

Water 2020

Potential developments in the commercialisation of the sludge treatment and recycling market

Wessex Water – June 2015



Executive summary

Improving the efficiency, quality and sustainability of water and sewerage services can be facilitated by progressively exposing individual elements of the existing integrated wholesale businesses to more focused price controls and commercial pressures. Sludge treatment and recycling, which is an obligation on sewerage undertakers, is one of the easier places to begin to explore these opportunities. How this is done can however have a significant impact on customers' bills, investor returns and credit quality, and the potential for further liberalisation of contestable services.

Sewage sludge is a natural residual of the sewage treatment process. Consequently, end customers and retailers have little if any choice over who provides sludge services. Whilst it is possible to create and auction a new separate sludge licence, absent this, it seems unlikely that sludge recycling can become contestable. In addition, non-regulated entrants may not find the current equity returns in the sector sufficiently attractive unless they have a significant operating advantage or can integrate sludge treatment and recycling with other activities such as energy generation.

However, commercialising sludge treatment and recycling through separation and activity specific price controls is a practical and logical first step in unbundling the wholesale service. Exposing comparative costs and services, commercialising intra-group relationships and setting benchmarked prices can increase efficiency pressures and help drive cultural change and innovation across the wholesale business.

The key to this is to define precisely the boundaries of responsibility and the loading into and out of the processes. Provided existing assets are charged for, or sold, at a value that reflects their share of the regulated capital value (RCV), there are negligible negative impacts on customers or existing investors. Moreover, as the RCV discount unwinds over the relatively short life of the assets, services can become increasingly contestable.

To that end Ofwat should mandate a degree of functional or legal separation of sludge services to allow for separate price controls to be set in 2020. The control should be determined by a comparison of gate fees charged by the newly separate SludgeCo to the residual wholesaler.

Companies should be able to choose to take separation further by, for example, letting a commercially based arm's length contract to an associate.

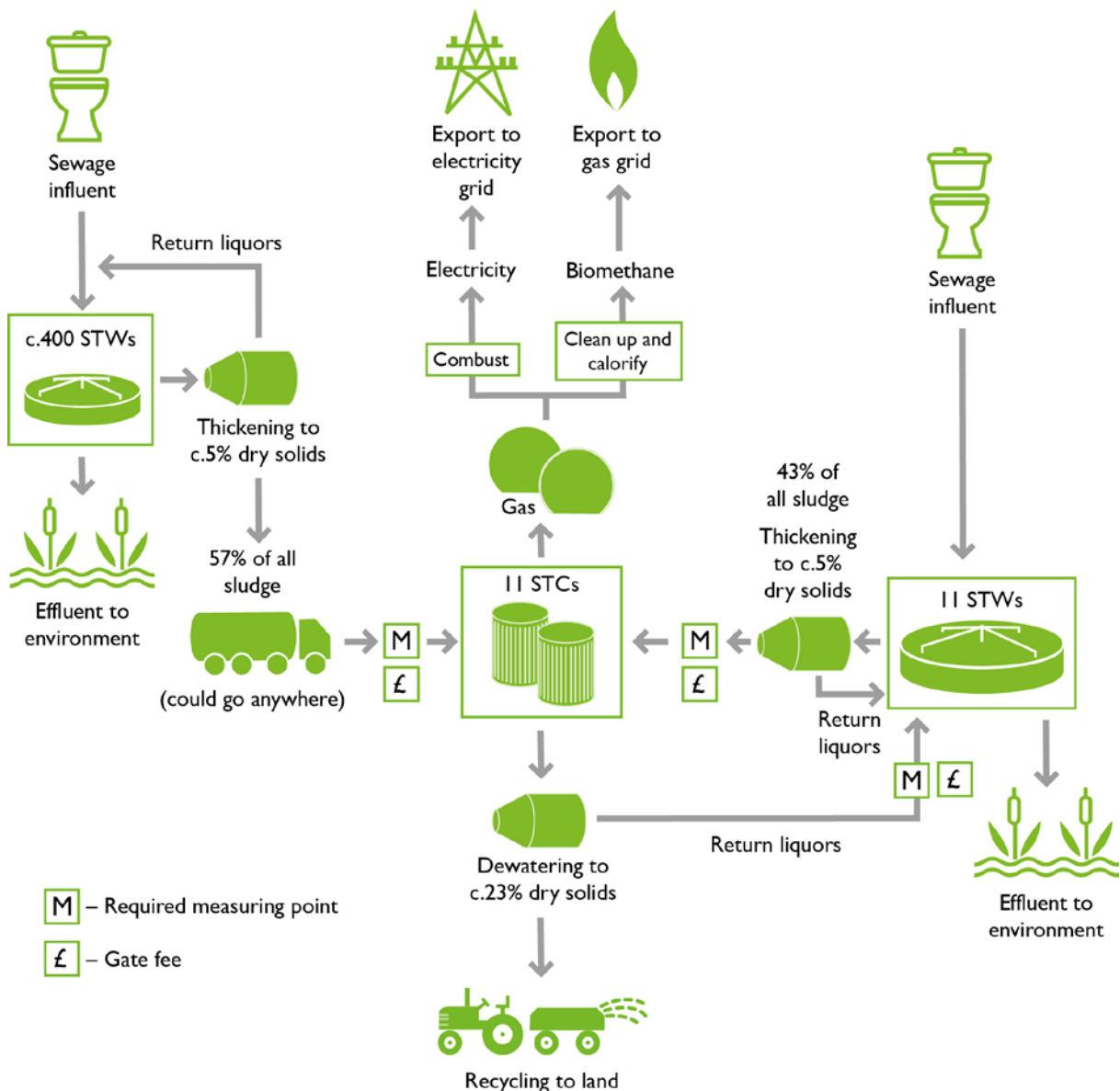
In the longer term the capital value discount will be unwound and this, coupled with continued innovation in energy generation, will lead to greater potential for competition. Experience in the external anaerobic digestion market suggests there are now hundreds of sites built over the last five years. Most sites treat varying degrees of feed stocks ranging from food waste, crops and slurries. Compared with sludge treatment some of these facilities are running at a higher investment risk profile because they do not always have a guaranteed feedstock and the feedstock itself is not necessarily homogeneous. Yet this higher risk (and assumed higher cost of capital) has not deterred investors. It follows that it is entirely possible that future generations of investors would view sludge treatment as a potentially attractive proposition.

Background to sludge treatment and recycling

Sewage sludge is a natural residual of the sewage treatment process. Its treatment and safe disposal is a legal requirement currently placed upon the holders of Sewerage licences. Over the years recycling routes have narrowed as disposal obligations have tightened. Prior to privatisation it remained possible to discharge untreated sludge to sea and land. Today raw sludge is subject to treatment through a range of methods including lime stabilisation, anaerobic digestion (AD), thermal drying and incineration.

Sludge treatment does not occur at every sewage treatment works, rather it is largely focused at large treatment centres with raw sludge being “trucked in” from smaller sewage works. Typically, fewer than 5% of sewage treatment works are also sludge treatment centres. Treatment prior to trucking is generally limited to thickening to reduce transportation costs. Sludge treatment does generate “return liquors” which require further treatment. It is common practice to return these to the sewage treatment process as if they were a trade effluent.

Figure 1: The sludge process at Wessex Water



The accounts of the water and sewerage companies (WaSCs) suggest that sludge costs should constitute c14% of the typical waste water bill¹. This assumes:

- capital maintenance charges equal capital maintenance costs
- the return is determined by the regulatory weighted average cost of capital (WACC) assumption applied to the proportion of the RCV accounted for by sludge assets within the net waste modern equivalent asset (MEA) values², and
- the MEA figures in the accounts are prepared on a consistent basis across companies, and are representative of the investment costs to an entrant.

If returns were based upon the net MEA values themselves sludge costs would be c15-20% higher.

In the UK sludge treatment has predominantly been undertaken by the WaSCs themselves, although it is common to outsource recycling to third party hauliers. By contrast water utilities in parts of Europe more frequently outsource sludge treatment to commercial third parties. There are a variety of ways in which this is done, from simple operating contracts to design, build, operate and transfer deals.

Sludge can be a valuable product. Over the years the focus of disposal has been to apply sludge to land as an agricultural fertilizer. This can generate significant revenues but its greater value today is as a source of energy created through anaerobic digestion (AD). This process generates gas that can be either injected directly to the gas grid or combusted directly in combined heat-power engines to generate electricity.

The process is not new. Gas has been used to generate electricity for use at sewage works for many decades. The amount of gas and electricity produced has increased in recent years as anaerobic digestion technology has advanced, the volume of sludge has increased, renewable energy subsidies and landfill taxes have grown, and the price of power has risen. These factors have simultaneously encouraged private equity to invest in anaerobic digestion capacity using fuels such as food waste, energy crops, green waste and farm slurries. When combined with the WaSCs these players may generate 10,000-20,000GWh per annum of power by 2020, which is broadly equivalent of half of the output of the Drax power plant.

Farmers face a similar challenge to WaSCs in the disposal of farm slurries, however the value of agricultural slurry is general less than sewage sludge due to its lower calorific value and the fact that treatment process can be disproportionately expensive to the agricultural community. Farmers are consequently faced with the challenge of storing large amounts of slurry in pits without treatment processes before it is returned to land. Unsurprisingly, farm slurries are one of the primary sources of pollution that in turn necessitates WaSCs to invest in additional treatment capacity to reduce nutrient levels in water bodies. Resolving these issues through more integrated markets could reduce water and sewerage bills as well as delivering wider environmental benefits.

What are we seeking to achieve?

The primary objective of any reform should be to improve the quality, efficiency and sustainability of water and sewerage services to customers, and to society more

¹ Sludge prices may not in practice mirror this cost allocation but this paper does not have visibility on current tariff setting assumptions of individual companies.

² $WACC * (Waste RCV * (sludge nMEA / Waste nMEA))$

generally. Change in the sludge market can help meet this objective. The form of change may include separation and possibly liberalisation.

The case for separation would be that in a large integrated monopoly it is often difficult to shine sufficient light on each activity so to ensure it is delivering as efficiently as possible. This should be a problem for management to address. However, it is at least possible to argue that external pressure, either in the form of tighter regulation and/or commercialisation will bring greater focus on efficient operation in a way that cannot be achieved solely by regulating the integrated monopoly.

Recent developments in regulation and competition in the sector could facilitate further separation, including introducing more focused price controls. However, such a move does require accurate and transparent cost and other information, and potentially some change in organisational structure and governance. Even a modest change would come at a cost. To go further and liberalise the sludge market may require difficult choices to be made between the potential for third party entry on the one hand, and customer bills or investor returns and credit quality on the other.

These issues are however common across the entire value chain and will affect decisions in respect of other potentially contestable areas. In tackling them sludge treatment and recycling is an obvious place to start as:

- in comparison to other assets, sludge constitutes a relatively small part of the business accounting for less than 1% of the asset base as measured by net MEA
- it uses relatively short-life assets so enabling a relatively rapid removal of distortions caused by the capital value discount
- it is not part of the more naturally monopolistic network assets and there is a choice of technologies and operating practices
- the market is growing, with potential interest from entrant investors, and
- there is precedent to draw from in Europe.

Does sludge treatment and recycling need to remain part of the functions of a sewerage undertaker?

For as long as the sewerage undertaker remains a natural monopoly, customers and retailers have limited choice over who provides sewage treatment³. As sludge is a natural residual of the sewage treatment process it seems competition in the market is difficult and consequently economic regulators may have to continue to set prices which allows undertakers to efficiently meet their obligations.

That said, sludge treatment and recycling is not part of a natural monopoly and sewage treatment undertakers do have a choice over who should provide these services. Options include an operating division of the undertaker, an associate non-regulated company, or a third party. This potential for competition for the market raises two further questions, namely whether the regulator should:

- mandate that, whilst the sewerage undertaker retains its obligations under the licence, it can no longer undertake sludge treatment and recycling activities for itself and instead must run a competition for the sludge services

³ It is recognized that by-pass may be possible in certain circumstances, notably where there are new developments on green field sites.

- remove the obligation to compliantly dispose of sewage sludge from the sewerage undertaker and create a new sludge-only licence that could be auctioned to third parties.

Separation and setting separate price controls for sludge treatment and recycling

Improved transparency can be achieved through some form of separation of sludge treatment and recycling activities. With it would come meaningful comparability which should allow a “market cost per tonne treated” to be established from which an efficient regulated price can be determined or market auction held.

There are five broad options for separation which are described below:

Options	Accounting separation	Functional separation within the regulatory ring fence	Legal separation within the regulatory ring fence	Legal separation outside of the regulatory ring fence	Separate ownership
Implications					
Structure and governance	Single central management team with joint responsibilities	Separate internal business units and management teams	Separate companies and boards made up of execs, one lead licensee independent non exec (iNed) & an auditor to provide scrutiny	Separate companies with separate Boards with separate independent non executive directors (iNEDs)	Divestiture of operating functions to new owners
Costs and service	Ex-post centrally determined	Ex-ante determination, potentially business unit driven	Arm’s length trading but shared cost allocation remaining	Arm’s length commercially based trading	Commercial trading
Culture	Focus on compliance with regulations	Focus on cost minimisation	Greater focus on profit maximisation	Focus on profit maximisation	Focus on profit maximisation

Accounting separation is largely in place with activities reported each year in the regulated accounts. However, measurement of interfaces between sewage and sludge treatment is poor and allocations may be largely ex-post and often centrally determined. Decisions also remain over the valuation of assets and whether the numbers meaningfully reflect a commercial situation.

Functional separation may well not be a major step for many companies to make, and could improve the reliability and accuracy of data provided that there was meaningful business unit autonomy, activity based costing and internal trading.

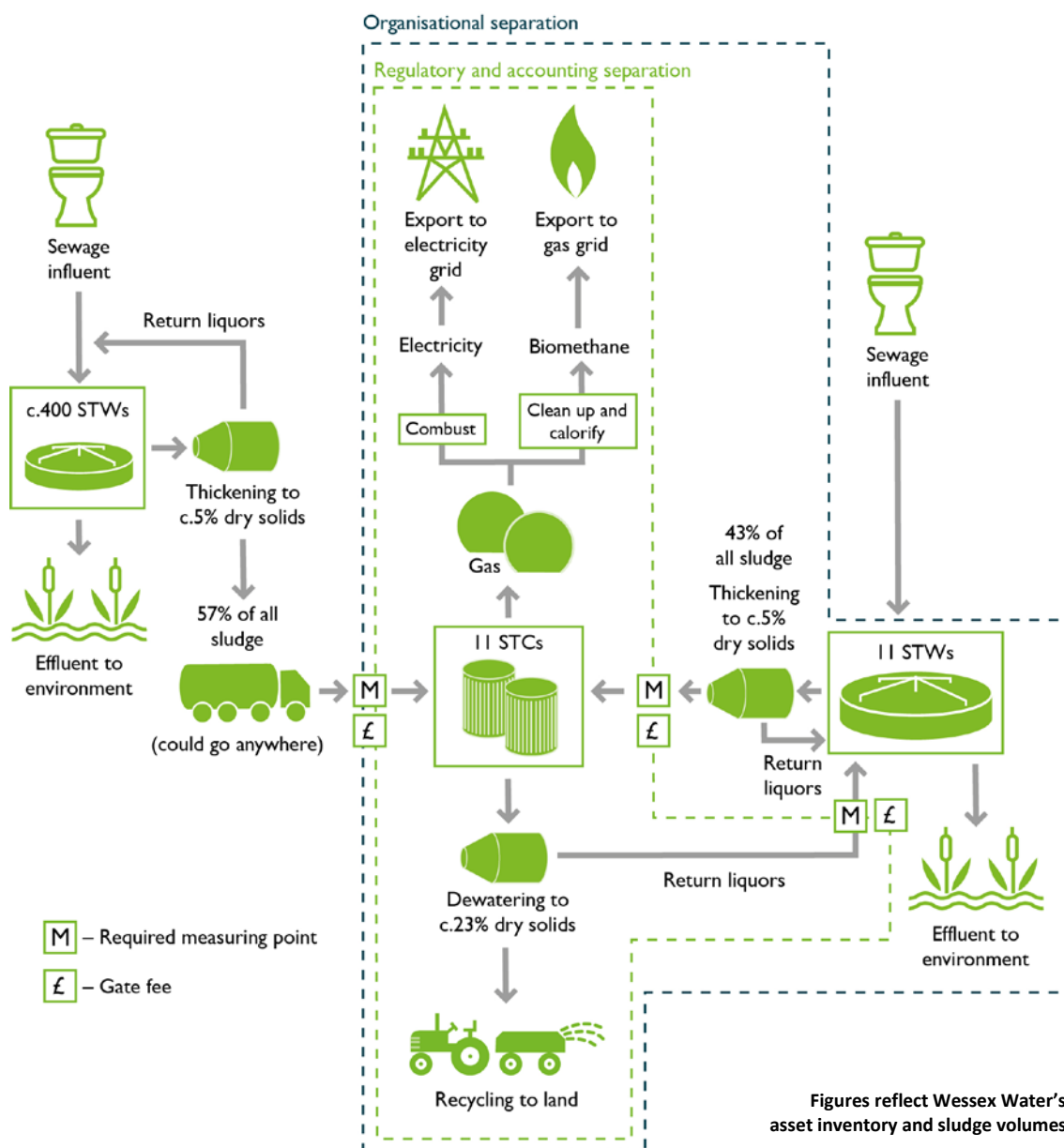
Legal separation would largely overcome these concerns, particularly if the company is moved outside of the regulatory ring fence, but ultimately that depends on who is the primary decision maker. If that remains the group CEO or the shareholder then, whilst mitigants such as iNEDs can be put in place, there is always the potential for “game playing”. If this is a concern it can only be resolved by ownership separation or divestiture and subsequent auction of the sludge Licence from other activities.

What should be separated?

As sludge treatment is often undertaken at a limited number of sewage treatment sites the day to day operation of the joint facilities is often seamless. Labour and supervising management are common, power, chemicals and materials are jointly purchased and issued, and sludge liquors returned directly to the sewage treatment process. Operational separation would therefore come at a cost.

This begs the question whether “regulatory separation” should be different from “operational separation”. This would mean the financial arrangements being different from the governance and control arrangements⁴. The problem with making that distinction is that once clear accountability for a particular activity is lost so too are some of the potential benefits of separation.

Figure 2: Sludge separation – regulatory vs organisational separation



⁴ As is the case in airports where, whilst using the same infrastructure, landing slots and passenger handling are clearly differentiated from retailing.

A solution to the latter problem would be to separate the site(s) undertaking combined sewage and sludge treatment activities rather than the activities themselves. This is the model followed by GENeco at Wessex Water's largest treatment works (see case study below). Care would be needed that this didn't lead down a path of geographic disaggregation of wholesale charges with all the associated customer and political reaction that would follow.

Case study: GENeco

In 2009 Wessex Water created GENeco, (now a functionally separated division of Wessex Water Services Ltd) to undertake sludge treatment services at the largest sludge treatment centre in the region and at an additional treatment centre that was physically separate from the nearby sewage treatment works. GENeco charges internal gate fees to the wider Wessex Water operational business to treat sludge at its own sites rather than those managed and operated by the integrated utility.



Traditionally vertically integrated sewerage utilities had been focused on cost reductions to meet regulator imposed RPI-X based efficiency targets in the face of tighter environmental standards and treatment requirements. Since its creation the tighter management focus of the GENeco organisation has assisted it to identify and exploit revenue generating opportunities by realising the value of sewage sludge as an input to the energy and farming sectors. The additional revenues and reduced costs for the regulated business have materially reduced sewerage bills to Wessex Water's customers as a result. Today GENeco's services range from food and liquid waste treatment and recycling to the composting of difficult to treat biodegradable material. GENeco's treatment processes produce renewable energy and nutrient rich biofertilisers which offer a sustainable and cost-effective alternative to inorganic fertilisers made from chemicals.

GENeco generates around 40GWh of renewable energy annually (a 53% increase since its operations began), recycles over 250,000 tonnes of biosolids to land each year, and has built and operates a 40,000-tonne food waste recycling facility. Other innovations include the composting CompAer process, diverting 10,000 tonnes of previously untreatable material from the sewage treatment process from landfill—an industry first—gaining planning permission and securing investment for the development of four wind turbines which will deliver a further 20GWh/ann of energy and the recent completion of the UK's largest Gas-to-Grid facility injecting bio-methane derived from sludge and food waste digestion.

GENeco's success in identifying and maximising revenue streams in related waste treatment and energy generation markets has created additional earnings for the group and has further benefited sewerage customers in the region where this has involved greater use of the regulated utility's existing assets.

Issues arising

The questions to be addressed in respect of separation therefore are:

- how far the separation process needs to go to deliver dynamic efficiency benefits and any balance between those benefits and increased separation costs
- whether this should be a matter for the company or the regulator
- whether it is practical to separate sludge and sewage treatment.

We consider that time and effort should be put into debating these issues, however at this stage we consider that a “step by step” approach is appropriate where the regulator mandates a minimum level of separation whilst allowing managements to go further should they so choose. Going further may include internal separation of certain sewage and sludge treatment facilities and/or letting contracts to associate operators.

Success can be evaluated at the appropriate point, with the regulator retaining the option to go further, including divesting and auctioning the sludge treatment and recycling licence.

How would separation, commercialisation and separate price controls work?

This paper assumes that it is decided to move “step by step” rather than jump to a separate auctioned sludge licence, and/or separation of combined sewage and sludge treatment centres.

On this basis it is suggested that commercial arrangements, supported by separate price controls, are put in place between a sludge operator (SludgeCo) and the sewerage undertaker (WaSC).

The commercial arrangements could be as follows:

SludgeCo charges the WaSC a gate fee per unit of sludge delivered for treatment and recycling, either regionally or site by site covering:

- variable costs of treatment
- SludgeCo overheads including any recharges from the WaSC or HoldCo
- fee for an agreed asset maintenance schedule to maintain supplier of last resort capabilities
- fee for assets leased or sold to SludgeCo
- annuity to recover planned (and agreed) new capacity
- the cost of working capital on agreed credit terms
- profit (if any).

SludgeCo will pay the WaSC:

- lease payment for use of assets not sold to SludgeCo
- treatment charge for the return of liquors⁵
- any corporate or group services used
- damages for performance failures in contract
- profit sharing fee for use of assets to treat third-party sludges.

In addition there would need to be contractual conditions on SludgeCo related to treatment capacity for the returned liquors and to address compliance risk at the sewage treatment works.

SludgeCo can sell gas or power to the WaSC at a commercial price provided it has paid separately for energy assets.

⁵ This should be based upon the trade effluent formula, but with potential enhancements such as charging for the ammonia load, which is typically very high in returned liquors and a critical parameter for the sewage treatment works.

SludgeCo would be free to generate and sell power and gas, receive ROCs and FITs, and to undertake sludge activities for third parties provided it were legally separate and outside of the ring regulatory fence.

Based upon comparative gate fee data that is revealed the regulator would set a separate price control for sludge treatment and recycling from 2020.

Asset valuation

It will be important to determine at what price the appointee should rent or sell existing treatment capacity. As the table below highlights the decision is largely dependent upon what the objective is. If it is to improve transparency, comparability and accountability as a means to deliver more efficient sludge services through separation and a progressive move towards market reflective prices, then the implications on customers and existing investors are limited and probably manageable. If the objective is to liberalise water and sewerage services more generally, either through competition within or for the market, then precedents could be created which make difficult decisions over bills or returns inevitable in the longer term.

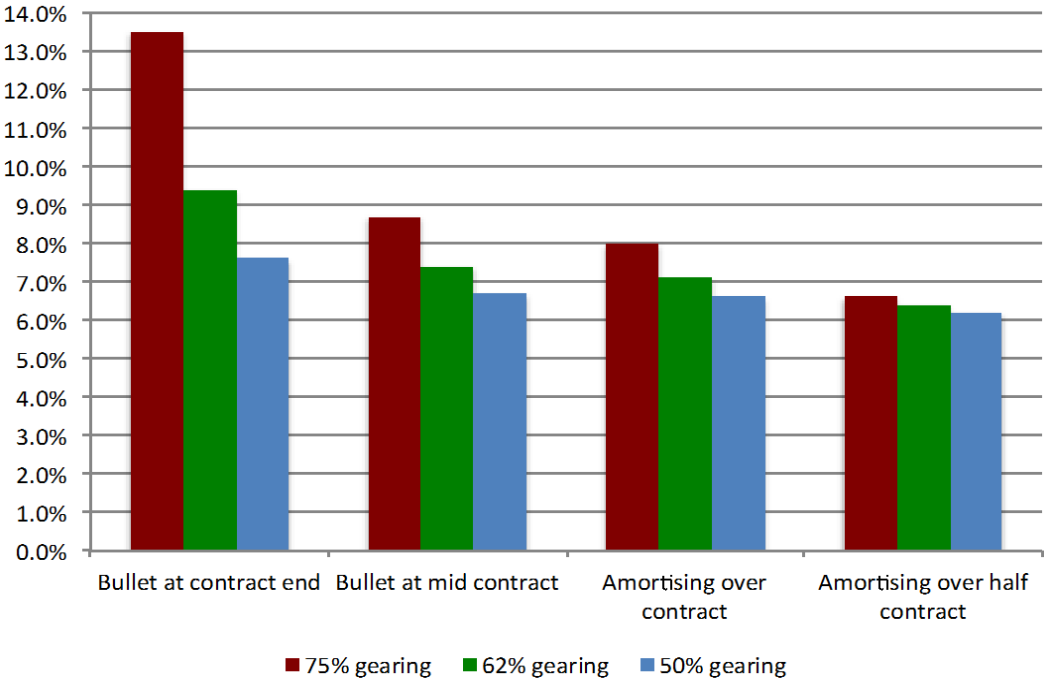
Sludge asset charged to NewCo at...			
	Existing RCV allocated on basis of share of net MEA	Net MEA with compensating adjustment to residual RCV	Net MEA with no compensating adjustment to residual RCV
Impact on...			
Customers	Bills unchanged	Bills unchanged in aggregate but marginally rebalanced	Bills increased and rebalanced
Investors	RCV, equity and cashflows unchanged in aggregate as appointee retains decisions in respect of totex	RCV, equity and cashflows unchanged in aggregate as appointee retains decisions in respect of totex	Value increased by value of net sludge MEA over its share of RCV.
	RCV would be reduced if assets sold but £ for £ swap with cash	RCV would be reduced if assets sold, but £ for £ swap with cash	
Competition in sludge services	Services initially priced below market reducing scope for innovative solutions, however this unwinds through time as assets are replaced	Sludge services priced at market marginally improving scope for innovative solutions	Sludge services priced at market marginally improving scope for innovative solutions
Competition for other contestable water and sewerage services	Gives reassurance on integrity of RCV but reduces scope for entry or innovation	Creates precedent that should facilitate third party entry Raises concerns over increased risk of stranding, integrity of RCV, and financeability	Gives reassurance on integrity of RCV and provides scope for entry or innovation

Is third party entry to the sewage sludge market likely without a licence?

RCV allocations issues are less where we are seeking to make the market for new capacity contestable. However, it is infrequent that such an opportunity occurs. Whilst growing, sludge volumes are relatively mature. Moreover, when new capacity is created it frequently occurs on or adjacent to existing assets. Even when that is not the case Licence holders also benefit from their use of statutory powers and access to land.

Non-licenced entrants are also likely to be hampered by the cost and terms of finance that is available to them. The capital markets perceive that a sewerage undertaker benefits from a perpetual licence⁶ and as such its debt will be consistently rolled rather than repaid. This benefit is not likely to be available to a non-Licenced entrant with a time limited contract. Even if such a company could obtain finance at the same price as the licensee it is likely to have to be repaid, at best, at the end of the contract. More likely still is that the entrant will obtain bank finance with lower levels of gearing and which would amortise over less than the life of the contract or asset. The consequential impact on equity returns, which is illustrated below, is likely to reduce the willingness of investors to enter the market solely for sludge treatment where they are expected to either buy or build assets.

Figure 3: Nominal equity returns for a given financing structure



That said, current evidence suggests entrants may undertake sludge treatment through AD as part of a broader energy generation business. Seeing sludge as a fuel to a business which generates higher non-regulated equity returns may be attractive to some.

⁶ Undertakers’ licences are granted on a 25-year rolling basis. However, the debt markets consider the licence to be effectively perpetual as the services provided under the licence are always going to be required. As such, even if the licence of a particular appointee were terminated, its obligations to its creditors will be transferred to a new regulated appointee. This understanding has proved crucial to obtaining the low cost long dated paper that predominates in the sector.

Way forward

Without a licence change which removes and subsequently auctions the obligation to dispose of sewage sludge, it seems unlikely that sludge treatment can become contestable. End customers and retailers have little if any choice over their service provider, and non-regulated entrants restricted solely to sludge treatment and recycling activities are unlikely to find the equity returns attractive.

However, commercialising sludge treatment and recycling through separation and activity specific price controls is practical and should deliver more efficient and sustainable services. Moreover, provided care was taken over the valuation of assets, this approach would also ensure “no regrets” when considering if and how to liberalise contestable parts of the supply chain.

To that end we would propose the following:

- minimum functional separation of sludge treatment and recycling by 1 April 2017 with:
 - governance requirement of internal trading and identified iNED supervision and audited accounts
 - commercial arrangements to include determining gate fees on the terms identified above with incumbent assets leased at RCV allocated on basis of net MEA
 - no freedom to sell power to third parties or undertake third party treatment within regulatory ringfence except to the sole benefit of incumbent customers
- the freedom to legally separate sludge treatment operations and sell incumbent assets to an associate company based upon the same valuation principles established in the gate fee, together with a regulatory commitment not to confiscate unregulated profits for the benefit of water and sewerage customers
- separate price controls to be set for sludge recycling from 1 April 2020
- review to be undertaken in 2023.