

Anglian Water 11A. ANGLIAN WATER BIORESOURCES STRATEGY 2020 - 2045



Anglian Water
Bioresources Strategy
2020 – 2045

September 2018

Introduction

We welcome the challenges and opportunities the development of sludge markets will bring to the industry. We believe we are in a strong position to respond positively to these challenges and facilitate these markets.

Our Strategic Direction Statement sets out our long term ambition to be carbon neutral by 2050 and to deliver sustainable growth in one of the fastest growing regions in the UK. Our Bioresources strategy outlines how this part of our business will contribute to achieving these ambitions, meeting the needs of our customers, and supporting the development of markets to drive further efficiency and productivity.

The strategy for managing our Bioresources for the next 25 years is a key element of our integrated operations. We have developed a sustainable strategy that meets the needs of our customers and stakeholders. This strategy depends on continued innovation and ensuring we deliver best whole life cost Totex efficiency for maintenance of and investment in bioresources assets. Through a risk-based approach we will take cost effective opportunities to open a sustainable market in bioresources.

Beyond 2025, we expect that a market will open for sludge and sludge treatment by-products. This will incentivise process improvements, innovation and cost reduction, and bring benefits to customers and the environment.

The new Price Control for Bioresources is a major change for an area of our business that has traditionally been a very integrated part of a wider Water Recycling process. However it also presents a range of new opportunities that can be realised to across the industry. We believe this will sharpen focus, improve performance and environmental compliance and drive costs down.

To aid development of our plan we partnered with specialist consultants (Business Modelling Associates) to develop a 25 year strategic decision support tool. The model considers the end to end bio-resources activities across our asset base and value chain as a fully interconnected system.

What we do now

Our current strategy for the transport, treatment and recycling of biosolids was set in 2005. It centres on the treatment of sewage sludge from over 1,100 water recycling centres at centralised sludge treatment centres (STC). The STCs are designed to treat sludge and deliver high quality products for use in agriculture as soil conditioners. These products allow our farmer customers to reduce the use of artificial fertilisers and return valuable nutrients and organic

matter to farmland, this improves soil and plant health and so has significant natural capital benefits.

Figure 1 sets out the Bio-resources price control area and the key activities undertaken. These include:

- the collection and transport of raw sludge (untreated) to our Sludge Treatment Centres (STC) or intermediate dewatering hubs,
- Treatment of the sludge at the STCs;
- the production of high quality products for farmers, and;
- the production of biogas, a valuable renewable fuel we use in combined heat and power (CHP) engines to generate renewable heat and electricity which is used for our own needs or exported to the grid.

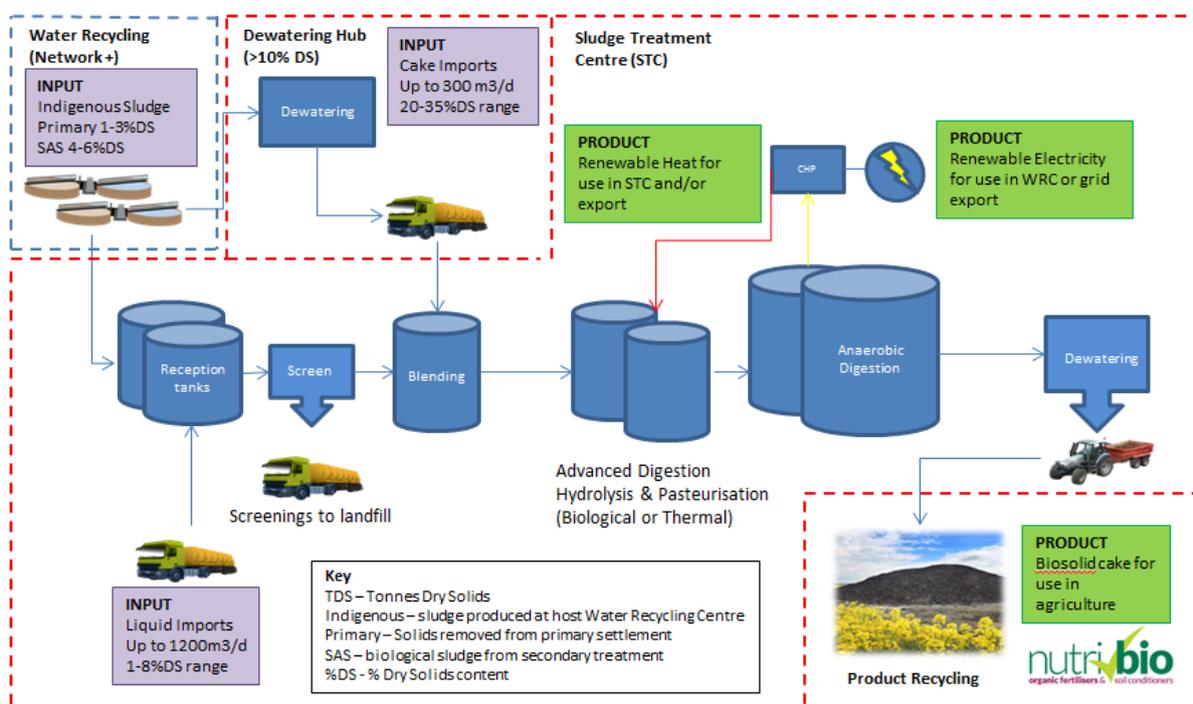


Figure 1 Activities in the Bio-resources Price Control

We have made huge strides in recent years by investing in advanced anaerobic digestion technology. This has replaced older and less environmentally sustainable conventional treatment systems and lime stabilisation technology. We have improved the product quality supplied to farmers by use of technology capable of treating to enhanced standard, and minimised the tonnage of product produced by maximising the amount of organic matter that is converted to biogas. By investing in advanced anaerobic digestion technologies we have significantly increased the quantity of renewable heat and electricity generated through CHP. Figure 2 shows the location of our STCs and strategic raw dewatering hub sites at 2020.

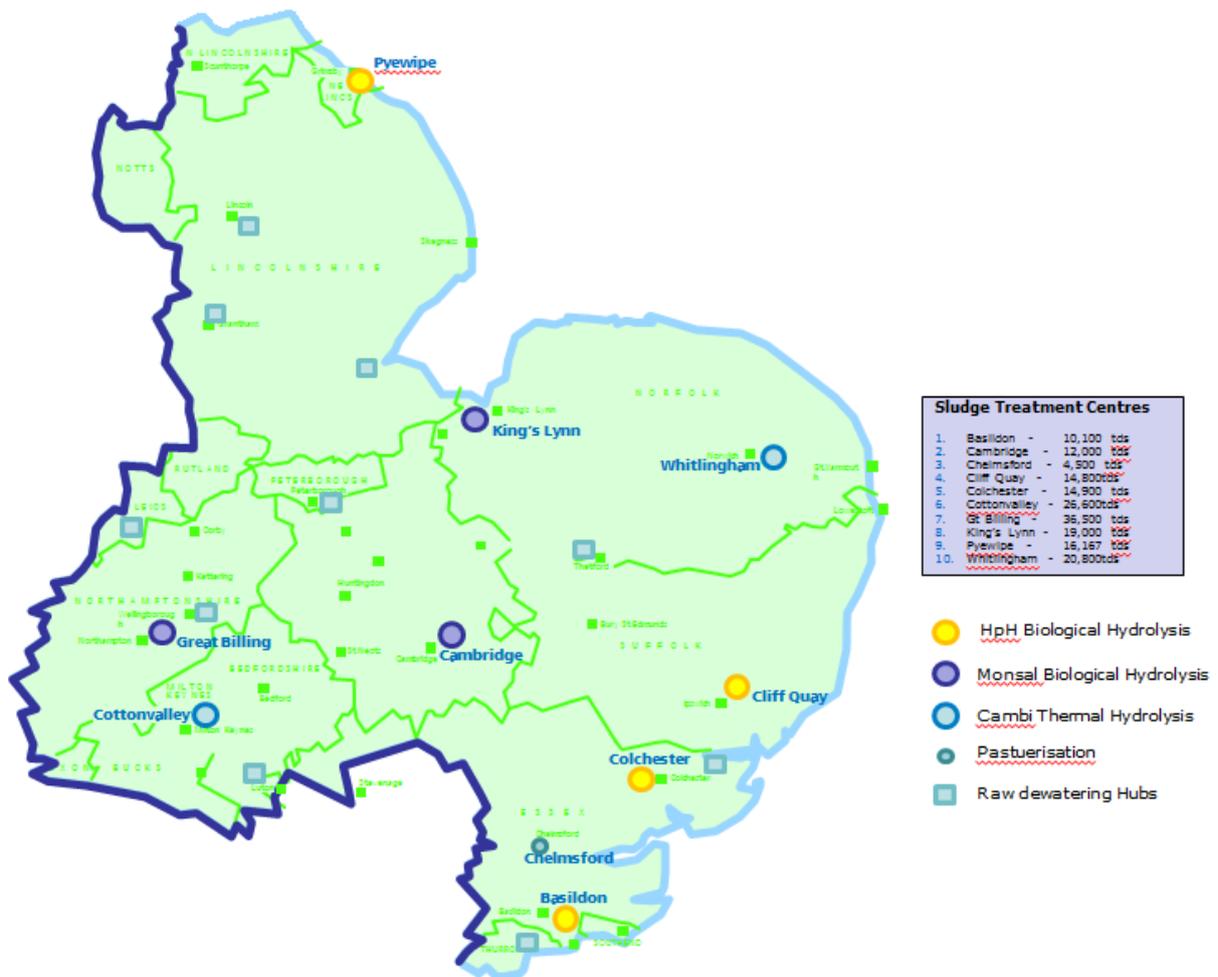


Figure 2 Location of our Sludge Treatment Works and strategic dewatering hubs, 2020

This approach has reduced the unit cost of treatment, by improving product quality whilst increasing revenues from farm sales and reducing the tonnage produced. We have increased renewable power generation from CHP from 13GWh in 2005 to over 98GWh in 2016/17. See Figure 3. We plan to grow this further by 2020 and into AMP7.

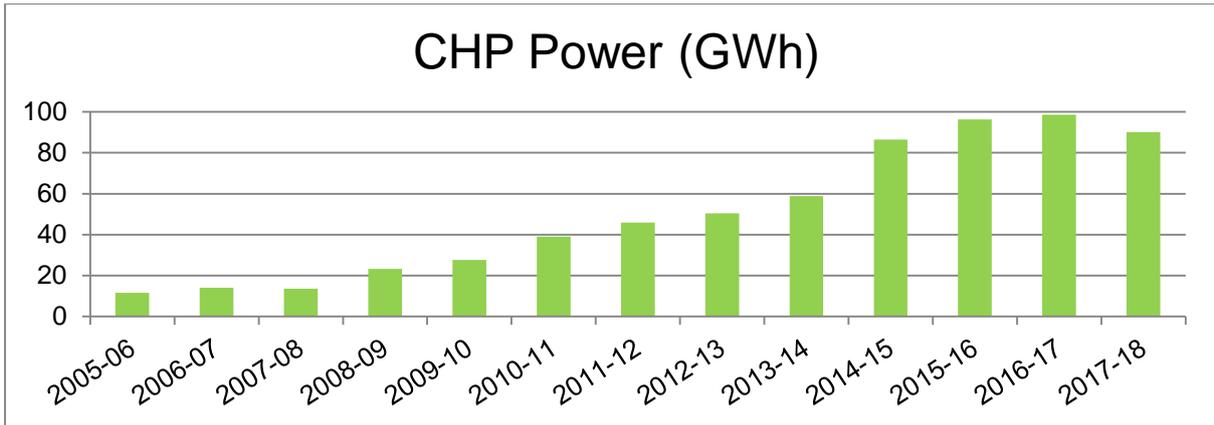


Figure 3 Renewable power generation

Figure 4 shows the annual tonnage of raw (untreated) sludge we produce, and the annual tonnage of treated product recycled through our STCs over the last 10 years.

This shows the trend over time of increasing raw sludge as a result of population growth and quality drivers. It also shows the reduction in final product as a direct result of implementing our advanced anaerobic digestion strategy.

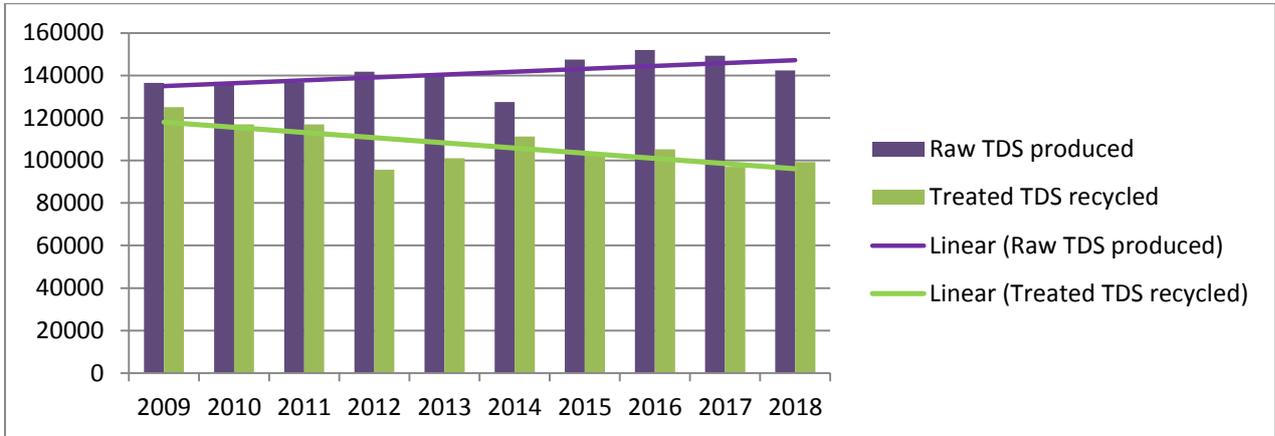


Figure 4 Sludge production and treated product recycling

Access to the agricultural land bank is critical for this strategy. So we routinely undertake land availability and risk analysis. Our most recent survey considered a number of scenarios and demonstrated that we continue to have sufficient available land within our area to recycle all of our treated biosolids production to agriculture. The scenarios considered included;

- Exclusion of high risk flood areas
- Exclusion of P sensitive areas
- Agricultural applications limited to crop offtake for P

- Competition for land from neighbouring WASCs and other organic waste providers
- Impacts of climate change

The findings are shown in Table 1 and Figure 5. Agricultural land available in the baseline scenario was 888,400 ha with a minimum land requirement of 227,300 ha. Our worst case scenario (P limited to crop off-take) results in a land requirement of 798,900 ha.

Table 1 Summary of available landbank, landbank required and haulage distance for 2016 and 2030

Scenario	STC year	Amount to land (tds)	Landbank required (ha)	Frequency of application (years)	Landbank available (ha)	Average haulage distance (km)
Legal minimum frequency (baseline)	2016	101,000	227,300	1.5	888,400	15
Baseline plus: 20m Surface water buffer			227,300	1.5	832,700	15
Baseline: high-risk flood areas excluded			227,300	1.5	726,200	17
Baseline plus: SPZ2 areas excluded			227,300	1.5	726,200	16
Baseline plus: P sensitive areas excluded			227,300	1.5	831,200	15
Baseline plus: areas within 500m of the coast excluded			227,300	1.5	864,500	15
Reduced P application frequency			494,700	3	888,400	23
P limited to crop offtake			798,900	5	888,400	31
Baseline via road distance			227,300	1.5	888,400	25
Baseline			2030	99,100	218,900	1.5
Baseline plus: water industry competition	484,100	3			827,200	20

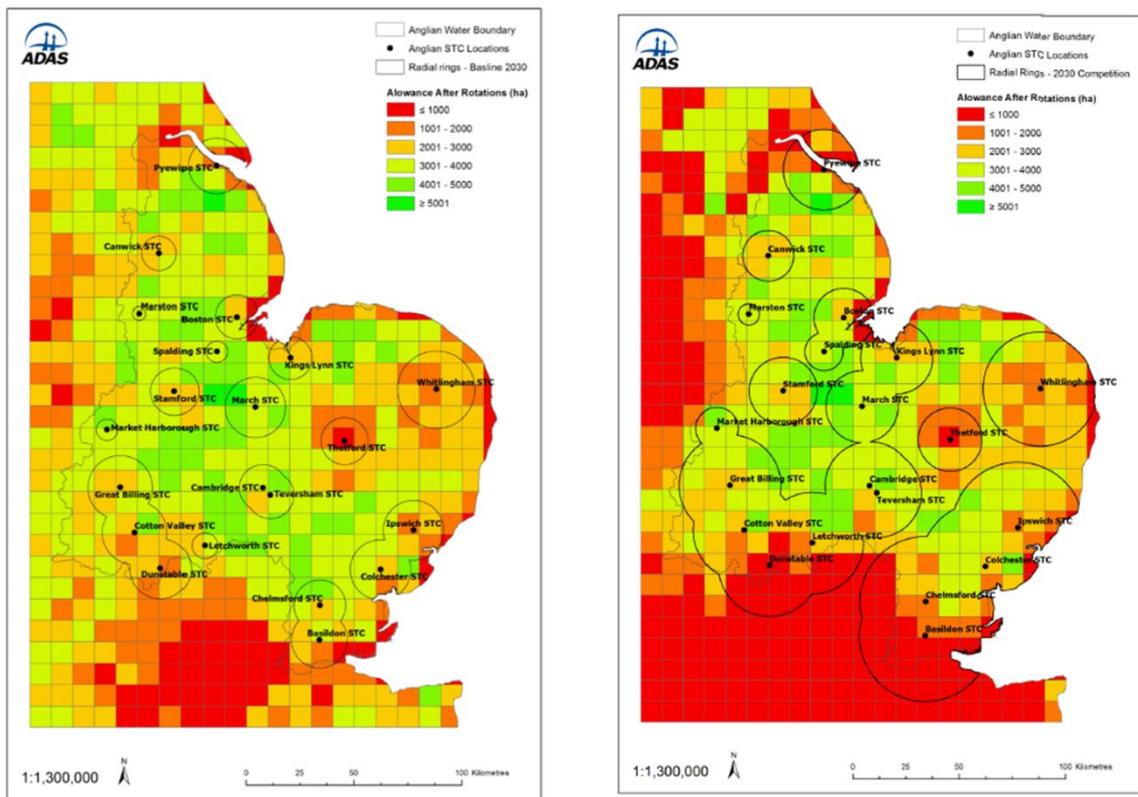


Figure 5 STCs (2030). The map on the left shows minimum radial landbank requirements (based on the Biosolids Nutrient Management Matrix - return period of once in every 1.5 years). The map on the right shows landbank requirement under competition from neighbouring Water Companies with reduced P application frequency (minimum return period of once in every 3 years depending on P indices, soil type and biosolids type). Each grid square = 10,000 ha.

Maintaining our outlet to agriculture and therefore building on our strong customer relationships with the agricultural and food producing stakeholders is critical. Since the introduction of the safe sludge matrix in 1998 we have been successful in moving our traditional sludge disposal operations to a product and customer focused function. We were the first UK WASC to have our agricultural recycling operations accredited by LRQA for 90001 and 140001. We were also the first to market sell our products at a rate linked to the market value of rock phosphate (typically we sell our product based on the phosphate content at 80% of the rock phosphate market price).

We have an established nationally recognised brand in Nutri-bio for the treated biosolids products that we recycle. We actively engage with our farmer customers and key agricultural and food industry stakeholders using this brand. Further information on our products and the services we provide to our customers can be found at www.nutri-bio.co.uk

We believe that agricultural recycling of a biosolids product continues to be the most sustainable management approach and the ongoing implementation of the national Biosolids Assurance Scheme (BAS) is designed to help to protect the agricultural outlet in the longer term.

We promoted the initial concept of an assurance scheme to the industry and have led the development of BAS. We see its full adoption across the industry as critical to maintain the compliance and quality of biosolids products used for agricultural recycling, and the confidence of food chain stakeholders. These elements are critical to the long term sustainability of this approach.

Anglian Water is represented on the board of Assured Biosolids Limited who operates and administers the Biosolids Assurance Scheme. Further details of the scheme can be found at www.assuredbiosolids.co.uk

Through implementation of our strategy and being an early adopter of advanced anaerobic digestion technology, we have become a recognised leader in the field of recycling biosolids to agriculture on an international stage. Recent examples of this include presenting to the European Federation for Agricultural Recycling in Hamburg and at conferences in Brazil, to showcase our experience and help Brazil design regulatory structures to progress sustainable recycling of treated biosolids to agriculture.

Our 25 year strategy continues to build on the investments and strategic changes made since 2005. Delivering high quality products for agriculture and generating renewable energy remain at the heart of what we do and contribute to the long term ambitions on carbon and sustainable growth in our 25 year Strategic Direction Statement. Our PR19 plans for Bioresources represent a stepping stone towards those long term aims.

What do our customers and stakeholders tell us?

It is essential that our bio-resources activities meet the wider needs of the business and are aligned to our goals whilst delivering high quality products and services to our customers. It is also important to maintain a strong consumer and stakeholder confidence particularly in relation to the activities undertaken that affect the rural agricultural environment. Table 2 gives a brief summary of the key customer, regulatory and community groups and their drivers, linking across to our wider business strategic goals.

Table 2 Customer and stakeholder drivers

Business Drivers	Customer	Community	Compliance	Company
Who	<ol style="list-style-type: none"> 1. Retail Customer 2. Farmers 3. WR Ops 4. WASCs 5. <i>DNO/Grid</i> 6. <i>3rd Parties (New Markets)</i> 	<ol style="list-style-type: none"> 1. Public 2. Politicians/Local Authority (planners / EHO) 3. Agri-Food Industry stakeholders 	<ol style="list-style-type: none"> 1. EA 2. OFWAT 3. OFGEM 	Owners & Investors
Their Drivers	<ol style="list-style-type: none"> 1. Affordable, sustainable and safe treatment and recycling of sludge 2. Safe good quality, affordable, quality assured biosolids product for use in agriculture 3. Reliable outlet for the collection & treatment of sludge to maintain WR compliance 4. Reliable outlet for treatment of sludge in accordance with contract terms 5. Legal/compliant connections with DNO grid for the safe export of generated power 6. As 3 	<ol style="list-style-type: none"> 1. Safe, sustainable treatment & recycling of sludge, capacity to meet regional growth, manage assets to minimise nuisance from operations (odour, noise and transport) 2. As 1 3. Consistent compliant and high quality assured (BAS) product for use in agriculture. 	<ol style="list-style-type: none"> 1. EA <ul style="list-style-type: none"> • Safe recycling of biosolids products compliant with SUAR and safe sludge matrix • Safe compliant operation of our assets in accordance with the conditions stated in our EPR permits • Compliance with new incoming MCPD covering our CHP engines and combustion plant 2. Efficient, affordable transport, treatment and recycling of sludge in accordance with RAG's and new price control 3. Compliant operation and reporting against renewable incentives (RO/RHI) 	<ul style="list-style-type: none"> • 30% power used by AWS generated from renewable electricity by 2020 • Carbon neutrality by 2050 • Sustainable treatment & recycling of sludge managing emergent risks to ensure a sustainable outlet • Ability to exploit opportunities in new emerging bio-resources markets

In developing our long term strategy we consulted retail customers and farmer customers, and key stakeholders from the wider agriculture and food producing industries. We consulted on a wide range of topics from the activities and operations we currently undertake, to opening of new markets, co-treatment with other organic wastes, the challenges of climate change, and our desire to reduce carbon.

Consistent and important messages emerged from this engagement:

- Anglian Water has a very strong and positive brand perception amongst its customers and stakeholders: trusted for being straightforward and honest
- Anglian Water already plays a significant role in environmental causes in the region and going forward could do even more regarding education and 'regulation' of others
- Although there was a lower understanding of Sludge and Biosolids amongst some customers, once it was explained, they believed it to be a vital activity needing rigorous environmental controls
- All groups highlighted strong concerns regarding the opening of markets as it was considered a potential risk to environmental standards and to maintaining quality of the biosolids product

- Anglian Water must balance the on going maintenance of sludge assets with delivering priority investments to build future capacity and continually reducing volumes of hauled sludge

Our customer group was very clear that the maintenance and optimisation of our current assets are a high priority for them. They saw this area as critical to maintain and improve the quality of biosolids product whilst ensuring that we also maintained high environmental standards. They also saw that investment to build long term capacity was important given current and planned growth across our region. In their view, this investment should be made as soon as possible to maximise benefit in the longer term.

Our stakeholder group mirrored the customer group belief that the optimisation of our sludge assets is a critical strategic area, particularly regarding the overall reduction of volumes of sludge being hauled around the region, and the biosolids product recycled to agriculture. There was strong support from the stakeholder group regarding continuing to use a sustainable agricultural recycling route. However, concerns were raised regarding the risk of sludge markets being opened without suitable controls.

We believe that our role in continuing to lead and promote the implementation of BAS across the industry can help to allay any concerns about the consequences of the development of sludge markets. This will be combined with continuing work with regulators and cross sector stakeholders to review and reform regulations for the treatment of sludge, biosolids and other organic wastes.

What's changing?

Bioresources Price Control

There have been a number of changes across the industry since the development of the AMP6 (2015-2020) Biosolids Strategy in 2013. Ofwat's Water 2020 publication has already stimulated opportunities that we and the wider sector are actively pursuing. We have addressed these changes as part of the development of our PR19 plans and our longer term strategy.

One key change from 2020 is the introduction of Bio-resources as a new price control. This price control will cover all activities relating to the transport, treatment and recycling to products derived from the treatment of sewage sludge. Figure 6 shows a typical Anglian Water sludge treatment centre at Pyewipe and the interactions with "Water Recycling Network plus" and the products and services we provide to our customers.

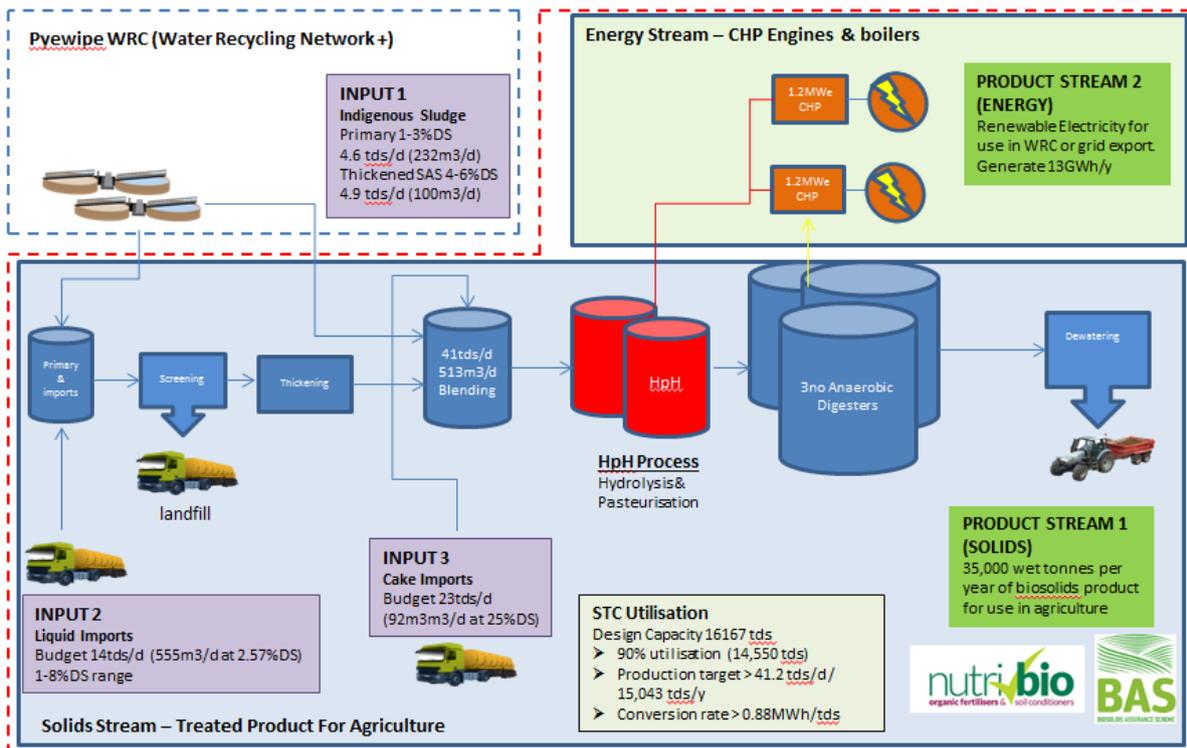


Figure 6 Pyewipe sludge treatment centre

Developing Markets

A key driver for change is to introduce new markets and competition into the sector, promoting innovation, collaboration and trading between WASCs and third parties, with the aim of reducing costs for customers.

We welcome the challenges and opportunities the opening of the sludge market will bring to the industry and believe we are in a strong position to respond positively to these challenges and make the most of opportunities.

Anglian Water has already been active in sludge markets. Over past years we have had bilateral agreements in place to import raw sludge cake from neighbouring WASCs into our sites at Great Billing (Northampton) and Pyewipe (Grimsby) from Yorkshire Water (YW) and Severn Trent (SVT).

The arrangement was based on a short term, marginal cost trade and included the collection, treatment and recycling of the treated biosolids product. Table 3 shows the raw TDS received from Yorkshire Water and Severn Trent

Table 3 Sludge received from Yorkshire Water (YW) and Severn Trent (SVT)

Year	Gt. Billing (tds imported)		Pyewipe (tds imported)	
	SVT	YW	SVT	YW
2017-18	0	1214	0	1387
2016-17	0	457	0	1566
2015-16	0	503	0	262
2014-15	0	0	0	0
2013-14	0	0	61	0
TOTALS	0	2174	61	3215

The trades to date have generally been in response to specific operational incidents resulting in reduced treatment capacity for a period of time. YW initially had problems with one of their incinerators at Leeds, resulting in a reduction in their treatment capacity from the autumn of 2011. YW then encountered flooding issues at several of their STCs in January 2016, so sludge trading recommenced. Trading was finally terminated with YW in January 2018, as we faced a reduction in our own treatment capacity, due to a combination of a digester failure at one site and the refurbishment of assets at another.

Trading with Severn Trent occurred between Jan-Mar 2014, as a result of SVT facing an unplanned reduction in treatment capacity, apparently due to an unknown substance adversely affecting the health of several of their digesters.

To date we have not entered into any trading agreements for 2018-19, however we are in regular dialogue with our neighbouring WASCs to monitor and explore opportunities.

In addition to trading sludge with our neighbouring water companies, we have provided small quantities of sludge to a number of parties during the commissioning of their digesters. This includes Welsh Water in September 2010, Thames Water in September 2012 and April 2014, and local third party AD plants in August 2014 and May 2017.

Historically we also traded sludge with a third party at Tilbury, for use in light weight aggregate production, but this process proved unreliable and the plant which occupied a part of our site at Tilbury WRC, was decommissioned and demolished.

We welcome and see benefits in inter-WASC trading. Previously we have triggered investments in increased treatment capacity once we reach 80% utilisation of the available design capacity. Our approach from 2020 is to trigger investment when we reach 90% utilisation of design capacity by accepting that the opening of opportunity of cross border trading with WASCs allows us to operate with lower headroom than previously, which reduces the need for investment in significant new capacity.

Tankering and biosolids recycling

We operate a fleet of 47 sludge tankers and 22 bulk vehicles, which complete approximately 65% of the planned sludge and biosolids deliveries. The remaining workload is completed by a number of locally based 3rd party subcontractors, under framework contracts which are tendered at 5-7 year intervals.

The overall sludge haulage workload is tendered on a regular basis to test market costs and drive efficiencies and our in-house team recharges costs on a unit cost basis for sludge / biosolids actually moved, to align with our subcontractors approach. Our long term strategy has been to maintain a cost effective split between in-house and 3rd party subcontracted resource, which in turn helps to minimise the overall risk and cost of these critical operations.

Biosolids Recycling (spreading operations to land) are also tendered at 5-7 year intervals, with all of the workload now being completed by 3rd party subcontractors. We sell the biosolids product to farmers as a replacement for artificial fertiliser, recovering a significant annual revenue stream.

Retaining a sustainable landbank for our biosolids recycling operations is critical to the future of our business and the quality of service provided by our biosolids spreading contractors in particular forms a key aspect in securing that landbank. We conduct a number of farmer surveys to ensure that the service it provides supports their needs.

The surveys illustrate that timeliness of spreading, minimising soil damage (compaction) and ensuring an even spread of material across the field are the key customer service requirements.

As a result of customer and stakeholder feedback, our strategy is to retain ownership of seven high specification self-propelled biosolids spreaders and to subcontract the operation of these units to approved 3rd party operators.

The units have a high capital cost and a significant lead time to purchase, which restricts the number of potential operators able to provide the services consistently and poses a significant risk if our subcontractor was unable to provide the service at short notice. We believe the approach of owning the units and then subcontracting their operation minimises overall risk and cost of the spreading operation, whilst ensuring that the agricultural landbank can be sustainably maintained for the future.

Strategy development

Our 25 year Anglian Water Bioresources Strategy sets out the following:

- How we address long term environmental challenges for the Bioresources Price Control including population growth, climate change, renewable energy and tightening quality compliance requirements (water, land and air)
- The need to maintain the vital agricultural recycling outlet which we rely upon for sustainable sludge disposal
- The need for Totex Investment as part of a long term plan i.e. what are the drivers for Totex investment proposals for asset maintenance and enhancement, including delivering a more detailed understanding of the costs of operation
- The use of Customer and Stakeholder engagement, demonstrating that we have listened and ensuring that our strategy meets their expectations for service, efficiency and environmental compliance
- Facilitating the development of sludge markets and how we maximise value by taking cost effective opportunities to open markets whilst maintaining stakeholder and customer confidence. This must be sustainable without compromising effective and compliant bioresource operations
- The use of innovation to drive technical improvement and maximise market opportunities
- How we will continue to respond to the Ofwat Water 2020 publication by planning effective approaches to market separation and maximising value from our products, assets and services

We have developed our PR19 Bioresources plan based on the consistent use of our predictive growth data, National Environment Programme predictive data and industry standard econometric modeling, which is led by our Regulation team.

The development of the investment plan has also been supported by the Bioresources Totex Cost project completed as part of the RCV Data Programme submitted in September 2017 and received positively by Ofwat.

We have developed a cost-beneficial Totex plan for AMP7 that maintains operational effectiveness and continues to deliver site utilisation at an industry leading 90%, aligned with timely investments to address the impact of growth, manage and reduce sludge volumes, maintain the condition of our sludge assets and maximise the production of renewable energy from biogas.

To aid the definition of our Bioresources strategy and investment proposals for AMP7 we have developed the Anglian Water Strategic & Markets Model (Decision Support Tool) in liaison with Business Modelling Associates (BMA). The model provides a high level end to end representation of Bioresource value chain from source (WRC) to recycling outputs at a process level including dewatering, digestion etc. and allows scenarios to be evaluated for the economic and performance impacts of the opening of a sludge market.

The model provides an annual representation of up to 40 years view, covering all direct and indirect Totex costs within the current Bioresource price control area and with specific inclusion of sludge market analysis and associated potential costs and revenues.

25 year plan

PR19: 2020 – 25

For the period 2020 – 2025 the outputs from the Anglian Water Strategic & Markets Model include:

- Multiple Totex investment scenarios to determine the optimal investment programme for AMP7 balanced with potential AMP 8to AMP11 expenditure
- Provides a rapid and flexible scenario analysis with investment optioneering
- Allows flexible objectives i.e. optimise Net Present Value (NPV), minimise Totex, etc.
- Provides a representation of Regulatory Contract Value (RCV) and Modern Equivalent Asset Value (MEAV) impact
- Enables the delivery of 'no regrets' investment choices
- Analyses potential trades considering marginal unit costs, fully apportioned costs, compliance, future growth, possible regulatory and non-regulatory Totex investment requirements

Our balanced and modelled approach for AMP7 has confirmed the need for strategic Totex expenditure in the following:

- Increased sludge treatment digester capacity at 2 sites: Pyewipe STC in Grimsby and Whitlingham STC in Norwich as a result of growth, linked to our Water Resources Management Plan (WRMP)
- Improved treatment at Sludge Treatment Centres affected by the impacts of phosphate removal improvements and other environmental improvements as a result Water Industry National Environment Programme (WINEP)
- Upgrades to our CHP fleet to ensure compliance with new requirements for limitation of emissions in the Medium Combustion Plant Directive
- Improvements to measurement and monitoring of sludge treatment assets including inputs and outputs at site boundaries

- Replacement and renewal of our haulage and recycling fleet
- Capital Maintenance refurbishment and replacement of critical assets for sludge / biosolids treatment and renewable energy production on a more proactive and less reactive basis
- Invest in innovation with a focus on technology developments, using our Shop Window as the proving ground

Based on the forward plan to maintain our sludge asset utilisation at an average 90% and on current growth projections over the next five to seven years we anticipate the overall treatment capacity of our sludge treatment centres to be exceeded early in AMP7.

We are proposing strategic investments to increase sludge digester capacity at Whitlingham STC in 2021-22 and at Pyewipe in Grimsby in 2024-25. These two key investments will provide enough capacity to deal with the impacts of regional growth and also for increased sludge loads received from sites affected by the WINEP Phosphate reduction programmes as they are delivered through AMP7.

This investment strategy is based on a longer term plan and the knowledge that further staged investment will be needed in AMP8 and AMP9 to keep ahead of the growth projections across the Anglian region. Figure 7 shows the period 2020-40 in detail.

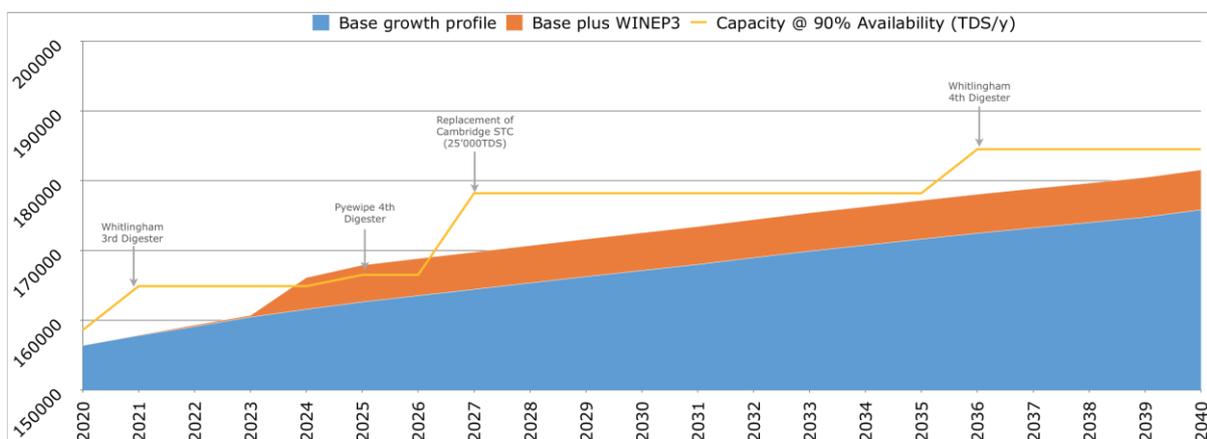


Figure 7 Long term projections of sludge growth and capacity

Energy from sludge

We have successfully pursued an Energy Renewables strategy since 2005. Utilising a combination of energy generation from sludge gas, wind turbine development and the introduction of solar energy, the Renewables Strategy has generated significant financial efficiencies and supported our carbon reduction targets. For the Bioresources strategy we are focussed on energy generation

from Biogas, driven through our fleet of Combined Heat and Power (CHP) units, by continuing to develop our CHP capability. The increase in energy from sludge is detailed in Table 4.

Table 4 Energy generated from sludge

	AMP4	AMP5	AMP6	AMP7
Energy Generated from Sludge GWh	90.3	280.8	522.2	633.0

Evaluation of tightening environmental air quality and emission standards has identified that our CHP engines will need upgrades to meet new standards and to continue to operate compliantly. There will also be a need to refurbish and replace engines during the AMP7 period. However, when that time approaches we intend to carry out whole life evaluation in comparison to alternate strategies, including the return of Biogas to national grid or potential use as fuel for the tanker fleet. The development of our CHP capability must also be factored in. There is a strong relationship here to our strategy for sludge trading and for co-treatment, as both could significantly affect the availability and quality of sludge gas production (either positively or adversely).

Operating Expenditure

The overall Opex costs of sludge haulage within the Anglian region are high, driven by our population distribution and the fact that we have the largest geographical area of any water company to cover with over 1000 water recycling treatment works producing sludge on a daily basis. However, the unit rate of our haulage is very efficient in comparison to the wider industry. .

Our strategic aim is to reduce the cost and environmental impact of sludge volumes hauled. We are currently planning to invest in the latter part of AMP6 to pilot an initiative to increase the percentage of dry solids (%DS) in sludge transported from our Water Recycling Centres, to either Dewatering Hubs or Sludge Treatment Centres.

Assuming this initial investment proves beneficial, we will continue with this initiative in AMP7 where we are targeting significant %DS improvements and a corollary reduction in hauled sludge volumes at over 100 of our key Water Recycling Centres.

An example of this is seen in our Innovation Shop Window where we are developing and proving the concept of mobile thickening using novel technology. By using this technology we can thicken sludge locally to approximately 6%DS in advance of tanker collections and onward transport to our STCs.

Capital Expenditure

The Water 2020 publication and the creation of a separate price control for Bio Resources gives a clear incentive to understand not only costs but more specifically the quantities of sludge and byproducts at all stages in the treatment process. There is a need for more detailed measurement and monitoring of the sludge in the treatment process, gas use and production, energy use and production, return liquors and water / final effluent usage as part of the process.

To fully understand Totex costs at this deeper level requires a detailed review and separation of STC costs from Water Recycling Centre operation. Also, the development of our long term asset investment strategies for AMP7 requires a new level of both Opex and Capex cost understanding across our region for all STC / Dewatering site locations, treatment and storage capacities and operational performance.

We are currently implementing the first stage of combined Opex and Capex reporting for all operational teams, which show Totex costs at a much more granular level. The current reports need further refinement as we move through AMP6 but this activity, combined with Totex pilot initiatives to implement improved operating and decision making practices, will be critical to drive more accurate cost data for the Bio Resources process moving into AMP7.

We believe that more detailed measurement and monitoring systems for treatment process, gas use and production, energy use and production, return liquors and water / final effluent usage can be achieved with minimal investments bridging AMP6 and AMP7. This will lead to significant opportunities to target issues and reduce Totex costs in the longer term.

The Water 2020 publication focusses on the promotion of markets within the sludge arena. It specifically encourages trading across boundaries between neighbouring water companies where it is in customers' interest to do so. As we move towards AMP7 it is clear that trading will play an important and increasing part of all our future strategies. We would anticipate entering into formal trading agreements with three neighbouring companies during AMP6 and AMP7. Early outputs from the Strategic and Markets Model are that shorter term, marginal cost arrangements are a cost effective way forward, but always need to be evaluated on a case by case basis. Any longer term arrangements at fully loaded costs do not appear to be a cost effective way forward at this point but we continue to evaluate any and all opportunities and work with our neighbouring water companies to develop joint future strategies and open trading markets before AMP7.

We are also aware other WASCs are exploring potential to outsource elements of the bio-resource activity. We will consider opportunities as they arise and have already expressed interest in a number of market enquiries. These cover the whole spectrum of services including design, build, operation and maintenance of new assets, the operation and maintenance of existing assets, and transport and recycling services.

We believe our proposed Totex investments for PR19 provide a cost effective approach for AMP7 and are pragmatic given the uncertainty of the current economic climate and considering how sludge markets may develop.

Evidence would suggest that alternate approaches to agricultural recycling taken across the UK in the last 15-20 years are proving problematic due to numerous environmental issues, technical challenges and the expense. Therefore our longer term strategy continues to be focussed on agricultural recycling as the preferred outlet for our product, although we will continue to research and test the viability of alternatives.

Beyond 2025

Using our Anglian Water Strategic & Markets Model we developed a number of forward looking scenarios.

We have identified in the longer term that we will need to:

- Build new capacity and increase the utilisation of our plants
- Continue to maintain our assets
- Collaborate with others to develop new markets
- Take further steps to enhance the outputs of our sites and Combined Heat and Power plants

The Water 2020 publication also encourages opportunities for co-treatment of sludge in the wider waste market. Environmental legislation controlling the use of Sewage Sludge and Organic Waste together currently compromises a cost effective move to this form of sludge recycling, but we continue to play a leading role in the negotiations with Government and our regulators to explore ways of resolving these limitations.

We are keen to explore options to progress co-treatment and believe that the legal and regulatory restrictions can be resolved. The opportunity for co-treatment in the Anglian region exists in several forms:

- The import of organic wastes from third party suppliers to our STCs either for digestion and treatment (either separate to, or combined with, existing processes)
- The export of sludge to suitable third party treatment plants where it is geographically cost effective to do so

The longer term potential for joint venture investment strategies between water companies at the boundaries of our regions. These can deliver the most cost effective Totex solutions to sludge treatment needs for both the water companies and customers