards a national digital twin. This project will create a set of standards on a thin slice for asset base to demonstrate the value of interoperable twins about the industry a collection of recipes for converting data to this format and a set of scripts to push the standard into commonly used systems.*

**AG: That's great, okay. So I’m just going to ask our panellists if you can switch on your cameras and unmute yourselves, thank you very much. Okay, so we're going to be talking about projects which fit within the category of unlocking our data. I will just remind everyone if you want to submit some questions you can do so through the Q&A function, and we will approach them at the end. If the panellists could just introduce themselves and I’m going to start off with Simon, if you could introduce yourself but also introduce your project, because there was no video for that one so it'd be good if you could just give a quick summary of that. If you can just unmute, Simon.**

SD: Sorry it's on the actual headphones, not the screen. Simon Deacon, Catchment and Environment Manager at Portsmouth Water. Our project is looking at nitrates in chalk and unlocking the nitrate time bomb. So groundwater from chalk aquifer is the main source of drinking water in the southeast of England, which is served by many companies, including Portsmouth Water and Southern Water. It all support streams and which are the most chalk streams, which are the most water-stressed, densely populated region of the country. Nitrate pollution by our culture has been a long threat to drink water and concentrations continue to increase, creating a nitrate time bomb. This nitrate is also a problem for wetlands, lakes, estuaries and encourages algae growth blanketing vegetation and destroying precious habitats. So to manage this drinking water, water companies can reduce the input through working with farmers and reducing practices on farms to reduce nitrate pressures. However treatment is very expensive and energy-intensive. So we need to avoid those treatment process by working with the farmers, and we need something like the nitrate time bomb modelling to actually target the areas where we can achieve better results. So what we're going to do is try and develop a nitrate leaching and recharge tool, called 4Rnitrate this is going to help us develop more targeted action within the catchments to reduce nitrates.

**AG: Thanks very much, Simon. Been, over to you if you could also give a quick introduction to your project and yourself.**

BH: Thank you. Morning all. Ben Hodge. Head of Analytics at Sagacity representing the Water For All bid today. So what is Water for All, even before the cost of living crisis that customers are now facing, financial vulnerability was a very real challenge for millions of customers in the industry. So Water for All is aiming to proactively identify and engage with customers that are in financial vulnerability to offer them support and access to social tariffs and assistance programs provided by water companies and their partners. Water for All will use a variety of data sources, advanced machine learning, statistical modelling techniques to identify these customers and create a classification for benefits assistance programs. Then working with customers will define multiple engagement journeys that match those classifications to better engage the financially vulnerable customers. Then, using behavioural science, we aim to test those engagement methods so that we can better reach those that need it most to maximize the support that we're looking to give.

**AG: Thanks very much, Ben. Andrew?**

AM: Andrew Meyers. I’m the lead Architect at Northumbrian Water and I’m here to talk about Stream, which is about unlocking innovation through open data. So open data is recognised as a great way for companies to increase trust and deliver more effective services and our project brings together 11 water companies and four partners with great experience in this area to unlock value from our water data, benefit customers, society and the environment, so this funding is going to really help us to accelerate that and amplify those benefits.

**AG: Okay, thank you. Ian, if you could just introduce yourself, please?**

IS: Good morning. Ian Savage. Strategic Control Manager for Thame's Water in London. Our project is the use of sub-seasonal forecasting to aid operational decision making. As was mentioned in the video, we're looking at using weather forecasting techniques which are innovative to the water industry and other industries as well, so we're looking at forecasts of up to six weeks ahead, rather than the conventional 10 to 14 days. The risk assessment process was developed as part of a EU project, facilitated by academia at University of East Anglia and with the experts from the Met Office and industrialist from the water, energy and offshore industries. We looked at a 42 months project looking into how sub-seasonal forecasts could be used in industry. The developed risk assessment looked nothing like what we thought it would at the beginning, so we ended up, you know, we thought we were going to get an extension of conventional weather forecasting when actually what we got was something totally different, which was basically the risk of high or low pressure systems occurring in the next six weeks. The Met Office, using hi class techniques, were able to identify that only a few weather patterns are the major impact on water demand. So if we could evaluate the risk of those happening then we can evaluate the risk of increase in demand, which enables the water companies to timely manage production plans and maintenance plans and manage storage levels in the right places to mitigate against customer impact.

**AG: Thank you for that, Ian, and we'll pick up in a bit more detail later. Helen, if I can move on to you know if you could just introduce yourself, please?**

HP: Hi everyone. Yes, so I’m Helen Patterson. I’m Customer Manager at Northumbrian Water, which also includes Essex and Suffolk Water. And as you saw from the video we're here to talk about Support for All, which is essentially the creation of a regional cross sector hub, which will be capable of securely sharing the sensitive data of customers who are registered on priority services register, the idea that we can increase the number of customers for supported and also providing a one stop shop and one version of the truth, compared to the various versions that are out there right now.

**AG: Lovely, thank you very much. And Unlocking Digital Twins, is that is that you, Ed, or is that you, Ian?**

EP: That’s me, thanks Ali. I'm Edward Parry. I’m currently leading Digital Ywin work at Thames Water and as we said in the video we're trying to make sure that the Digital Twins are sustainable and available to water companies and work with each other.

**AG: Great well. Thank you, it's great to have you all here. So I’ve just got a few questions I wanted to ask. So you know there's projects like Stream and Unlocking Digital Twin, they focus on creating, you know, the infrastructure needed to capture and share data across the sector and I don't think that's been done in the past, so I mean it's really ambitious. What challenges are you envisaging and what's your approach to overcoming these? Maybe, if I can start that with Andrew from Stream, it that's all right?**

AM: Thank you. So, first of all, I agree it's very ambitious what we're trying to do here, you know if it was easy it would have been done before now. But I think one of the strengths that we've got is we've got a really good consortium, we brought together 11 water companies together and four partners with some great experience in this area, I think that's set us up with really, really good foundation for this. We've got a really enthusiastic core team, we've been working together on this for two years now to get to the point where we're ready to put this bid forward and we're ready to really put the funding to use. You know, it's not usual that you have Friday afternoon meetings that you're looking forward to, but it's actually such a great group with such great enthusiasm, you know, we've got that kind of positivity and optimism of what we can do here. But then the first phase, you know, now we've got this funding we can really start focusing on the research that we need to do so, looking at what's been done already in other sectors, what we can learn from the platforms that work well in this space, what are they have in common, are there any things we can use from those. And also, what can we learn from adjacent sectors, so you know, trying to make sure that we take all the learning that's out there. And you know some of that were brought in with the partners that we’ve chosen to use, such as Sia Partners, the Open Data Institute, we've got those people on board we've been actively working with them so they can introduce us to a lot of people and help us to hopefully achieve the ambitions and avoid some of the pitfalls in other projects that haven’t gone well and learn from ones that have.

**AG: That’s great, thank you for that. I’m wondering, Ed, if you could chip in there, obviously, as you know, Unlocking Digital Trends is absolutely front and centre in this area, so what are your thoughts on the challenges and how you go about overcoming those?**

EP: Yes, there are two main elements to the infrastructure, we've got the architecture and the data and the architecture is something that’s been worked on quite a lot, not just in our industry, but across all of the British companies. And that's being driven by the centre for digital and the national digital twin program, they’ve developed these two bits of work called the information management framework and the Gemini principles. And that's already been used to demonstrate that by collecting Digital Twins you can, for example, increase resilience to climate change and things like that, and so we're building on the work that they've done for our industry. But then on the data side the focus for us is actually understanding what our assets and how do we represent them and data. I can just say very snidely that asked question, “What is the pipe?”, and everyone here will probably have a slightly different answer to what is the pipe and we need to somehow create a way where every company when the system ask the question, “What is a pipe?” It gives a common response with the right fields but it's also not overbearing every company to go and convert all their data to this new format and so for that we’ll be working with British Water and the water data task force and the classification hierarchy’s task force as well as the other partners from Severn Trent and Anglian and another company’s who are already working in this area to try to create this this system. The other thing is the innovation fund has made it even harder for us, we don't just have all the historic assets, but every project is coming up with these new innovative ideas that need to be represented in the system, somehow, and so we need to have that future proof capability.

**AG: Yeah and so I mean what we’ve picked up there from what you were saying, Andrew, and also Ed, is around the teaming the partnerships, the involvement of broader organisations. I mean, how are you involving other organisations that you perhaps might not normally be working with, what's your approach been to that?**

AM: So, within Stream we looked at the areas where we felt we didn't have the experience within the water sector and within the people that we brought on board. So, for example, we knew that we needed experience from people who have been there and done this, that have actually done successful open data projects. One of our core partners that's been in since the start is Sia Partners who've done this in other sectors, including areas such as the Royal Navy and they've seen the benefits from opening this data up and they had frameworks that we could build on, so we weren't starting from scratch. But we've then also looked at which other gaps do we have there, you know, so we've worked with the open data institute who brought some fantastic knowledge and who are real enthusiasts for the benefits you can get from this, but also how to do it in the right way, you know, they’ve absolutely been there and done it and have some great best practice we can follow. Then we've brought in other partners with specific expertise, such as Cost In, who were helping us on some of the legal frameworks that we needed to put in place around having this sort of large consulting with so many companies. And we've got AME who are on board to help us with some of the more technical aspects who’ve got quite a lot of data, science and analytics expertise so they're helping us from that perspective, so we're really bolstering the kind of skills that are within the water industry with these third parties who can really add a lot to the bid. And I think that was very clear when we put the budget together, you could see that was calling out time and again the experience that we'd brought from departments.

**AG: So cross-learning from those other sectors is really important, as well. So we've also got projects which look at developing, so we've talked there around building the infrastructure, the partnerships, the architecture and data. We've also got projects which look at developing and use new or different sources of data, so perhaps pulling on more of the data that you wouldn’t normally use in the water sector. In the long term, what impacts can we expect to see from projects like Defusing the Nitrate Time Bomb and Sub-seasonal Forecasting, particularly for customers and the environment, and maybe if we start that off with you, Simon?**

SD: So using existing groundwater models, our project consultant will develop software tools, in particular developing a new 4Rnitrate tool that will allow water companies, the Environment Agency and nature conservation organisations to predict nitrate concentrations much better across the chalk and to test out different options to reduce inputs for farming. The last panel, we talked about the nitrate neutrality issues that we've got, these models will help us and help local authorities as well actually better target this, particularly with the important [unclear 00:1:1017] sites that we have on the south coast, where we can actually target a lot of this work a lot better and reduce the impacts that we do have from that kind of pollution.

**AG: Thank you. Ian, I wonder if you can, you know, this is right up the street of Sub-Seasonal Forecasting, isn't it so?**

IS: Yeah, from a customer point of view it's all about security of supply, making sure the customers’ supply are not impacted by weather events, so the further ahead we know about the events, the more time we've got to prepare, set production levels at the right levels, get the water in the right places in storage, adjust maintenance plans to make sure that we're not taking things out of service at times of high demand. And from the water company's point of view, you know, if we know further ahead changes in demand then we can optimise production so that we're not carrying more headroom than we need to at times of low demand and that we’re cutting headroom at the right times. Similarly, maintenance, if we know ahead we're going to avoid mobilisation and cancellation costs of maintenance projects if we can cancel in good time.

**AG: Fantastic, that's great. Maybe then if we go on to some of the other projects that we've got so you know Water for All, Support for All, you know, projects that are really very much focused on the customer. So what benefits for customers be from your projects and what differences can they expect to see from when your projects are implemented? I’ll start that with you, Helen, sorry.**

HP: Oh no problem yeah, so I guess similar to Andrew, for us the journey’s been around collaboration to make sure that the end result is correct for customers. So when we look at previous worked on around service sharing there's been some great achievements already between energy and water, which is gonna essentially act as a stepping stone for this project, so it's all around learning from those in order to create the right experience for that customer. The ultimate benefit that we've seen smaller projects, which through challenges have not been scaled, still show huge benefits in that there is a clear disengagement between customers registering for priority services between theor various suppliers. But where the data sharing has took place in small scale trials, you know, we've seen uplifts of over 60% of customers gaining that support through zero effort by themselves with the companies sharing data with each other, between energy and water. So we expect similar benefits through this project, which will hopefully act as a blueprint for a national priority service register. And the added benefit as well, of course, behind this is fact that we as energy and water companies all hold varying pieces of data with related to their needs and their priority services details, all of which simply can't be up to date, simply can't be true, because you know they don't align. So the sharing of the data will line up for customers again without the effort needing to be made by themselves and they’ll only need to tell us once.

**AG: That's great. What about you, Ben, what's your views?**

BH: Yeah, so just coming back to your first question on the challenges there and it was good to hear everybody talking about the technology and the architecture. That really is one of the easier elements, I guess the hardest thing to overcome is getting that governance right, using those frameworks so it's good to see the enthusiasm there ‘cause it is important to take everybody on the journey to overcome the governance barriers. And then in terms of data about customers, I guess, for Water for All, and the water industry, it’s property and individual so when we're looking at eligibility in the eligibility for funds we need to understand what is the type of property that people are living in and how can we help them and then who is living there, and what are their personal circumstances. So bringing in data from land registry, statics, epc data, to really build up that view of both the property and the individual so that we can then tailor and identify the needs of the individuals who reside at property and then develop the appropriate journey for that individual to support them with social tariffs or to increase their benefits or to offer them an improvement to that property which will in turn reduce their consumption, which in turn reduces their bills. So bringing those two things together, that's never been done, all of that data is in many different formats so again, the big challenge there is the governance to get people working to the same classification system or points that Ed touched on.

**AG: Okay, great, thank you very much, Ben, that's really interesting. Andrew, I know this is slightly off piste here but I’d like to ask you the same question. For Stream, which is very much a sector wide, you know, building a shared data platform, the visibility of the benefits for customers might not be so obvious to them and so it'd be great if you could just explain where you see the benefits to customers coming or emerging in the future?**

AM: I think there's probably two aspects that will be quite visible to customers, one of which is the increased transparency, I think it's something that customers are absolutely crying out for to understand how water companies are performing, how are we spending their money, because you know it’s customers’ bills that are paying for these things that we're doing and enables us to have a much better dialogue with customers over how we're performing and where they want to see that investment so looking at what we do with willingness to pay but getting that in a much more and kind of open and honest dialogue with our customers through more transparency because more data will be in the public domain. The other side of that is around the efficiency with which we can tackle some of those challenges by pooling data together. A lot of the really key things that customers want to see us act on don't happen that frequently although, you know, often these are much more than we'd like, but things like asset failures, discharges of waste water, the environment, each individual company doesn't have that many failures but once you start to pull your data together you've got much better chance of understanding the factors that can influence those, understand the steps you can take to mitigate and potentially understand some of them to prevent some of these issues happening before they’ve started. So we think there's, you know, there's the transparency aspect, which I think is very important for customers and certainly there's a lot of very engaged customers who are really keen for that. But the other one is just the efficiency with which we can address those challenges by looking at water company sector data together rather than each individual customer, each individual company just looking at their own.

**AG: That's great, and thank you for that. It is something that I’m looking forward to seeing how that pans out in future. Ed, if I can also bring you in also in that question around for the Digital Twin project how might customers see the benefits?**

EP: There's a few different ways I think where you'll see the benefits, the first one would be potentially having other companies having access to data. So something like waves, there's no reason why, when a sewer collapses from our assets, we can't recognize that in the twin and, and the something like waves Google Maps to pick up saying there's a problem here we're going to divert people around this to avoid long delays. But then the bit the customer wouldn't necessarily see directly, but will really impact how we make wise use of our customers’ money and increase the reliability of our service, if people start developing models based on this Digital Twin and there's no reason it can't be easily packaged up and available for other water companies. If Anglian Water develops an amazing model for detecting leakage there's no reason if everybody is working to the same standard if the data is up to the same quality, another company can't take that model and start making use of it, you’ve always got a whole bunch of IP issues but that's where something like the innovation fund comes in and we can build models collaboratively as an industry and we can create that ecosystem that will work around it for the benefit of customers.

**AG: Great, thank you very much, Ed. Ben, I’m interested in your view on everything, you know, we've got representatives from the water companies here, what's your perspective as a supplier and everything, how's it working out for you?**

BH: From the journey perspective of the application and the progress?

**AG: With the opportunity that this is bringing, you know, the opportunity for these projects and some great working what's your perspective as a supplier.**

BH: Yeah, I think it's been fantastic. I think one of the cornerstones of the bid was to look at the challenge of trying to solve financial vulnerability and that's often done discreet and it's done in an ad hoc process using manual data. So what this really allowed was every actor in that journey to come together and play to their strengths. So you've got Sagacity and Equifax from a data access, cleansing and modelling perspective and you've got the water companies with their customer journeys and the data that they have already on their customers. And then you've got our partners Ariga, and AgilityEco that are best placed to engage with those customers already have existing relationships with customers and know how to take them through that benefits journey. But it hasn't been done before, joining all of those things together in a holistic way, with a tailored journey that allows that proactive engagement. So when you have an onboarding event, understanding who that customer really is, the property that they reside and what journey they can go down in order to get the help that they need. So yeah it's a fantastic opportunity to join things together that should be joined up.

**AG: That's great. We've actually got a question from attendee. Rosie, has asked a question and I’m going to ask Helen, if you don't mind answering this one. What's been the biggest learning and challenge around applying new technologies and these programs so far? I mean I guess we're just about to set off we've not really, you know, not learning yet, but you know what maybe, if I can just flip that slightly around, what do you see is the biggest challenge around applying new technologies to your project?**

HP: I guess I'll flip that again, Ali, and say that our methodology isn't to disregard anything that's done before, anything that has been done, which is relevant, there is always learnings and outcomes that can be used, either as a ‘not to do’ or ‘to take forward’. And so for us, from the outset it was very much, you know, we have all our partners and stakeholders, anyone who has done some of the fantastic work in this sector, to actually bring them in. And we hosted a sprint in February, we had about 60 participants from 30 different organisations within that, we had UKPN, who were sharing with Thames. We had UU and thee work with Electricity Northwest, all of that gave us a grounding to kind of move and jump and elevate from, so rather than necessarily applying a brand-new technology we’ll take those ideas that have been useful, the work that's been done in the last few years to align the needs of the priority services register as well, bring that all together and join that up. The technology build itself absolutely and so a part of the Sprint was to prioritise backlog of requirements. And that will be unique but of cause there's a lot of other challenges around this, as others have mentioned, you know, it's the governance it's the fact that this is sensitive data. The technology is actually just part of the challenge and our data suggests that the other challenges may even be, you know, if not just as important, but maybe is even more so tricky.

**AG: You're nodding your head there, Andrew, do you want to chip in?**

AM: Yeah, absolutely. I think when we're looking at open data I think there's a lot of people that have been there and done this before so there's a lot of stuff out there that we can learn from. And one of the things we did, so this was our second submission for funding to try and get funding for Stream, our first one was unsuccessful so we went back, and that was one of the areas we really worked on, to say actually, what can we take that's already out there to simplify the bid to mean we can get to value much quicker by looking into exploit what's already there. So we did quite a big wide scan of the market to see what's there that can help us accelerate this, rather than us starting from a blank sheet of paper and trying to build the technology, you know. A lot of people have been there and done it and it's a lot of really good work we can learn from so that means we can focus on the stuff that's important really, focus on getting our data in good shape, focus on making sure we absolutely pick the right use cases that are going to deliver most value and make sure that we focus on getting all the different companies aligned in our thinking and make sure we've got all of the, you know, appropriate agreements in place I think those will be much, much bigger challenges than the technology side.

**AG: And actually, Andrew, you've just given a great segway into the next question, which was from the previous session. Sal Watson had asked the question around what's been your biggest challenge in learning from developing new proposals for the breakthrough challenge and, Andrew, what you've just said there's a lot of learnings that you got from round one. If I can just ask each person to very quickly give a challenge and a learning, you were all successful, that would be really useful for prospective entrants. I’m going to start, I’m going to go around clockwise on my screen, so Simon, for developing your proposals, a challenge and a learning?**

SD: I think a challenge was the actual application form itself it, you know, trying to get as much information concisely as possible. You know, we had so much information and trying to put that across in the application form was the biggest challenge, but yeah you just gotta persevere, let other people review what you're doing, see the wood for the trees and everything else so yeah, that was the biggest challenge. But I think was about the enthusiasm really as well, you know, it's such a fantastic group we got six, seven water companies working with us as well, as well as the Environment Agency in two different regions and trynna get all their points across as well, so yeah make it exciting application and successful bid really.

**AG: Great, thank you, well done. And Ian?**

IS: Yeah, from our point of view it's communicating the successes that we've had with the service so far, obviously there's a certain amount of apathy around weather forecasting in general, and anything new people need to gain confidence in it’s use going forward. I think the fact that nine of the water companies want to take up the service it sort of tells the story, then you know that it's gonna be worthwhile.

**AG: Okay. Helen?**

HP: Thanks Ali, I guess, for us, one of the best learnings was probably not to try and run before we can walk, in a cliched saying, because the ultimate ambition for us will be a national PSR platform. The bid is very specific around a regional success, which allowed us to really hone in on the detail and establish a working mechanism there first. And I guess just to go off of what Ian was saying there, again the learning in a positive way has been just how excited the industry is around innovation, working together, collaboration, and how we're all coming together for the good of our customers to want to make things better. For me it's been quite a humbling experience just to see the level of support from partners and stakeholders who are really striving to make us achieve. quite fantastic.

**AG: Great, thanks, Helen. And we've got one minute left so sorry Ed and Ben, but if you could really very quickly just give us your learnings and challenge, just for the benefit of others?**

BH: Take the opportunity and collaborate. I think the fund gives you that opportunity to innovate, so do something that's difficult and then collaborate, because the ideas of the consortium, the ideas that are out there will help you solve that problem, but be concise because of the word limit.

**AG: Finally, Ed.**

EP: I think Ben summarised most of my stuff but the big learning for me was when it gives you a 100 words, if you can't explain why you're doing something in 100 words it's probably not the right thing to do, so it may seem constrictive to have those word limits, but it really is important to do that.

**AG: Right, thank you. And thank you, I’d like to thank all of the panellists today and wish you all the best for your projects and we’ll be seeing you along the way. We're now going to take a break for five minutes so we'll return here at 10 past 11, where you'll be seeing me again and we'll be discussing projects around managing leakage. Yes, thank you, thanks again panellists.**

**Welcome back everyone, thank you for coming back after the break. We're going to move on now to the next session, which is on managing leakage, those other projects around that theme that were successful in breakthrough two. Elettra, if you don't mind rolling the video for this, please, thank you.**

***Our clean water pipes aging with most companies, replacing less than 1% each year lining existing pipes gives water companies the opportunity to cost effectively meet customer expectations specifically relating to leakage disruption and carbon. However, the UK water markets to for suppliers it's highly regulated water companies are risk averse and innovation payback can be slow innovative solutions are therefore slow to market, and this will not change without intervention. We present design a liner, this is the first of a two phase project that will facilitate one or more new lighting solutions to market. Phase one has secured 200,000 pounds from the catalyst stream and support from seven water companies. It will define what we need from a 21st century lining solution what could feasibly be delivered and how, as a minimum, this will offer a guaranteed 100-year lifespan but will also evaluate the potential for additional features such as embedded fiber self-healing materials biofilms oppression and sensors. This will improve the service and value for our customers and will reduce the carbon impact of pipe rehabilitation water leakage is a serious environmental problem, it must be drastically reduced to protect or to security. There are plenty of ideas to tackling but development of solutions needs to be accelerated. The national leakage research and test Centre will be a five kilometre buried water pipe network, specifically for developing and testing it conventions, without disrupting customer supplies are affecting water quality. It allows things like repair robots and see lot sealants to be inserted into the water supply, to see how they for the Centre staff will issue certifications to show water companies how well each innovation before and then network will include new and old pipes in a variety of materials and diameters just like a live or to network, but it will allow researchers to insert and move deliberately conceptions of pipe. It will collect and recycle leaked water and when even simulate customers drawing water was tested taking place there is also scope for the sense to be used for training and other research. I am Chris from most water and we're delighted to be involved in the background, a good project colleagues from Andrea Water in Portsmouth water and supported by partners and venue systems and the University of Sheffield. This is an important project for the water industry feeds into our roadmap to 2015 we will challenge accepted wisdom regarding the nature of leakage and distribution systems and if we are successful and find the long run and leaks that avoiding detection we pretend to create new sustainable ways of meeting long term aspirations to have leakage at a lower cost to customers. Like box for rising means right, it means our pressurized pipelines that convey flow from pumping stations were savages pumped from a lower level to a higher level for gravity discharge or for treatments their company made of cast or Dr Lyon and range from 100 to 1,000 millimetre diameter during their operational life they deteriorate, this can lead to burst, which can result in major pollutions degeneration can be variable due to internal and external corrosion hydrogen sulphide attack and abrasion. It is currently very difficult to internally inspect these pipes, as they are challenged to access and shut down. These robots will be tested to inspect the internal condition of rising means the robots will help operators identify and fix deteriorating parts before they best which will prevent pollution, so the environment. This project will pave the way for autonomous robotic technology to be used in fully pressurized survives.***

**AG: Thank you very much, those were good videos. We have a smaller panel this time, if I can just invite the panellists to turn on your cameras and unmute, thank you very much. And a reminder to anyone who's listening, if you want to channel any questions to the panellists please do put them in the Q&A function in Zoom. Okay, so perhaps if we do some introductions and again I’m going to go around clockwise on my screen if you could just introduce who you are, what project you represent, and your organisation that would be great I’m going to start with you Clive.**

CS-W: Hello, I’m Clive Surman-Wells. I’m Innovation Partnerships Manager for Northumbrian Water and I’m representing the national leakage research and test centre bid, winner.

**AG: Winner. Katrina?**

KF: Morning. I’m Katrina Flavell from the Innovation team at Yorkshire Water, I keep an eye on our clean water network projects and I represent Designer Liner.

**AG: Thank you. Joby.**

JB: I am Joby Boxal from University of Sheffield. I'm formally here representing my colleague, [Unclear 01:41:31] who's leading the Pipebots for Sewers, but I’m also involved in the national leakage centre with Clive, the leakage one with Chris and early one on water policies service.

**AG: It provides a great opportunity then for double learning then, doesn’t it, or triple learning, rather. Chris?**

CR: Morning all. I’m Chris Rees. Head of Water Engineering at Welsh Water and we're leading on the manager background leakage project.

**AG: Okay, thank you very much. So some great projects there were seeing and very much looking forward to seeing them taking shape over the next few months and years. If I can maybe just start off with one question about leakage in general, and you know we all know, it's one of the industry's top priorities. How much of a challenge is it, and when and what's its impact on customers and the environment and how clear a picture do we actually have of it? Maybe if I can start with you, Chris, on that that'd be great.**

CR: Yeah, certainly. So it's clearly a major priority for the industry and I think it's attracted quite significant investment and innovation over the past 30 years and that's allowed us to reduce leakage to the current level, which has the lowest we've seen but there's still a lot more I think we need to do. The industry has set itself some challenging targets for the future, so ultimately to halve leakage by 2050 and I guess, in the context of customers that will help us to reduce the quantity for water to be taken from the environment, provide that headroom to accommodate future population growth and provide resilience as well against drought in light of climate change. To put that into the context of the project, background leakages is an accumulation of all the small leaks across the network, which traditionally are too small to find and fix using existing methods. But when we add these up they do account for a large proportion of our current estimates of leakage and hence an even larger proportion reduce leakage further so it's kind of vital that we understand the true level, so we can plan appropriately to tackle the issue. So our project aims to sort of redefine the detectable limit of leakage through some forensic investigation, deploying some smart sensors, flow pressure temperature and a high intensity across the network. And coupling that up with sort of digital twin approach to help us really redefine what that background level of leakages is ‘cause then we can plan for appropriate interventions to manage that forward.

**AG: Thanks, Chris. And I’m just interested in the other water companies perspective, I mean you know, obviously leakage is affecting everyone but is there a particular challenge at Yorkshire Water and Northumbria, if I can maybe start with you, Katrina on that?**

KF: Leakage is always a big problem, it's a big problem for our customers and they tell us that a lot. And I think customers often don't realize that the challenge of leakage is not just finding and fixing it but it's the cost of producing that water in the first place and the environmental and financial costs that that has for our customers, they often forget about that. I’m delighted to hear about Chris's project to find more leakage, but we also have to think of better ways to address that leakage for our customers because when we go and repair a pipe, customers actually want to see the water, you know not bubbling up on pavement, they absolutely hate us shutting their roads. So we have a massive challenge, for example in Sheffield where customers and the Council really don't like is shutting roads, so we must find better ways to repair pipes and to do it more efficiently and to save carbon. So it's an enormous problem for us and it's a bit more holistic than just dig a hole and that will solve the problem.

**AG: Right, thank you. Clive, any particular views from Northumbrian Water?**

CS-W: My main observation is, in terms of the challenge, the pipes are buried right, so you can't see precisely where the water is coming from, if it does spring a leak and you can't see the nature of the leak either, so you're not really sure until you get down there what you're looking at in terms of a repair job, so that's one of the challenges. Cost is clearly a problem, cost to everybody, water companies and the customer and potential water quality impact as well. And I guess in terms of a clear picture of leakage, you know, nobody's really sure about how much of it is customer side and how much is network side and how much is background leakage. And it’s interesting that we have this concept of background leakage, like any leakage at all is in some way acceptable, you know so I’m really applaud the Welsh project to look up background leakage and make that a thing of the past.

**AG: Fantastic, right. I’m going to stay with you now, Clive, while you're on the subject. So clearly this is an area, you know, it's a universal challenge for the sector, so this is clearly an area where we need to have more innovation. What does the sector need in order to accelerate innovation in this area, what are some of the challenges that we're finding and finding solutions to manage and mitigate leakage?**

CS-W: I suppose with that question you have to answer another question first, which is what’s slowing us down in the first place. We know there are lots of ideas out there, for robotics, for sealants, for liners and all sorts of things and quite a lot of them are progressing in development. But the thing about them is they're invasive on the network itself, which means you've got to get into the network to test and prove, show it’s safe, show it works and to develop the product and it's that access to live alter networks that causes the problem. Most water companies have a small test rig, perhaps up to 100 meters long, not very diverse, not really representative of a real network. And the poor innovator, and the supply chain tell us this, they'll test their product up to a certain point, and they need to draw on water company resources to do that, and then they've got this massive leap to go to the live network, which is the next thing in the chain. And that is the hindrance really, the thing that is slowing innovation down, so what we've proposed with our project by national leakage research and test centre is to establish this, as you saw on the video, a buried network, which is five kilometres long, it will probably be the biggest test network in the world when it's established, it will take us about two years to build. And that will accelerate innovation in leakage detection and repair in three ways. First of all, it has its own staff of three people, a centre manager, a researcher and a technician to supervise and design tests and it's big enough to allow concurrent test to take place. Secondly, testing can carry on whilst regulation 31 approval is obtained, so this is approval to put something into the water networks to show that it's safe. Well, this isn't a live network, it's about the closest thing you can get to a live network so testing can continue in parallel while that process takes place. And thirdly, even after a product is developed, or a solution is developed, there’s quite often a long lead time before it becomes in common use, because each water company wants to carry out lots of trials. So what the project proposes is to develop some certifications and standards for solutions and their deployability as one of the outputs of the test centre so that water companies have confidence to deploy the solutions without long trial periods. So that's it, that's what we're doing in a nutshell.

**AG: Okay, and you know the previous session that we had was around unlocking data, the introduction of Stream and other ways of sharing data across the sector, so you know, there's an opportunity there, isn't there, around that testing to share the data across the whole sector, I guess?**

CS-W: Absolutely, yeah.

**AG: Okay. So I’m going to move on a little bit now, so if we just talk about what what's the sector doing, in terms of you know, innovating in this space, you know, Clive’s talked about providing a facility in order to allow new innovative solutions to be tested in a safe environment and a representative environment. Katrina, if I might come to you about what's some of the other things that are doing to accelerate innovation, and you know how does your project fit into that?**

KF: Yeah, so I’m really excited by the innovation fund actually because it's allowing innovation that's risky. And so often when we do innovation, you know, in the innovation team at Yorkshire Water, we can take a limited amount of risk, we can collaborate on a relatively small scale, but it's this kind of fund that allows that level of risk and I’m so pleased that some of the feedback this morning from the judges was, “We want to see that risk and we're prepared to support it.” Albeit with a caveat of stage gating and sensible consideration, but that's great. What Design a Liner is one of those risky projects, it’s saying we have a solution that could help to repair your pipes, address your leakage and deliver you and 100-year warranty lifespan on a lining solution. And it's that kind of level of aspiration that we need in kind of repair technologies to drive us on from what we have now, which is a fantastic solutions to repair pipes but we need to take it that step further and take that risk, and I think that that's what we kind of have to do with this fund, and I think that's what's really interesting. And the national leakage research test centre is really going to support this kind of innovation as well and is another example of taking that risk and we hope that it will pay off.

**AG: Thank you. And Joby, I’m just wondering, you know, if you can maybe give you a perspective on what's happening in the sector and around developing innovative solutions for leakage. But also how do you, you know, as a as a university, you know how do we make sure we're bringing in new innovators into the space?**

JB: One of the good aspects of the challenges you commented on earlier, but I guess these days just the sheer size of these networks and the complexity of the networks. It's relatively easy to inspect a building or a bridge, you've got these whole networks and systems and what we actually usually measure and understand of them is there emergent behaviour and performance of them, which usually means it's too late so we are stuck too often in a reactive response to how the system then fail, very good over the years at getting efficient and effective those responsive reactive. But the big challenge is can we get proactive, can we know what that set of assets is condition is, where it's next most likely to fail, so we didn’t see it just before the failure. And that's the big game change, so for me it's, how do we start to get the innovation really pushing and transforming us from reactive to proper proactive maintenance, knowing before the customer and being able to line it, or fix it, whatever is most appropriate. So understanding the ultimate condition assess really understand that infrastructure’s a really key game changer for us. And I think there's an exciting opportunity in that we, as a country, our infrastructure is about the oldest in the world. You’re probably facing these challenges and problems before anyone else. So if we can really practice through the innovation fund there's a chance for us to recover kind of where we work with privatisation, we transform leakage with the Mas, the good and bad, certain profoundly leakage step change in a very short period, I think we have an opportunity to do that again and put ourselves firmly back in that world leading seat. I think your added question how do we engage early innovation in that. I think what we've heard about change and start off with that third stream that's going to let an even higher risk, even earlier stage so we can truly bridge from kind of the underpinnings so I’ll say we have a great history of supporting early stage research Pipebots makes a fantastic example of that. And now that is levering through this, there is a bit of a gap in the middle, and it’d be great to see Ofwat bridge that gap and then making sure we've got that UK continuum all the way through – its going to be really important.

**AG: Thank you, Joby. And Chris, if you want to add to that around, you know how you bring some of those early innovators in and what do we need to do to innovate?**

CR: Yeah, I think certainly in the last 10 years when I’ve been involved in leakage a lot of the innovation’s been focused on the detection side of leaks, think we've done a lot of work there, so it's really pleasing to see both Katrina's project and Clive’s as well, and that we’ll have an environment in which we can test some of these repair technologies in a safe manner, because we are very risk adverse on the network, for the right reasons. So as Clive pointed out to get in terms of like regulatory approval for repair techniques is quite a cumbersome process at the moment. So things like, you know, Katrina’s solution can be tested within the test environment and proved to us as water companies, so we get that confidence to deploy within the network quickly. And I think that's been one of the big obstacles to innovation within the repair side and yeah, look forward to being engaged in both of those projects really and particularly Katrina’s, it's almost an output of the background leakage project, once we fully understand the level of background leakage that could be one of the solutions we then use to help manage it.

**AG: Thanks, Chris. I mean it is something that we've been faced, we've worked with a lot of innovators in this area and solution developers and it's always been around the testing on live networks that's been the blocker, so great. Clive, big project, big issue for the sector, what does the future look like? You know, let's say your projects are all up and running, you've got the leakage route map, what does the future look like if you had the perfect system what's the opportunity here?**

CS-W: Well, I think what we're really looking for as an outcome is a flurry of technologies that much sooner than we would have had them without the test centre. So being able to accelerate them and get them into use should bring down leakage sooner. And also, I think, having such a dedicated test facility should allow innovators to be more daring and take greater risks because there's a fail-safe environment but it's very, very much like the live environment. So you can sometimes find that something work perfectly well on the test streak but it doesn't actually work, or there's an unforeseen problem, when it's deployed on the live network. So we should see much less of that happening and a much more short solutions, with the ultimate game that you know, by the time we get to 2050 leakage is considered unthinkable and completely unacceptable because of the value of water, and you know, hopefully, everybody will take that on and that will just become a general perception.

**AG: Thank you. Katrina, have you got any views on that?**

KF: Yeah, so we're obviously running a two phase project, here's hoping we get to phase two and it's funded. But the ultimate aspiration will be a lining solution that's more cost effective and beneficial for our customers. So at the moment, the UK has about 300,000 kilometres of clean water network, we’re replacing less than 1% of that, and if you do that by conventional open cut methods that's over 600 million pounds a year. So if designer liner, it's likely to be an expensive solution, but if it can ultimately reduce that cost by just 10% that's a massive saving for our customers. And I think the project has other benefits as well, so we're going to look at how can we possibly influence regulation in this area. So we know that suppliers have told us that regulation 31, although it's a great thing for customers, is really hampering development. How can we look for other test approaches to say it's not just regulation 31 you need to meet to put something on network, what can we do about fitness for purpose testing, what can we do about developing our workforce in this area? There's loads of additional benefits as well as fundamentally improving things for customers in the environment.

**AG: Okay, thank you very much, that was a great. I’m just going to move slightly on to, I’m going to ask the same question that I did in the last session because there's so many people on this call who, you know, will be looking at the next round of the competition and, as I said, as winners you've got things to, you know, that experience under your belt to share. Joby and Chris, maybe if I start with you, Joby, if you can just share with us in terms of developing your proposals for the breakthrough challenge, what was some of the challenge and what was a learning that you can share with others on the call?**

JB: Things are different, the last time that was ran. I don't think any of these came because of the call, they were all sort of ideas that have already been talked about, connections that were made. Although you think you've got the idea, you’ve got the core of it, there's a very long road making sure the consortium comes together and you actually can integrate the parts that will then fit the idea to the core and deliver. So I think what Ofwat sets as key challenges and drivers, working out how it really delivers to them. So yeah, I guess it kind of echo some of the comments we had at the start in response to that, thinking through how the project will actually deliver the innovation from just that good idea, make sure you’ve got the right consortium with all the different bits that will see right through to delivery.

**AG: Okay, that's great, thank you. Chris, anything from you that you'd like to ask?**

CR: Yeah, well, This was our second attempt with the project, so I think the learnings from the first round, really good feedback we received after the first submission. I don't think we were specific enough in terms of how the project was going to run and the outputs, but also how those outputs will benefit customers, ultimately. So we went back to the drawing board and revamped our bid to make that a lot more clear because it's a technical area that we were trying to get across. So we needed, as practitioners, sometimes we get a bit blinded by the obvious, so we needed to spell certain things out and that actually helped us get our point across more succinctly.

**AG: Thank you. So we've got no further questions from those in the audience so I would like to thank you all for being here and for contributing a really interesting discussion and really looking forward to seeing your projects develop and get the outcomes that that we're looking for. So thanks again and I’m now going to hand over to Caroline Wordsworth from Isle Utilities who's going to lead on the next session, so thanks to everyone again.**

**CW: Thanks, Arlene, that's great. So welcome everybody to the final winners panel of the event. This session is going to focus on creating value from waste. So we'll start, as we have done before, with the run of the videos so Elettra, if you wouldn’t mind running those, that would be great, thank you.**

***Hi, I’m Pete Vale carbon architect in seven trends and it's my pleasure to introduce the catalyzing a net zero future project. Climate change is the biggest challenge of our time and industry most dramatically reduce greenhouse gas emissions to achieve net zero targets. One of the biggest sources of greenhouse gases from the water industry is nitrous oxide, a greenhouse gas 300 times more potent than CO2. Around two thirds of process emissions from nitrous oxide produced by bacteria that play an important role in removing ammonia from wastewater. Researchers have recently identified naturally occurring bacteria that can remove ammonia without producing nitrous oxide, but these don't ordinarily thrive in treatment plans is truly innovative project will look to capture these bacteria in bio catalysts that can then be deployed in existing treatment processes. The project will take theory into practice by first lab testing the concept and control conditions and, secondly, it will scale up the process by pilot testing it a wastewater treatment plan. This project will see only water work with 10s southern Yorkshire and North every mortar to develop a collaborative strategic planning capability all underpinned by business modelling associates adaptive systems planning software. We can identify potential opportunities to trade by resources across existing assets determine the optimal bind future into company investment or with third parties, looking to enter the market tackling common challenges was maximizing environmental and customer value across the price control. We're excited to bring this project to life, challenging the traditional siloed business planning approach building upon the leading work that we've been doing across a range of buyers last activity over recent years. it's my honour to introduce the hero for screenings project, the water sector has a growing screenings problem. We generate about 100,000 tons of screenings a year and our only viable disposal route is to landfill. The mixture of plastics organics and watering screenings makes resource recovery very challenging and we know we need to do more to meet the government's landfill and carbon targets we've been looking for a site based recovery system that manages screenings and source and avoids thousands of lori movements. And the good news is we found one the home energy recovery unit or hearing for sure. Here it was approved and small-scale pyrolysis system for domestic and commercial waste. It uses heat pipe technology to efficiently recover energy from mixed organic waste, so as all the right ingredients to tackle screenings on site. Our project will demonstrate what a hero can do two screenings so we can understand the technical and environmental challenges of a wide scale rolled out. Yet Laura Evans nothing new mortar I’m here to talk about the supernova protect the security for project will use led to remove them local phosphorus from wastewater super effective is essentially a loser material without the call it on the surface, this is known as a bio composite from your university and Newcastle university will work together to develop the prototype these prototypes will be tested in the laboratory to identify the best type of value to us and also the best type of code and once the buyer composites have been tested and the recipes finalized pilot unit or be designed and installed or treatment works with Northumbria water, they said, we are ready for four months after the form, and this is up the buyer compensate to be collected and the phosphorus will be recovered. You said Al Qaeda we foster some way sport will reduce the amount of chemicals which are required, which is the carbon footprint and also might have a large impact on the circular economy. I’m delighted to introduce you to the CHP exhaust carbon capture and utilization project CHP engines have widely used across our sector. They take buy gas from the digestion of sludge and generate renewable electricity and heat. However, carbon emissions from CHP engines make this a major component of the water industry's carbon footprint fortunately there is a great solution to this. In a world first, we will be undertaking an industrial scale trial of the carbon capture machine process, which is designed to capture CO2 and converted to valuable sustainable material that can be used in multiple sectors without detail sustainability assessment we will respond to our customers, environmental and economic concerns. And by engaging with regulators and end users will confirm, there is a viable business case. So, in summary kericho or develop a blueprint for the commercial use of innovative carbon capture equipment and CHP plans turning the captured carbon into a product with a variety of valuable uses.***

**CW: Fantastic, there were some fantastic videos there. I’d like to start by asking all of the panellists to please turn your cameras on. Lovely. And maybe we can go around and if you could please introduce the project that you're representing again, just very briefly and mention the organisation that you're from. I’d like to start, though with Chris, if you're able to unmute yourself and put your camera on as well, that would be great. I'll just give you a minute to…Chris is obviously not there at the moment, so we'll move on but yes, if the rest of you that are on the screen we'll start with you, Pete, you were clearly there a few times, but if you could just quickly say who you are and who you're representing and give us a summary of the projects that you're representing today, please?**

PV: Sure, thanks, Caroline yes and sorry to subject you all to three od me. Hi, I’m Pete Vale now I’m the Carbon and Circular Economy Architect in in Severn Trent. And yes, representing three projects today, although I should point out, and thank and recognise that the hero project was led by my colleague, Richard Smith, but he's just move roles in the business so yeah I’m standing in for Rich today. So yes, so obviously all three of these projects have a strong carbon circular economy interest, so two very much tackling direct process emissions, huge challenge for us as an industry. One aimed at nitrous oxide because it's such a potent greenhouse gas, has a big impact on our carbon footprint and the other looking to capture carbon dioxide and convert that to a valuable resource. And then the third the heru project is looking to move us away from landfill. We, and I know in common with all the water companies have a desire to move away from landfill, so this is looking to divert screenings from landfill and recover valuable resource from.

**CW: Brilliant, thank you very much, Pete. Moving on to you, Steve, if you could do the same phase.**

SR: Okay. Hi everybody. I’m Steve Richards I’m the resources portfolio leads at Anglian Water, and delivery Planning Team. The projects I’m here to talk about today is the bio resources markets project, so the idea of this is really for us to pull together and develop a decision support tool to help look across WASCs and across systems to identify opportunities for bio resources and developing market potential really and it will, I think tie in quite nicely with a lot of the things Pete was saying there. I think, you know, we all acknowledge there is quite lot of optimisation we can do in the bio resource space and particularly linking at through other results recoveries, circular economy and other elements. So I'm looking forward to a good discussion.

**CW: Thank you very much. Last but not least, Laura?**

LE: Hi there. I'm Laura Evans from Northumbrian Water and I’m Treatment Works Manager here. So our project is the super loofah project, and in terms of the circular economy main reason we want to use the super loofah is because it recovers phosphorus, ao at the moment, there's much tighter phosphorus permits coming in to wastewater treatment plants. And one of the issues is that phosphorus is usually removed using chemicals, which are expensive and obviously carbon heavy. So in terms of recovering that phosphorus as well that generally doesn’t get done on a lot of the smaller treatment plants, so the super loofah will potentially allow that phosphorus to also be recovered and reused, phosphorus is a finite resource so we need to be really capturing that phosphorus. So that's kind of our steer in terms of the super loofah.

**CW: Super, thank you very much, Laura. At this point I’ll just remind the audience that if you do have any questions please don't hesitate to drop them into the Q&A session section on the Zoom screen, so please do be uploading those as we're going through ours. I’m going to start with, Pete, because you do represent quite a number of initiatives within this group. All of those initiatives that you talked about are exploring different issues but it's clearly lit a fire for you within Severn Trent so, can you tell us a little bit about what it is that's exciting you and the teams that work with you most about this kind of circular solution?**

PV: Yes, thanks, Caroline. You're absolutely right, I think we view this as a huge opportunity, you know, this ort potential for transforming how we treat waste water, so you know 400 hundred plus years we've been following, you know, what in truth, are fairly similar processes that use quite a lot of chemical and energy to treat waste water and you know they're linear processes, we don't make full use of the resources that are in there. We do recover a fair bit of energy through anaerobic digestion so we shouldn't forget that. But yeah because we've got this challenge of climate change and, you know, industry absolutely needs to pull together to grasp the nettle and become net-zero. You know, we chose to look at this as an opportunity as well as a challenge and I think if you do start thinking about, you know, the resource that comes down the pipes into our treatment works, that's energy and material and of course, water too. Yeah, it is genuinely hugely exciting about what you can do so, as you rightly point out, it has lit a fire in Severn Trent and we're so pleased to work with, you know there's a huge number of partners involved in those three bids and I, you know I genuinely I think it's going to be a dead exciting few years, with the support of the breakthrough challenge to really move these things on.

**CW: Yeah, know that's really, really good to hear and it's so encouraging to see the range of projects coming through and the level of excitement, actually it's visible in all of the different projects that are taking place, so fantastic to hear. Laura, do you have anything that you would like to add to that around what's most exciting you about these circular solution opportunities?**

LE: I think just the impact that you can actually have to the water industry and then environment in general, some of them obviously have got huge potential to really change the environment and change the world we live in, I suppose. So, in terms of circular economy it's, as Pete says, it's seeing those opportunities and being able to explore those and really have a goal of tackling the big problems, climate change. And yeah just really honing in on them, and in this competition really does give you the opportunity to explore those ideas that maybe wouldn't be explored, or maybe thought of too risky, yeah just generally not have enough backing to take them forward. So that's why this competition is just so good for the water industry as a whole. That's what excites me, it's having those opportunities to do something a little bit different that could potentially have major impacts.

**CW: Brilliant, that’s great, really good to hear. Steve, do you have anything you'd like to add around that?**

SR: I mean I just echo everything that everybody said, really, I think all of the projects Pete and Laura described recognise, Anglian we face those very same challenges, we have very similar ambitions around net-zero, and circular economy and zero waste. I think certainly the personal point of view, the projects excite me and really interested to see how they come about and how we can build on those and implement you know new exciting solutions for the future, yeah great.

**CW: Super. So I guess a leading on from that, we've obviously touched lots of points in that brief discussion around the importance of the circular economy and the potential for impact that it could have. These circular solutions, when we look at them we know that actually to have that really significant impact, we need to be working across multiple sectors. Can you perhaps give us a little bit of insight into how you're doing that within your individual projects that have been successful through this round of funding? Start with you, Steve, and maybe you could elaborate upon if there are any areas or opportunities that you can see, either within or beyond the life of the projects that are really right for cross sector collaboration?**

SR: Okay, so I guess with bio resources market, so I think it's long since recognized going back to Water 2020, there's a big push to try and extract as much value out of the bio resources end-to-end chain as possible. One of the things, reflecting back looking at PR 19, one of the things that was difficult to do was sort of work out what the benefits or disbenefits would be of working across WASCs and equally across other sectors. So, think what we're trying to do with this project, so with Northumbrian, Yorkshire, Thames and Southern using the BMA modelling platform is to try to break that open a little bit and try and explore where those true opportunities are for us to collaborate and work together. Before we were still quite silo’d and our systems are very complex but just talk about handling ourselves, we've got over 1,000 water recycling centres feeding into treatment centres, so any decision we make around partnering or trading has an impact on that whole network and then you can expand that out to the other WASCs that gets even more complex, so this is what we're really trying to push to see within the project. I guess in terms of future growth, obviously we'd like to see this expanded into sort more of a national type approach, where we incorporate the other WASCs but equally in the long term, and this is a difficult subject to some ongoing changes through DEFRA and the Environment Agency at the moment but when we start to hopefully be able to co treat sludges with other waste treatments as well, I think that would then really expand and bring market much more closely aligned to what we're trying to achieve.

**CW: Yeah, that's really interesting, thank you Steve. Pete, is there anything you'd like to add to that?**

PV: So firstly agree with everything Steve mentioned. It's probably worth just reiterating the circular economy only really works when you have, you know, multiple partners involved, and you have an end-market for whatever resource it is that you're recovering. So yeah as we were writing these proposals, these bids, we were really conscious of you know, looking beyond the sort of traditional water sector, so as an example the carbon capture, the CSP exhaust carbon capture project, there were going to be producing precipitated calcium carbonate which is used in the chemical industry for things like paint and agriculture and construction and so as part of the project what we're really keen to do when we're using r Brunel University, one of the project partners will be undertaking, you know, really detailed life cycle analysis, sustainability assessment to really look at, you know, what is the carbon benefit and what is the added value to industry and society of recovering these resources. Heru is a technology that was primarily designed to treat domestic and commercial waste, so black ben type waste. So there we sort of picked upon a really, really clever technology that's been designed for other ways streams and this project’s all about can we use it to treat screenings one of our really difficult waste streams. And then you know if that's successful that the products that produce things like bio charges that have]]s a use, possibly in wastewater treatment to remove pharmaceuticals, for example, or in agriculture. And then catalysing net-zero similarly it's sort of looking to the biotech industry and using some really clever technology to encapsulate bacteria and then bringing that into the water sector.

**CW: Yeah, that's great, and I think that really helps us visualise how, obviously, how broad the topics are that that have been focused on, particularly within this panel discussion. But also how interconnected all of the projects are and how that technology transfer is taking place and that the learnings from one project will feed into another and help that progression continue. Laura, is there anything that you'd like to add to that?**

LE: I think, as you say, the projects are very different but they've got similar sort of themes. And in terms of our partners, we're working with two universities, Newcastle and Northumbria University because it is very much a pilot trial, the initial start is a lab tests. So having them on board is great because they've got all the all the knowledge, all the scientific knowledge understanding of the algae and all the coatings that we're going to use. So in terms of taking that forward we’d envisaged if the pilot trial is successful, there’d be a spin out company from the University, that will be sort of manufacturing the loofas but obviously would need a engineering company on board and. So after the project we would be sort of engaging with all the water companies to have a discussion about potential partners in this in terms of the manufacture of the process units that the loofahs are going to sit inside because they have to go into a actual box, I suppose they need to be contained. So yeah so as Pete sort of touched on it it's important to think about the future and how you're gonna actually make it in the real world and applicable. So yeah, I don't know if there's much more I can add that hasn't already been said.

**CW: No, that was absolutely fantastic, thank you. And just to sort of really build on that thought process, Pete, you specifically talked about the need for if the circular economy is to work we need to have the multiple partners and the end markets and you talked about that precipitated calcium carbonate that is one of the by-products of the processes that you're looking at. A question to all of you really is, can you see these projects leading to even more markets being developed as a direct result of the projects or do you hope that this will result in new market opportunities being created for the by-products that are generated? And I’ll start with you, Pete, because you were the one that raised that?**

PV: Thanks Caroline. I really, really hope so, so what we're intending to do, what we plan to do in our sort of delivery plan is to make sure that we hold sort of stakeholder workshops and we get people actually to our sites and see the technology, but also see the products that we that we're generating. Because, as you say, we've done an initial analysis of where we think things like precipitated calcium carbonate and our project partners Clark Energy and carbon capture machine have quite a bit of expertise already in that area, but I bet you're right, I bet there are other markets that we haven't sort of really explored, yet, and so what I’d love you know, an outcome that I would love to get from all the projects is, you know, throwing open wide, making sure that we publicise what we're doing and getting interested parties to come in and, you know, and have a look and see if what we're producing whether they you know the specification’s right for their use. And I suppose the other important aspect is to sort of get the Regulator's interested as well because it's, I think, for me, the three sort of key areas are, does the technology work, can we produce product of sufficient quality, is there a market for it and, you know, can we do work to develop that market. And then thirdly, do we have the right regulation to get to end waste, for example, to be able to sell it, so yes for all projects that's definitely built into the plan.

**CW: Brilliant, thank you, Pete. And Steve, I guess this really speaks to the heart of your projects’ ambition anyway in terms of unlocking the bio resources market. Is there anything else that that potential that you see?**

SR: So I guess Peter said. I think there's a lost opportunity there to develop different product lines, and that in itself will hopefully further developed]] markets, I guess project I'm doing is really looking at the where and the when, so for all of these great ideas people are looking at how they integrate into this by resources into end-to-end value changes a case of well where would you make those investments when and what's the most economic way of doing it, and then, how do you engage with markets to promote that, so I think that's where I see our projects are fitting into this this wider piece here.

**CW: Super, thank you. And Laura, is there anything you want to add, you've already touched on the opportunities that are going to be generated through the new partnerships that you've already created and are anticipating will be created during the life of the project. Is there anything else?**

LE: So I think Steve just touched on it there, in terms of the product and the outlet, so the bio-resources outlet because we're going to be a recovering phosphorus and would like to have it as a product rather than a waste, so it's looking at the legislation around that. And also as part of the super loofah project, the algae that we're using you can change it, so for this one it's going to be specific to remove phosphorus and then you'll be able to recover that from the loofah material, but there are potentially other avenues that we can go down for maybe removing ammonia using the algae or specific pollutant. So there’s some options there going forward that would obviously be part of another project but there's potential opportunities for pollution removal and things like that going forward.

**CW: Yeah, that's really exciting. Brilliant. And I guess actually all of you really again touched on the next question I’ve got, which is really almost taking us back a step and quite simplistic one of, why do we need these circular solutions and what benefits do we hope that they will bring to the customer, specifically? Maybe start with you, Laura, this time.**

LE: Okay. So for myself phosphorus is a finite resource, we need it to live and at the moment we remove the phosphorus from our waste water using chemicals, it's carbon heavy, there's a large cost associated with it and the permits are getting tighter and tighter. So there's great value in the phosphorus that is bound up in the chemicals that we are using. There are alternative technologies out there, but most of the water industry are going down the sort of chemical removal route. There are algae technologies out there, but they are more suspended growth so there's potential of wash out of the algae whereas our loofas contained, they're coated so you don't get that and potential risk of not removing your phosphorus so hopefully it will be more robust treatment so you're protecting the environment. And for our customers, obviously river water quality is very high on their priority and also our Regulators, we have to meet our permits in terms of the circular economy part, obviously that phosphorus has got a lot of value, it's needed for fertilizer so if we can harness the phosphorus in a different way and we use it as a product that's gonna be better for everyone, it's going to have less environmental impact we're not going to need to mine phosphorus if we can use the phosphorus that's already there, as a product.

**CW: Absolutely, great, thank you. Steve, is there anything you'd like to add to that?**

SR: No, I agree phosphorous obviously is a very important resource and then linking it back to my project with bio resources, majority of the treated bio resources is going to land as a fertiliser substitute, so the more that we can do, the more projects we can do that, I guess can harness the value within that and then make better products to secure that outlet and the more we can then offset, mining of other phosphorous products the better really. I think that's a win, win for our customers and for the wider environment, that's exactly what we should be doing.

**CW: Absolutely. Pete, are there any additional customer benefits that you'd like to draw out specifically from the projects that you're working with?**

PV: Yeah, so it's absolutely true, and at the centre of the project, you know, the environmental, social benefit that can be delivered by recovering, reusing resources. But there's also, I think a direct financial cost, you know, customer benefit, so if we become more efficient at treating waste water by, you know, recovering value from that waste water and generating new revenue streams from doing that that will then feed through into lower customer bills and that really is the beauty, isn't it, of a circular economy, now if we get it right, it is definitely win/win, it's a win for the environment, but also should enable us, as I say, to be more efficient and therefore for customer bills to be lower.

**CW: Great, let's hope we get to that point of environmental sustainability with lower bills and greater resilience into our systems, it sounds great. So we painted a really good picture there and we can see the clear benefits, why do you think we haven't done this kind of project before?**

PV: Shall I take that one?

**CW: Yeah, oh sorry, yes, I was looking directly at you, Pete.**

PV: It's a good point, I did sort of allude to the fact, and Steve's got a brilliant sort of illustration, examples of this, with all the stuff they're doing in Anglian on advanced digestion. But for a long time as a sector we've been pretty good at recovering energy from waste water, and that is, you know that circular economy, resource recovery. But I think yeah, why it's only been in relatively recent years that we've had this focus on other resources and, you know, I think climate change and the real focus on carbon has really sort of focused minds. And I think when you look at the carbon challenge, and what we need to do to get to net-zero very quickly you realise that sort of circular economy and carbon go absolutely hand-in-hand and certainly, you know, our strategy and Severn Trent the two are you know really interlinked. So yeah, I think that's probably the biggest change in recent years, this focus now on carbon, we've always had a focus to a degree on energy and chemical but overlaying carbon on top of that then just makes it a really compelling case.

**CW: Yeah, the burning platform is definitely there now, isn't it. Steve, is there anything you'd like to add to that?**

SR: I think as Pete said, with bio resources, particularly with what we've done in advance direct suggestion, there was a catalyst for that sort of change 20 years ago, you sort of need the catalyst for having the technological revolutions in a way. And I think, as Pete reflects, the whole focus around climate change and carbon currently, acknowledgement that we’re needing to do things differently, I think it's going to spur on a technical revolution, I guess, in terms of how we treat waste water and bio resources going forward so yeah, exciting times for me.

**CW: Laura, just give you the last opportunity to add anything to that particular question, we've had quite detailed responses, but yeah is there anything you'd like to add?**

LE: To be honest, I think Pete and Steve have covered it beautifully, there's probably nothing I could say that they haven't already said.

**CW: No, that's great. So I’m going to end this panel session with the question that we've asked all of the other panels around, what's the biggest challenge you've experienced during the development of the proposals, and therefore the greatest learning that you take away and could impart upon others that are looking at this Fund and the opportunities it could bring to them. Laura, I’ll start with you, so that you're not having the questions answered first?**

LE: Great, so I think in terms of writing the proposal, the biggest challenge was knowing the audience. So we're very technical, I think we know our own areas, really, really well and often trying to get your point across in plain language, without jargon, is quite difficult so what we did is we had our first go at writing the proposal and then we passed it on to other people in the company to say, do you understand what we've written, if you had to judge this could you follow it? And so I think probably advice would be get someone who's maybe got a different knowledge base to read it and see if they could actually understand your proposal. And they will also find areas that need a bit more work and it might say actually no, that question I don't know what you're trying to say there. So that was probably the biggest challenge in that, was finding the right words. I’d also say work as a team, get a team of people together to help because there are quite a few questions to answer and it can maybe be a little bit overwhelming to start off with. So break it down, work as a team and get people to help and check your writing.

**CW: I think that's a great learning point actually in terms of getting those from different technical areas to check what's been written and do they understand the key points that you're trying to put across within a limited word count. So that's fantastic, thanks Laura, thank you. Steve, I see you unmuted so you're keen to impart your knowledge?**

SR: Yeah, I want to build on Laura, we took the same approach actually in terms of doing first draft and getting people within the wider business and even outside the business supporting us to review those documents. I think it was a big challenge trying to get your succinct, answer the exam question and do it within that word count limit. And I think I guess the other learning point for us, ‘cause we were looking at market, so one of the things we had to address was how we were not going to trip ourselves up with the rounds of competition law up some of the question challenges we had. The learning point from that for us was to making sure that we could use Open Source data wherever possible, so freely available data. Now luckily, in our case, the majority of that as water companies we publish every year for the bio resources markets platform anyway, but there are a few pockets where we’ve had to think about how do we get the information in a fair and unbiased way that's open and shared with everybody and how we set our assumptions, I guess. I think that's the biggest learning point for me in this particular project.

**CW: Again some really, really good advice for those that are looking to participate in the program in the future rounds. Pete, do you have anything you'd like to add to tht?**

PV: So I think I’m really reinforcing a couple points that have already been made. But yeah, in some ways, you know coming up with really good project ideas, the sort of technical bit of the project is the easy bit and then you've got to really, I think challenge yourself and focus on articulating that. Not only in a clear, easy to understand way, but absolutely making sure and really being rigorous and holding yourself to answering the questions, which might sound a bit obvious, but the temptation is just to get it, this is great, you know, without you know, really, really right am I, because I’ve gone through the process a couple of times, where I’ve written stuff and I though, yeah that's good. And then I thought actually, does it answer the question. So that would be my greatest bit of advice I think really analyse what the question is asking and then making sure your answer addresses it. And then it's already been said, you know, make full uses of your project team so we learned quite early on that it was best to do things as collaboratively as possible so, you know, we had the sort of live document we all sort of fed into, we could all go in and add comments, rather than it being one person with a pen who had the responsibility. And then make full use of the resources that are on offer, through the competition so there's some great stuff available for us as a team to, you know, so we used, for example, science practice to do a review, so those sort of resources that are available through the challenge, I think yeah, make full use of those ‘cause we got some great feedback.

**CW: That's incredibly useful information for future participants and I think the nuggets of advice in there around answering the question that you're actually being asked not that you'd like to be asked is an absolutely key one. So very, very valuable insights. That brings us to the end of this panel, so I’d really like to just thank you all for being so engaged and developing such exciting projects. I’m excited to see how they progress and see those positive outcomes in the future, so thank you very much it's been a pleasure speaking to you today. You're all released and can turn your cameras off and mute yourself again. Lovely.**

**So that actually is going to bring us to the end of today's event, we're going to give you a little bit of time back, roughly 10 minutes. But I was trying to just jot down some key points in terms of what all of these presentations and videos have shown us today and I think what some of their key points are that the burning platform has become more evident, so the driving need for these projects is there. There was a wide recognition across all of the projects that everything that we're doing within the water industry has a knock-on impact on those are there and processes and systems, so we need to look more holistically. And that we need to share these learnings widely so that other projects can build upon them and develop. But it was clear that there are silos that traditionally were seen in the sector are beginning to break down. There's a hugely increased level of collaboration taking place and that risk appetite is definitely increasing. And the scale of the projects being undertaken is also far more ambitious than perhaps was several years ago. So all really, really encouraging and the customer benefits that we will see as a result of this scheme are really good to see and personally it excites me that we can be in this position where we are at the moment. So I would just like to thank everybody for attending the session, we will be sharing a visual recording of the event today, along with a transcript. And I can I remind you all, please, if you haven't already responded to the Ofwat consultation on the future rounds of the Ofwat Innovation Fund please do so, it closes on the 17th of May, Tuesday the 17th of May, so please go and do a quick Google search if you haven't already got that and make sure you do respond and provide us with your thoughts and insight. As we start to close the event down today we will be launching a brief survey, again it would be fantastic if you could please share your thoughts briefly on the event today. And that just leaves me to say a very big thank you, it's been a fantastic session, thank you to all of the project participants for joining us and we hope to see you all again soon.**