

# Capital Markets Day

## Triple Carbon Pledge session

Slot		Time	Lead presenter
<b>Intro</b>			
1a	Intro part 1	2 mins	Andy
1b	Video	2 mins	-
1c	Intro part 2	2 mins	Helen
<b>Supply zone</b>			
2a	Self-generation and PPAs	6 mins	Neil C
2b	Flexibility: DSR, batteries and hydrogen	6 mins	Howard
2c	Anaerobic digestion/biogas	6 mins	Leah
<b>Demand zone</b>			
3a	Electric vehicles	6 mins	Chris W
3b	Asset design and build	6 mins	Frank T
3c	Technology innovation	6 mins	Pete V
<b>Close</b>			
4	Wrap up	2 mins	Andy & Helen

## 1 Intro

### 1.1 Intro part 1 (2 mins)

**Andy:**

Good morning everyone and welcome to the triple carbon pledge session.

Severn Trent has been innovating and leading in carbon for a long, long while. Over forty years ago we started generating biogas from anaerobic digestion of our sewage sludge and we've remained a leader in the water industry to this very date.

Of course, back then, it wasn't driven by climate change but by a need to deal with sewage sludge that, unlike other waste companies, we couldn't pump into the sea.

A desire to do the right thing for the environment, to do the right thing commercially and a willingness to innovate drove the adoption of anaerobic digestion (or AD) and electricity generation from the biogas. It simply made great business sense then and it still does today.

That same combination of environment, commerciality and innovation drove a big ramp-up in combined heat and power engines, fast adoption of renewable incentives, first use of innovative German technology in what is now the UK's biggest crop AD plant, a move into food-waste AD and many more things that have led us to supply around [10]% of the UK's biomethane today. And in parallel, we've also developed a bunch of solar and wind assets, improved our energy efficiency and entered the energy flexibility markets. So, 'carbon' is engrained in what we do and we're proud of what we do.

This session is mainly about sharing our plans to build on this track record. But before we do that, we just want to take a couple of minutes to reflect on the progress we've already made.

### 1.2 Video (2 mins)

- 5 years ago we announced a commitment
- To self-generate 50% of our energy needs from renewable sources

- Many thought we were mad
- But we knew it was the right thing to do
- Since then we've been busy
- X GWh solar...enough to cover x football pitches
- X GWh wind...powering xxx
- 400 GWh anaerobic digestion...enough to power 100,000 homes for a year
- Acquiring Agrivert in 2018 made us the biggest AD operator in the UK
- Our hard work paid off
- And in 2019, we delivered our commitment a year early
- Generating our own renewable energy has helped us reduce our carbon emissions by 63% since 2002...almost twice the average UK reduction
- But we know this isn't enough
- Which is why last year we announced our triple carbon pledge
- 100% renewable energy
- 100% electric vehicles
- Net zero emissions
- All by 2030
- And today we're announcing our commitment to Science Based Targets...ensuring we're aligned with the goals of the Paris Agreement
- We are determined to play our part in tackling climate change

### 1.3 Intro part 2 (2 mins)

#### *Helen:*

No matter how well we've done, we always want to do better and that's particularly true given the climate challenges that we face today. We want to take a leading role in adaptation and mitigation and we're well placed to do it. That's why we made our bold commitment to our triple carbon pledge.

And as you've just heard on the video, today we're also announcing that we're committing to Science-Based Targets, which will help to ensure we deliver our net zero commitment in a way that is consistent with the goals of the Paris Agreement. This will see us place even greater emphasis on reducing our scope 1 and 2 emissions through direct action on our own operations, and we'll also be stepping up our focus on scope 3 emissions and embedded carbon in our assets.

It's a huge challenge and a huge ambition. We very clear that we don't have all of the answers yet but we have some of them and we are getting going to start to work on the gaps. Over the next hour, we want to bring to life what we're doing. We'll share with you a few examples that illustrate how we're getting onto the front-foot to achieve our goals, all whilst by constantly applying our proven approach that ensures we're making our business better for all stakeholders.

We're going to split you into two groups. You should all have been given a token when you came in, saying either 'demand' or 'supply'.

If you've got a token saying demand, you'll come with me and start in our Demand Zone, where you'll hear about:

- Our plans for electric vehicles
- How we're factoring carbon and energy into our asset design function
- The role technology innovation will play in reducing our energy and carbon emissions

**Andy:**

If you've got a token saying supply, you'll come with me and start in our Supply Zone, where you'll hear about:

- Our plans for further renewable energy self-generation and corporate power purchase agreements
- Our anaerobic digestion and biogas operations – and the platform they give us for further growth
- The ways we're engaging with the energy flexibility markets

## 2 Supply zone

### 2.1 Self-generation and PPAs (6 mins, Neil C)

*Either Jess Alce or Emma Long (wearing high vis jacket and PPE)*

Hi everyone, I'm [Jess/Emma] and I'm a renewable energy engineer busy [commissioning our 8<sup>th</sup> food waste plant at Derby using autoclave technology / I'm running our Southern Bioresources plants and previously ran our two Birmingham food waste plants]. For the Severn Trent Group, energy is our second largest controllable cost after people. In 2015, we set a bold ambition of supplying the equivalent of 50% of our electricity needs from our own sources of generation. At the time, we didn't know exactly how we would do it, but we took some risk and invested at pace in a range of renewable projects, taking advantage of the incentives available at the time.

*Poster showing how we've achieved our 50% target.*

We've made targeted investments in onshore wind, solar and hydro assets at our energy consuming sites taking advantage of the incentives available to us and landbank we owned. However we've also stayed true to our strategy by focusing most of our investments in our area of unique experience and distinctiveness, anaerobic digestion. The great news is we've delivered our ambition, having reached the 50% milestone a year early, as already announced in our half year results and with our monthly run-rate at 54%.

This puts us way ahead of our peers on self-generation, both within the water sector and beyond which protects us from long term price volatility and contributes to our wider environmental commitments.

*Poster showing how our self-gen numbers compare to others, both in our sector and more broadly.*

Our approach has bolstered and delivered scale and capability in our stand-alone food waste business both through the assets we've developed and the acquisition of Agrivert. Across our Bioresources and Green Power businesses, we're now the largest owner and operator of anaerobic digestion plants in the UK. The Government's draft Environment Bill going through Parliament at the moment promotes a strong recycling and renewable heat agenda and favours anaerobic digestion over incineration. In the food waste sector, we're now a top 3 player and are set up for future growth in this rapidly expanding market. You'll hear more about that in one of the other breakouts.

**Neil Corrigall (wearing high vis jacket and PPE)**

Thanks Jess. We have now gone further by committing to source 100% of the energy we consume from renewable sources by 2030. Once again, we've applied ourselves and through some very effective sourcing work and commercial negotiation we can get there by buy green REGO-backed renewable energy. We'll start next month and expect to deliver this pledge 10 years early!

Great news, I'm sure you'll agree, but it's by no means the end of the story. Our goal is to reduce our reliance on 'buying green' by doing more self-generation (where the projects and economics make sense) as well as entering into dedicated power purchase agreements (PPAs) where we can support investments in new renewable generation assets, but on someone else's balance sheet. In this way we can make a more direct contribution to tackling climate change and in a way that makes good business sense. I'll just take a minute to highlight the underlying reasons that put us in a very strong position.

- Firstly, we have a range of energy intensive assets with a steady, predictable energy demand but where we might not own or have access to developable land nearby. Depending on the local situation, it may be better for someone else to take on the development risk through a 'private wire arrangement' where they can invest in developing land and assets to produce renewable energy with us playing the role in the project of a secure long-term offtaker of the energy. For us it means we can support investments in more localised renewable generation, avoid some of the grid charges and limit our capital commitments.
- Secondly, operational resilience is a huge focus for us. Our customers quite rightly expect it. We are dependent on power and dedicated 'behind the meter' power generation is great in providing an alternative to grid power particularly as the range of flexibility services and technologies improves, which you'll see in another breakout.
- Last, but not least, the economics stack up. Whilst PPAs aren't strictly self-generation, in the PPA deals we're working on we have high credit quality as a counterpart for renewable developers to secure financing against and build out the assets. By providing an offtake commitment we can secure favourable deals. Net-net, the energy we can buy from private wire assets, especially those supplying behind the meter, is substantially cheaper than the full cost of grid supplied energy. We see this even more so when the solar or wind assets are oversized compared to our own needs and able to get better economies of scale.

We've currently identified opportunities for around 10-20% of our electricity needs potentially coming from PPAs across our estate.

*[Map spread out on table showing where we've identified PPA potential based on large using sites.]*

Now we're not going to implement all of this in the next five years, but nevertheless its overall potential is to reduce our energy bill by a few million per annum. A prize worth going for.

We're currently in discussions with several providers who are doing detailed analysis on some of our sites. We can't share details at this point but, if all goes well, we are hopeful of being able to make an announcement in the next couple of months.

[If we can, we'll announce the Strensham PPA at this point.]

## **2.2 Flexibility (6 mins, Howard Perry)**

*Creative plan for this session is to have three screens in the breakout area which will be showing relevant images/data throughout. We also plan to link one screen to a live elec trading platform so we can see how prices move real-time – a great way to illustrate some of the points in the script and bring it to life.*

**Howard:**

The low-carbon energy system of the future will be built around much more intermittent and decentralised renewable generation than now. And this is going to create new challenges, but also new opportunities. Unlike the gas fired power stations that provide much of the UK's power today, many types of renewable generation can't easily be turned up and down – they generate power when the sun shines or the wind blows. And this makes it much harder to balance supply and demand across the electricity network.

What this means is that we – the UK – are going to need to introduce more flexibility into the energy system to help balance supply and demand. In fact, the Committee on Climate Change cites additional flexibility as one of the three key things required to decarbonise our electricity supply. It also means there will be greater power price fluctuations to be navigated and new opportunities to provide flexibility services to the grid. The good news is that the nature of our assets and operations makes us very well placed to take advantage of both – and, in the process, make a real contribution to the UK's energy transition.

We're currently actively looking at three main flexibility technologies, all at different stages of technical and commercial viability: demand side response (DSR), batteries and hydrogen. I'm going to talk briefly about each one.

First, **demand side response** – which basically means adjusting your electricity demand up or down to counteract an over- or under-supply of electricity in the national grid. This is a highly effective, tried and tested and commercially attractive way to provide flexibility. And the good news is our assets lend themselves to demand side response very well because we have a degree of discretion over when to pump our water and treat waste water – more discretion than most companies would have over their operations.

We've been using demand side response for a number of years now. For example, during winter Triads (the periods of peak demand and very high prices over the winter), we typically reduce our demand to around 40% of normal levels, which saves us around £2.5m a year. We also operate 'frequency response' on several sites – thousands of little up/down switches with no impact on process. The investment in the control equipment we use to enable this pays back within 2 years.

Now, Triads are ending after 2021 and National Grid and local distribution network operators are revising all their market-based flexibility mechanisms. New ones are coming down the line and, while we're not completely sure what they'll look like yet, we're confident we'll be well placed to benefit.

The second flexibility technology we're looking at is **batteries**. Quite possibly you'll have heard a fair amount about batteries lately – whether because of Elon Musk's ventures or various other high profile initiatives. We think batteries are going to play a crucial role in the future energy system, to store electricity generated from renewable assets until it's needed. But in spite of the hype, it's still early days and the economics are not yet compelling in most cases, with paybacks typically longer than 10 years.

But we want to be ready for when the economics improve, which is why we're doing a number of trials – such as this one with Centrica at Loughborough, which will tie in with our existing solar generation there. We're going to learn by doing so that when the time is right, we can roll out batteries at scale and pace across our assets.

The final flexibility technology I want to talk about is **hydrogen**. Many commentators see hydrogen playing a prominent role in the UK's future energy system in multiple ways – including as a zero-carbon source of storable power. However, the technology is still a long way from being technically or commercially viable: it is currently difficult to store and can be expensive to generate.

That said, it's another area where we have a natural advantage. For example, we use vast amounts of energy removing ammonia and supplying oxygen into waste treatment. Theoretically we could produce hydrogen, use oxygen for our secondary sewage treatment and reduce the ammonia in our

liquors. We're going to trial this using some (future proofed) EU co-funding. Hydrogen may also play a role in renewable heat and transport, and we could also play a role in these areas.

**To conclude**, flexibility is going to play an increasingly important role in the future. We understand the landscape from our longstanding strategic focus on energy management and generation and this puts us in a great position to take advantage of new commercial opportunities and, in the process, play a positive role in decarbonising the UK's energy system.

### 2.3 Anaerobic digestion / biogas (6 mins, Leah)

**Leah:**

Good morning, I'm Leah Fry and I head up our Bioresources business.

As Andy stated in the intro, we're very proud of our AD business and extremely excited about the opportunities we have to do more commercially as the new competitive market develops and to do more to support our triple carbon pledge.

We got into anaerobic digestion 60 years ago because of our geographical location – we're landlocked. It meant that we couldn't dump our sludge in the sea like others and had to spread it all on land. A costly process and, with necessity being the mother of invention, we got into AD. It a brilliant process for us and the environment.

It reduces the volume of solids that we are left with at the end of our waste treatment processes which means lower transport and spreading costs – great commercially.

It produces an end-product (we call it cake but you wouldn't want to eat it!) that's a great fertiliser – great for the environment.

It captures methane that would otherwise escape to atmosphere – which means we can use it as a green fuel and avoid methane's damaging greenhouse gas effects.

Our Sewage Treatment works produce a lot of sludge – around 4.2m tonnes a year. That's over 11,000 tonnes per day. Our customers are a productive lot! So, we now have 26 AD plants and we've got good at it: we're the frontier company in the last price review.

*Pull down map showing where all our sludge AD plants are and point to weight illustrating how much sludge we treat.*

We're looking all the time to utilise our competence in innovative ways.

We stepped into crop digestion about ten years ago. We own about 600 acres of land near our sewage works in Nottingham that can't be used to grow crops on for human consumption. We were growing crops there to feed a dairy herd – not the most environmentally friendly or commercially sharp thing to do. So, we took technology from Europe and built a plant using crop as a fuel for AD. We've doubled the size and improved the yield by 15% through process improvement, biological enhancements and investment in bigger assets. It's now one of the largest and most successful in the UK. Sadly, there's no immediately attractive growth available in crop but we keep our eyes and ears open.

*Pull down map overlay showing where our crop waste AD plant is and point to weight illustrating how much crop waste we treat.*

Given this success, we were on the look-out for more opportunities and decided in 2013 to move into the food waste AD business. We saw this as a strategic play given society's increasing desire and willingness to separate waste streams at source rather than sending it all to landfill. We built a couple of plants near Birmingham and have a third in commissioning in Derby – and then in 2018 we acquired five more AD plants from Agrivert. We now have 0.5 million tonnes of food waste capacity.

*Pull down map overlay showing where our food waste ADs plant are and point to weight illustrating how much food waste we treat.*

Together our Bioresources and food waste plants make us the biggest AD operator in the UK. We are on track to deliver over 400GWh of Renewable Energy from 34 AD sites this financial year. This is enough to power around 100,000 homes for a year. We use this energy to directly power our sites wherever possible and it accounts for around 44% of our energy use as a company – which makes it comfortably the single biggest contributor to delivering our renewable energy and net zero commitments.

### ***Opportunity to switch to new speaker?***

We're proud of that but not content and we continue to strive for more.

In the sewage sludge market, we're delighted that Ofwat have taken steps to develop the Bioresources market and in AMP7 they implement a different regulatory regime. Severn Trent is a strong advocate of the power of competition. In the right market conditions it's a great way to generate efficiency and stimulate innovation. We embrace the opportunity to compete with others for so-called 'trade-waste' and other companies' sewage sludge – the more we can bring in the more energy we produce and the more money we can make. We're passionately focused on being the 'go-to' company for trade-waste producers and hauliers. We're looking to invest more to create better quality cake and make more energy. In 2018 we were the first to set up a dedicate Bioresources business with its own P&L to provide the focus required to maintain our frontier position.

In the food-waste market, we're bang on strategy with mandated segregation of food waste looking likely. We presently have around 25% share of the food waste market share. If we can maintain that share of projected new market demand, and we fully intend to, it would mean we could be providing the equivalent of around 65% of STW's energy needs from AD. That's properly exciting for us and we're well up for making it happen.

### ***Chart/poster showing our food waste market share versus others?***

Finally, as the Government steps up its focus on renewable heat, as a large AD producer we are fantastically positioned to play a role – and can pivot in multiple directions. We currently use our biogas to produce a mixture of renewable electricity and grid quality green gas. In future, depending on how the UK renewable heat strategy develops, we have options to dial up our electricity generation, inject more gas into the gas grid or even produce hydrogen.

So, to summarise. AD has a critical role to play in delivering the UK's carbon ambitions. It makes sense environmentally and commercially. We've a great track-record, we've an industry-leading capability, we've got momentum and we've got ambition. As you'll have gathered we're very excited about what we can do.

## **3 Demand**

### **3.1 Electric vehicles (6 mins, Chris Wand)**

*We're hoping to have either an actual charging point or a mock up, potentially plus charging software. We'll also have a video playing of a scalextric car driving along from 2020 to 2030, with key stats flashing up in sync with the script.*

#### ***Chris:***

Good morning, my name is Chris Wand and I head up our supply chain and logistics function. I'm also in charge of our electric vehicles roll out strategy.

As Helen said in the introduction, our number one priority for delivering our net zero commitment is to reduce our scope 1 emissions. Our vehicle fleet is responsible for around 5% of our scope 1 emissions and so reducing them directly, rather than by offsetting them elsewhere, is really important to us.

We have already started taking action to reduce our transport carbon emissions, buying low emission diesel vehicles, trialling electric vehicles and fitting additional particulate filters to our HGVs. We now want to take this to the next level and last year we committed to switch our entire fleet to electric.

It's a bold and ambitious move, but one that makes sense from both an environmental and operational perspective:

First, EV performance and cost are improving rapidly and forecasts for when EVs will become the norm are shortening all the time. Price parity for EVs and combustion engines is expected to be around 2025. The Government's 'Road to Zero' strategy forecasts that up to 70% of new car sales and 40% of vans sales will be electric by 2030. These numbers will likely improve further on the back of the government's recent announcement to bring forward the date for ceasing new petrol or diesel sales from 2040 to 2035.

Second, we are naturally set-up for EVs in a way that many companies aren't:

- We have a large fleet of around 3,000 vehicles that operate within a limited geography.
- We have a number of sites such as Spernal and Minworth where we generate excess renewable electricity that currently gets exported to the national grid. This presents a fantastic opportunity to charge our vehicles instead, thereby reducing load on the grid and avoiding charges.
- Many of our supply chain are based locally, creating an opportunity to share infrastructure.

Our strategy is to start with the quick wins where the EV market is more mature, such as with cars, and then progressively roll out to the more challenging areas of our fleet over the next 5-10 years.

Severn Trent Water has already made the bold decision to purchase only EV cars from now on, and will get to 100% EV in 2026.

We also plan to buy more electric vans starting from this year with small van sizes doing shorter trips. The market in this space is more immature than cars so we will still need to buy some diesel in parallel until suitable equivalent models are released. We anticipate from 2023 we will buy only electric vans and by 2030 our entire van fleet will be electric.

We're also looking at ways to speed-up roll out by doing things like reducing the amount of kit we carry so we can use smaller vans.

HGVs and tankers will be more challenging. Based on today's outlook, electric options may not be available by 2030, so we are exploring alternative low-carbon options such as hydrogen and biogas – where of course we have the strategic advantage of producing our own.

We also need to put a charging infrastructure in place and have already signed off plans to install over 300 charge points across over 65 sites over the next 18 months. By 2030 we plan to have installed around 1,000 across 100 sites. On many of these sites we generate excess renewable energy, creating a truly green cycle.

Our EV strategy is likely to cost up to £2m extra capex in the next few years but will deliver whole life cost benefits from 2022, lowering our operating costs through AMP7 and beyond.

We are also talking to our supply chain about their plans and looking at where we can work together to go faster.



Now another vital part of our EV strategy is to bring our colleagues along with us on the journey. We want them to be excited and proud of our commitment and confident that our strategy will help them do their jobs better. And the great news is that they are, with a recent colleague survey showing the clear majority are happy or very happy with our commitment.

To conclude, our electric vehicle strategy is a key part of our net zero commitment that also makes good business sense. It will make an important contribution to reducing our direct carbon emissions, and puts us on the front foot to benefit from the electric vehicle revolution.

### 3.2 Asset design and supply chain (6 mins, Frank and others)

#### **Frank:**

Hello, I'm Frank Thompson and I head our newly created asset design function. In this session we're going to tell you about the critical role that design has in delivering our carbon triple pledge and science-based targets.

- We operate and maintain billions of pounds worth of assets which consume and emit carbon. The decisions we take on how to design, build and maintain our assets have a huge impact on our carbon footprint.
- Over past decades energy has been relatively cheap and freely available. Naturally, designers have increasingly used energy intensive solutions to meet increasing customer and environmental needs. We are now in a new era where this has to change. To make this happen, we have insourced design this AMP – the only water company to do so. We did this to give us total control of the assets we create and renew to enable us to place a greater emphasis on carbon and energy.
- The assets we design will be in operation for decades and building them with low energy and carbon is crucial for the environment and we can see it will also reduce our costs.
- We'll now talk you through some examples that illustrate how we're doing this.

Let me introduce you to Mike who'll tell you about what we're doing in our waste treatment programme

#### **Mike Busby, Design Manager, Waste Treatment**

- XX% of our energy usage is associated with treating waste water.
- We have a significant environmental programme to enhance watercourses in our region by improving the quality of the discharge from our Sewage Treatment Works.
- One thing we're doing is wetlands as a nature-based solution. These are a series of ponds that act as a filtration system and give us low operational and carbon costs. They don't require major construction and avoid the need for additional treatment processes. These avoid both carbon emissions and energy consumption.
- Sometimes we can achieve the same outcome by rationalising our assets by transferring flows to another site. This streamlines our operations and at the same time reduces our processes and energy consumption.

I'll handover to **XX** who can talk about how we can reuse existing assets.

#### **TBC:**

- It's not always about building new assets but reusing what already exists.
- We had a sewer flooding problem in XXX and we needed to create more capacity in the network.

- We identified an unused underpass and with a bit of lateral thinking we were able to convert it into a gravity sewer.
- This avoided building a concrete tank and pumps so we were able to reduce the carbon and energy consumption and it was also cheaper. We gained as we have the best solution and the local authority gained as they don't have an unused asset to maintain.

Nikki is now going to tell you about off-site manufacture:

***Nikki Riches, Design Manager:***

- We have over 200 dosing rigs which put chlorine into drinking water ensuring it's good to drink.....and here's a scale model printed using 3D technology.

*Show scale model*

- We've developed a design which means this equipment can be constructed off site.
- Our design has reduced the amount of concrete needed by bringing equipment into a kiosk. Constructing these off site reduces the number of site visits and deliveries of components to each site which all contribute to reducing the carbon footprint.
- This also results in time savings on site meaning that the construction of the project is reduced so we won't have heavy diesel construction plant working for long than necessary
- We are now investigating the use of solar panels onto the kiosks.

I'll pass you to Aaron to talk about the impact of our water mains programme:

***Aaron Dhadli, Design Engineer:***

- Improving our water network is a huge part of what we do.
- Bursts and Leaks have two environmental impacts; firstly, water has an embedded energy cost in its production and, secondly in the methods we use to renew our network.
- The typical construction approach is to open cut, where you excavate a trench the entire length of the new main install the pipe and backfill. This results in large areas to reinstate, using tarmac and stone which have high embedded carbon.
- Our design incorporates slip-lining, a trenchless solution where the new smaller main can be fed through the existing pipe

*Show physical example of pipe.*

- This only requires digging out small pits which dramatically reduces the stone required to fill the excavations and the tarmac to reinstate the roads. This reduces the raw materials we're using as well as the transport costs.
- We believe we can design no-dig solution for XX% of our water mains projects.

I'll now pass you back to Frank

***Frank:***

- I trust that you found those examples interesting and insightful and enjoyed hearing directly from some of our super talented design experts!
- You can see that by owning the design of our assets we can bring the right mindset and creativity to bear immediately. This gives us the edge we need to reduce the energy and carbon embedded into the design and build of our assets and processes.

### **3.3 Technology innovation (6 mins; Pete Vale + Albi Lamaj, Innovation Exploitation Lead)**

**Pete:**

## **Intro**

In the other breakout sessions you'll have heard or will be hearing about some of the exciting activity already underway to deliver our carbon commitments. But we know that our journey to achieve net zero emissions by 2030 will also require technology innovation. And while we don't have all the answers yet, we have well developed plans and a strong pipeline of innovations coming through.

*Show innovation funnel*

I want to talk about two things that are going to make a particularly important contribution to this.

## **Spernal**

*Play drone footage of Spernal in the background (footage has been shot and will be edited by Chris)*

The first of these is our industry leading resource recovery and innovation centre located on our Spernal wastewater treatment works near Redditch, which some of you will be visiting tomorrow. This research centre and testbed, which cost £5m to develop and is the only one of its kind in the UK, opened in autumn 2019 and allows us to run large scale technology trials in a way that simply wasn't possible previously.

We can pick up wastewater from multiple points of the wastewater treatment plant and safely return the trial effluents to the treatment works for further processing if required. We even have a gas bag and flare installed so we can evaluate renewable energy opportunities. A laboratory on site allows us to run bench scale experiments to support the demonstration trials.

We're using Spernal to test a wide range of technologies and processes, current trials include:

- Enhancing our primary treatment process by using very small bubbles of air to separate the solids from the sewage through flotation, rather than settling the solids out in a tank as we currently do. This more efficient separation process will improve the energy balance on our works in two ways; 1) we will produce more of the energy rich solids that, as you've heard, we can feed to our digesters to make green gas and fertiliser, and 2) we reduce the energy required for the second stage of sewage treatment as we've cleaned up the sewage to a greater degree in this first stage.

*Show pictures of Spernal EPT trial plant*

- Developing reactive media technology to polish the treated effluent from our small rural works, in order to remove the phosphorus that remains before it is returned to the river. This will avoid the need to use expensive and corrosive chemicals to remove phosphorus from the wastewater and address the issues around transport and storage of chemical at these more remote rural sites.

*Show media samples of the reactive media*

Within the next few weeks we will be commissioning a trial of a novel membrane technology that if successful will allow us to deliver oxygen to the treatment process in a much more energy efficient way than the process we currently use – compressed air to create bubbles.

*Show pictures of the MABR technology and a membrane sample*

Spernal further cements our position as a sector leader on innovation and will help us to secure further innovation funding from sources including the EU's Horizon 2020 and InterReg research programmes, Innovate UK and the Carbon Trust. In this AMP we have secured direct grant income of £2.4 million and leveraged funding of £37.5 million – and we expect to do even more in AMP7.

**Albi:**

## **AnMBR**

Thanks Pete. Good morning everyone, my name's Albi and I'm our Innovation Exploitation Lead.

The second thing we want to talk about is our work on a process called an Anaerobic membrane bioreactor (AnMBR).

Approximately 90% of Severn Trent's energy consumption is used on our operational sites, with roughly half of this used by our wastewater treatment sites. The conventional way of treating sewage uses blowers to pump oxygen into the treatment tanks. This is very effective and produces very high quality effluent...but it also uses a lot of energy and chemicals and produces greenhouse gas emissions such as methane and nitrous oxide. We've got better and better at this over the years and have increased efficiencies and reduced costs. But, there are diminishing returns. So, we thought – what if you didn't need oxygen at all?

We've been busy working with our research partners to develop such a process and it's called AnMBR.

This technology uses bacteria that we know and understand well – indeed the same type of bacteria we've been using for years to treat sludge – we're real lovers of things 'anaerobic'. These bugs normally like to be warm. We heat our biogas digesters – efficiently, of course, using waste heat from our electrical engines. The recent breakthrough with this technology, however, is getting the process to work with the dilute cold wastewater that enters our treatment works

We've done this through sponsoring research at Cranfield University leading to the coupling of the anaerobic reactor with an ultra-filtration membrane and developing a way to extract dissolved methane from the treated wastewater. We are now at the very exciting stage of building a large demonstration scale AnMBR that we will be installing and commissioning at Sernal in early summer this year.

We currently spend approximately £15 million per a year on electricity to aerate our activated sludge plants. If we prove the viability of the AnMBR technology and over time replace all our ASPs we could potentially save all of this OPEX.

The icing on the cake is that we have also developed a way of capturing and recovering valuable nutrients (nitrogen and phosphorus) from the AnMBR effluent. Not only does this recover valuable resources and provide a potential new revenue stream it also removes the production of the very potent greenhouse gas nitrous oxide – this has a global warming effect of about 300 times that of CO<sub>2</sub>.

*Show ion exchange media and AnMBR poster*

**Pete:**

**Close**

Thanks Albi.

Hopefully those two examples have given you a real sense of how technology innovation is going to contribute to delivering our triple pledge – and in the process also significantly reduce our energy bill. Innovation was one of the core pillars of our AMP7 business plan and we're truly excited about the impact it can deliver, both in AMP7 and beyond.

## **4 Wrap up (Andy/Helen)**

What you've seen should give you a real sense of how we're building on our great track record of tackling climate change to date to deliver our triple pledge and science based targets – and also of how committed our colleagues are to delivering these commitments.

As we said earlier, the topics we shared with you are some of the key building blocks for us, but they're by no means the complete picture.

Today we're launching our overarching sustainability strategy, but we're also working hard to fill in the gaps in areas where we know we have more to do – and we plan to make more announcements on these areas later in the year.

We're totally convinced it's the right thing to do and we're committed to doing it. As a purposeful company it's what we do. We can play a leading role in tackling climate change, generally making the world a better place all whilst doing good business at the same time. Simply put, it just makes sense.