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Research

Exploring the potential of an Infrastructure Investment Fund

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Material Focus

Evaluating opportunities to establish an investment fund for WEEE infrastructure

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Evaluating opportunities for establishing an infrastructure investment fund for WEEE

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Executive summary

The purpose of this research was to evaluate the opportunities for establishing an infrastructure investment fund for WEEE, to better understand the challenges and opportunities in WEEE system and how investment could overcome and take advantage of those changes that are currently just out of reach for economic reasons.

As part of this, the research looked at different parts of the system to assess the future investment potential of the sector, in the interests of establishing funding, and understanding how any funding could be best focused, alongside other areas that will enable an increase in recycling. Through research and stakeholder interviews, we found that establishing a fund is not the sole solution to improving the WEEE system and simply making investment available was unlikely to have a lasting positive impact, according to views of the stakeholders across the WEEE system.

There is a growing rate of consumption of electronics with sales of EEE estimated to be between 1.6mT to 2.5mT per year by 2030. In the context of end-of-life electronics (WEEE) this raises questions about the current market capacity, potential for growth, and if further investment is required in readiness to be able to collect and recycle the electronics being replaced. Prior research shows there is a significant amount of WEEE that is not being captured through the reported system and permitted sites. In total around 300kT of WEEE are lost each year to household and commercial mixed or residual waste.

Despite the expected growth in WEEE, investment is not forthcoming and private investment sees the risk and reward ratio for WEEE recycling as unfavorable for return on investment or puts lending prices and criteria out of reach to operators seeking financial support. Market dynamics have reduced the current number of permitted AATF[1] operators. The number of large AATF sites has fallen from 90 to 84 between 2013 and 2019, and smaller sites have fallen from 182 to 103 in the same period. This has resulted in fewer sites available to treat WEEE. Despite these trends there still appears to be over 140kT capacity available from the remaining AATF operators.

We found from the research that the prices commanded by recycled material is not comparable to the equivalent market trading prices. This makes the commercial case for increasing WEEE recycling less viable. Counter to published research and reports, stakeholders suggest average London Metals Exchange market prices are 4 times higher than the reality in some materials, in part because the quality of the metals derived from WEEE is lower grade e.g., copper is £1,000 instead of £5,000/T and the composition of plastic means there is a cost of >£100/T instead of a rebate. The lower market rates seen by WEEE recyclers are comparable with the price of lower quality grades of non-ferrous metals traded.

As a result of these findings, it appears premature to establish an infrastructure investment fund to build new capacity and try to compete against the current market in its current form. There are wider systemic issues that we have heard from industry and other opportunities elsewhere can be addressed. Based on the findings, four options are presented to make the sector more investible. These options are equal in weighting but collectively could have a greater overall impact on the WEEE sector.

[1] An Approved Authorised Treatment Facility for WEEE which can issue evidence notes on behalf of producer compliance schemes.

Opportunities to improve infrastructure investment

To intervene with suitable investment fund opportunities and progress a priority of options, a summary of the ideas and best practice from the long list is presented in the top 4 recommendations. These are options to consider individually or combined, but in no order of priority. This short list of options addresses some of the barriers and opportunities to make WEEE infrastructure activities more viable in the long term, and build a stronger business case for outside investment in infrastructure and recycling activities. This short list offers options for investment across the broader supply chain from the feedback and findings gained through the research and engagement activities.

These ideas have been developed as the basis for future work in testing and application of the project frameworks described, by building them into more refined business cases or project plans in partnership with other key stakeholders.

We have included a narrative about the possible barriers for implementation, framework of project and approximate timelines.

Option 1; Mandatory WEEE treatment standard for any waste permitted site handling WEEE

The option based on the improvement of treatment quality, suggesting that greater value could be recovered from WEEE than is currently the case. Development of new or adoption of existing quality standards, with appropriate enforcement, could bring clearer and measurable comparisons between different recycling facilities, so that it is clearer to compare different activities against a common standard. If only permitted sites can handle WEEE, then external economic conditions, such as commodity prices, could have a reduced effect on whether WEEE ends up in a licensed, or unlicensed facility.

Barrier to implementation; operational cost increases for those sites not already achieving the newly imposed standards. Would result in far-reaching impacts across the waste management sector because all site operators would need to meet the new standards if WEEE arises, especially for those where WEEE is not the target waste stream but does occasionally arise.

Framework; development of new (or adoption of existing e.g. CENELEC) standard that requires any site handling WEEE to meet the requirements as a condition of their site waste permit. Implementation date set in the future to allow for awareness, site updates, registration system and independent governance system to be setup. Standards would cover handling practices, processing, and recovery rates for material fractions.

Timeline; 12-18 month development of any new standard, then up to 12 months (or end of compliance period) before implementation deadline to allow for adoption by industry. Mandatory measures would take considerably longer.

Option 2; Grants for developing new Tier 2 and beyond WEEE derived material recycling infrastructure

Stakeholder feedback suggests there is more that could be done for secondary processing in terms of processing to increase material value and capturing this value within the UK. There appears to be existing primary processing capacity within UK infrastructure already, which recover the more prominent ferrous and non-ferrous metals, albeit the quality of this is not clear as suggested by some respondents, who said values are lower than the open market data suggested. This may leave a gap in the market for improving quality of metal recovery and precious metals that are more advanced in the separation processes, that may be more suited to tier 2 or additional activities and infrastructure alongside tier 1 facilities.

Barrier to implementation; uncertainty of business viability beyond that of start up grant, appetite for risk (material supply and commodity market volatility) of current banking investor sector is low for WEEE sector, longer term supply contracts with AATF's (or similar) would be necessary to maintain adequate volumes for technologies to work and validate a business case.

Framework; a grant fund for establishing new downstream material recovery or as part of existing AATF's that are recipients of WEEE or WEEE derived materials from UK AATF's. Applicants would need to

demonstrate adequate scalability of the operations that can treat the off takes from AATF's in the grades and volumes that arise, and at a competitive rate to that of the overseas counterparts that we understand more material is currently flowing to. Applications can be scored based on impact, longevity and business case strength and evaluated by an independent panel.

Timeline; This could be a quick win once funding is identified and management organisation can oversee judging and implementation of the infrastructure, whilst supporting startup operations.

Option 3; Understanding and addressing the challenge of lost WEEE

There is evidence from the Material Focus 'Electrical Waste - Challenges and Opportunities' report as well as stakeholder feedback, that there is more to be done to capture WEEE through the official system. The loss of household WEEE (155kT/year) is being tackled through awareness, education and behaviour change, however there are still concerns around business derived WEEE, be that Commercial and Industrial (C&I) waste (145kT/year) and/or Business to Business (B2B) asset managed (90kT/year) disposal practices that may not be entering the official system and whose whereabouts is not clear. Further work could be done here to address these losses.

Barrier to implementation; Advocacy of recycling from the general public is increasing, but volumes of WEEE recycled through the reported system are not seeing the same increase. Embedded behaviours and lack of understanding for correct disposal in the home and workplace are difficult to engage.

Framework; More targeted project to engage with end users (businesses) to identify why and how WEEE is being lost from the official system. Volumes have already been calculated for C&I and B2B through prior research, but greater understanding is necessary to challenge these behaviours before providing an alternative service or behaviour change program to capture these losses.

Timeline; Preliminary research within 9 months, before campaign design and roll out after a further 6 months. There is a consensus amongst stakeholders that any recycling campaigns need to be regular and long lasting to have an ongoing impact. This would need to be considered in a project design as well as longevity of funding to support activities.

Option 4; Improved system stability and certainty

The EPR policy review provides an opportunity to overcome some of the barriers identified from this research and address the instability in supply agreements that recyclers say are holding them back from investing, whilst recognising the benefits of a competitive environment for collectors and PCS's.

Barrier to implementation; Local authorities and waste management operators have existing contracts that last a number of years, whereas producer compliance schemes contracts to clear these sites on behalf of member obligations, are much shorter. Local Authority waste management agreements (some long term private finance initiative) are also not all in sequence so a blanket UK wide update would be challenging to modify simultaneously.

Framework; A revision to the EPR policy requires industry wide consultation and various impact assessments. A better understanding is needed of what type of treatment and the capacity of each that is necessary to support the WEEE arising and being channeled into the official reported system. What does this look like financially through EPR funding, and what would be required to achieve this. Modelling the impact of revised arrangements between Local Authorities, their waste management operators, PCS's and the recyclers on minimum contract duration and volumes necessary to initiate investment would help blueprint a model for stabilisation.

Timeline; The current WEEE Regulation reform may be an early opportunity to address some of the knowledge gaps, and re-designing the arrangements between PCS and the Local Authorities. Lessons may be learned from the Packaging Regulation Reform and could set a precedent for alternative WEEE system setup beyond 2023.

Short term and longer term investment impacts

The evidence found in the research shows only small scale levels of investment into the WEEE sector. However, the possibility of a fund supporting a positive change to the market looks possible in a market with declining recycling rates, increasing volumes of EEE sold and consumed, and the quantified losses from the official system in prior research. In this section we take the 4 options and consider how an investment fund might be used against each, if applicable, and the short and longer term viability of the options for consideration.

Investment options potential outcomes

Option number	Activity	How investment might be financed short term	Longer term impacts
1	Mandatory WEEE treatment standard for any waste permitted site handling WEEE	Increases in operational costs to achieve mandatory standards subsidised by EPR system through supplier price negotiations. Ultimate cost increases carried by PCS & producers, but may help incentivise WEEE to be channeled into these operators achieving the standard.	Stabilised market with harmonised and more clearly defined and applied standard to recycling, financially supported through EPR system and producer fees.
2	Developing new Tier 2 and beyond WEEE derived material recycling infrastructure	Grant funded kick-starter funds to support operations gain a foot-hold in the supply chain against traditionally non-UK downstream customers. Geography and impact of UK-EU trade negotiations may help this become more viable or attractive to the UK market or those seeking to secure precious metal fractions and/or recycled content for new products.	Higher quality material extracted and captured in UK creates self-financing system (more value extracted increases revenue). Where businesses use these green commodities, the product credentials can be used as a market differentiator compared to virgin sources. On-going start up funding may be necessary to start other new material operations. However if business case is robust with early test cases, investors may take this forwards independently.

Option number	Activity	How investment might be financed short term	Longer term impacts
3	Understanding and addressing the challenge of lost WEEE	C&I and B2B research and awareness campaigns are included in current research projects being considered by Material Focus. Areas like commercial waste and asset disposal, and theft of WEEE are reported to be other major losses but little is known about the behaviour and/or motivation of end users and collectors. Research fund to understand and then target action to address these supply chain losses.	On-going support campaigns would be needed for behaviour change campaign delivery after initial research identifies why and where supply chain losses are most prominent, if this is the root cause of why WEEE is lost to these destinations.
4	Improved system stability and certainty	N/A - Policy changes would not seek funding.	Changes would be embedded into the WEEE system, and impacts of these challenges can be reflected upon retrospectively in subsequent analysis of WEEE system.

Further development of these project ideas should be collaborative, so that stakeholder needs are recognised and to increase the probability of a long-lasting solution. A better approach is an integrated one, and it is believed that where these options are employed together, they would complement each other and reduce the overall risk of investment in the industry.

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Acknowledgement

We would like to thank all those stakeholders from the WEEE system that have participated in this study. We are grateful to those who engaged through our webinar workshop, and to those who responded to interview questions and provided firsthand evidence on the WEEE market that has helped to provide a clearer picture of the state of the WEEE market and the challenges and opportunities that exists.

An assessment of key UK WEEE sector infrastructure

This report profiles the types of investment that could be made in the UK WEEE sector, considering the different potential economic, environmental and social impacts.

It examines the historic and current performance of EEE sales and WEEE collected, profiles the UK's major WEEE recyclers, and summarises trends in product supply and material sales. It also forecasts what the market might look like in the future and identifies upcoming challenges, such as targets, capacity pressure, and new product supply models.

The research has captured current investment models for WEEE and for the waste sector as a whole. It summarises barriers and opportunities for investment and proposes options to consider in establishing an infrastructure investment fund for WEEE.

The conclusions highlight some possible interventions to support the development of new infrastructure in the UK.

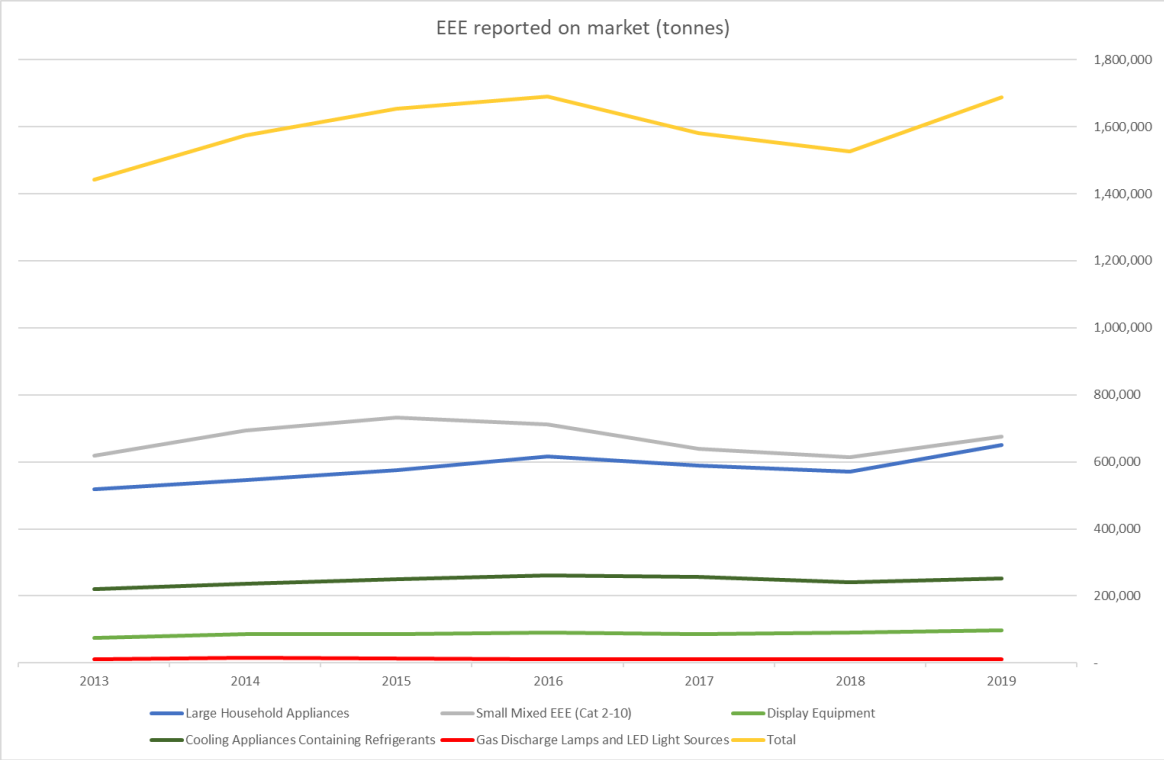
The current state of the market

Historic EEE sales and trends

WEEE recycling is reliant on a supply of material from end users, with a focus on household WEEE which drives most of the UK reported system. We can look to historic sales trends, to help anticipate future market requirements:

- The total weight of EEE sold has tracked between 1,424Kt – 1,689Kt since 2013. We have excluded Photovoltaic Panels from this chart because the sales trend was significantly distorted by the final year of higher rate Feed-in-tariff eligibility for installs up to 2013 . After 2013 the weight of PV placed on the market each year stabilised to 20-50Kt.
- The weight of large household appliances and cooling appliances sold has steadily increased over time, but this has been offset by the decreasing weight of display equipment and fluctuations in sales weight for Small Domestic Appliances (SDA) also known as Small Mixed WEEE (SMW).

Figure 1; EEE reported on market (excluding Photovoltaic Panels)[2]



Historic WEEE collection and trends

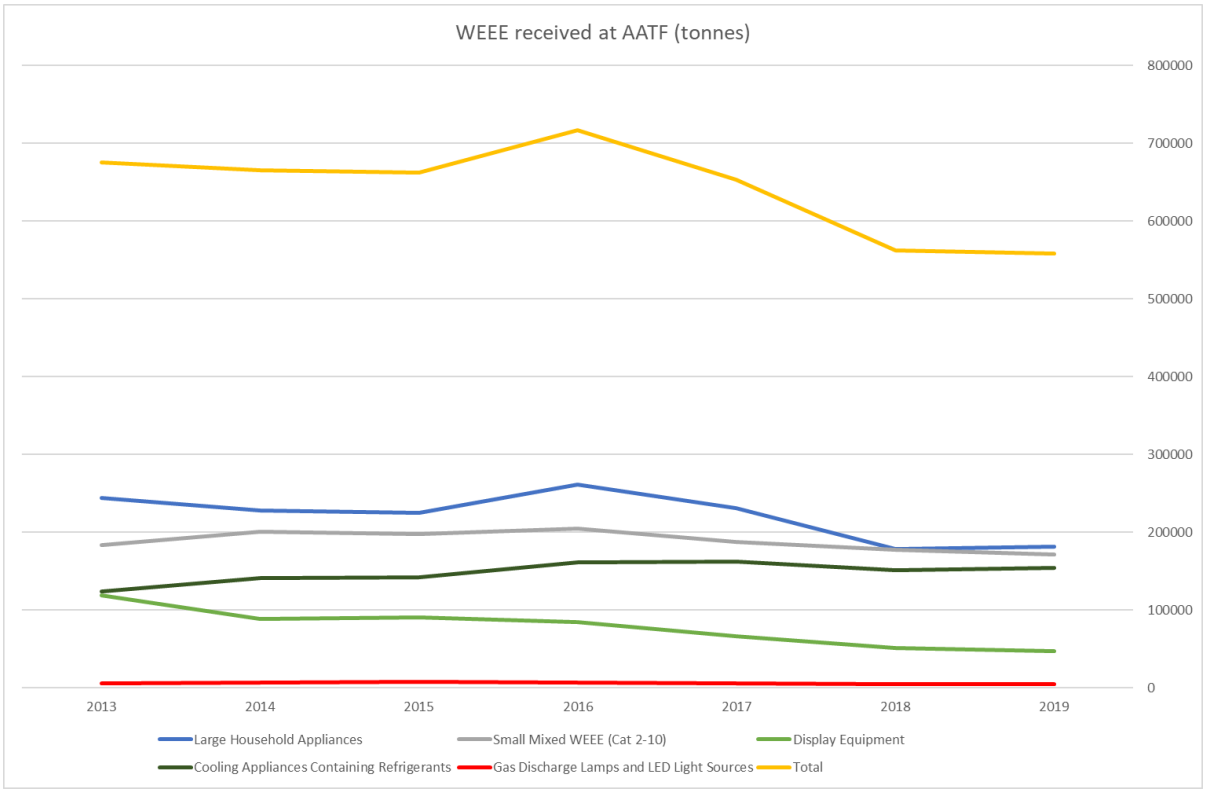
[2] https://www.gov.uk/government/statistical-data-sets/waste-electrical-and-electronic-equipment-weee-in-the-uk

The UK WEEE system relies on Authorised Approved Treatment Facilities (AATF's) to recycle and report processing volumes to meet UK targets. In addition to this, further volumes from substantiated estimates contribute towards EU recycling targets. Recycling activities reported by AATF's are supported by downstream processing performed on separate sites which are permitted as Authorised treatment Facilities (ATF's).

Points of note are:

- The weight of WEEE received by AATF's has decreased from 717kT in 2016 to 558kt in 2019.
- 2016 was the peak during the last seven years, 2019 was the lowest.
- The decrease in the weight of WEEE being processed by AATF's and their downstream ATF's between 2016 and 2019 is 22% – equivalent to ~159kT tonnes.
- The trend in WEEE tonnages processed inversely reflects the scrap metal prices i.e. when reported WEEE recycling falls down, scrap metal prices are higher.

Figure 2; WEEE received at AATF's (excluding Photovoltaic panels)



The number of AATFs permitted in the UK has decreased from a high of 279 in 2013 to 174 by Q3 in 2020, with volumes aggregating around a small number of large operators. A group of 14 WEEE recycling organisations operating various AATF's came together in 2017 to create an industry group called the AATF Forum[3]. In the last 3 years the group has grown to represent 22 operators, which claims to represent more than 85% of the UK's WEEE recycling capacity by

[3] https://www.aatfforum.co.uk/

weight. Within the 22 operators who represent 43 larger permitted AATFs, we understand a small number of these operators process significantly more WEEE than the others.

Information regarding the sites shows:

- There has been a steady decrease in the number of AATF sites since 2013.
- The number of AATFs was relatively steady until 2016 (between 279 and 259 sites) but from 2017 the number of permitted sites began to decrease, with the lowest number of permitted sites (174) by mid-way through 2020.
- The number of large AATF's (permitted to process >400T/year) has also seen a decrease but to a lesser extent, peaking with 99 in 2016, but since falling to 84 in 2019.

Treatment operator standards

AATF's must meet the operating standards specified by their AATF permits and follow the Best Available Treatment Recovery and Recycling Techniques (BATRRT) guidance, but some AATFs hold voluntary accreditations too.

Guidance from DEFRA in 2006 in 'Best Available Treatment Recovery and Recycling Techniques (BATRRT and treatment of Waste Electrical and Electronic Equipment[4]' states;

> *"Article 6 of the WEEE Directive requires Member States to ensure that producers (of EEE), or third parties acting on their behalf, set up systems in accordance with community legislation to provide for the treatment of WEEE using best available treatment, recovery and recycling techniques (BATRRT). These systems may be set up individually by producers, or collectively. The systems must comply with Article 4 of the Waste Framework Directive and treatment must, as a minimum, include the removal of all fluids and selective treatment in accordance with Annex II to the Directive."*

In terms of the current size and quality management systems of AATFs:

- At the end of 2019 there were 187 AATFs in the UK, and 84 of these hold a Large Processor permit allowing them to treat more than 400 tonnes of WEEE per year.
- All sites must meet permit requirements that achieve BATRRT standards.
- Among the largest AATF's, ISO 9001 quality management systems and ISO 14001 environmental management systems are the most commonly held standards.
- In accordance with the requirement in the WEEE directive (article 8.5), the European Commission requested European Standardization Organisations (ESOs) to develop European standards (ENs) for the collection, logistics and treatment, including recovery, recycling and preparing for re-use, of WEEE. The CENELEC standard was developed and since then a certification body (WEELABEX) was formed to certify sites operating to the CENELEC standard. The objective is to assist operators in fulfilling the requirements of the WEEE Directive without unnecessary administrative burden, give additional guidance to operators, cover treatment of waste from all products within the WEEE Directive, and cover collection and logistics of WEEE to allow for its proper treatment.

[4]https://webarchive.nationalarchives.gov.uk/20130403043343/http:/archive.defra.gov.uk/environment/waste/producer/electrical/documents/weee-batrrt-guidance.pdf

- There are 2 sites in the UK operating to the voluntary CENELEC standard who are WEEELABEX certified; Enva Toomebridge in Northern Ireland, and AO Recycling in Telford. Previously Viridor St Helens also held certification, but this site was only permitted as AATF until late 2020.

Current UK WEEE recycling and unused capacity

The volume of WEEE recycled each year has been declining, as has the number of registered AATF's. However, the biggest recyclers remain in business, suggesting the capacity has either remained constant, or grown when considering the recent introduction of large Cooling treatment facilities by AO Recycling and GAP Waste.

- Our analysis in Table 1, supported by feedback from stakeholder interviews, suggests that there is adequate capacity in UK AATF's to treat likely future arisings in the Large Domestic Appliances (LDA) and Small Mixed WEEE (SMW) streams.
- New market entrants, AO Recycling and GAP Waste, have filled a previous gap in capacity for Cooling.
- A number of AATFs process Display equipment, and new operations are becoming established (e.g. Sun International Recycling Group Inc.). However stakeholders report there has been an increase in the ratio of Flat Panel Displays (FPD) vs Cathode Ray Tube (CRT) and Regulatory requirements around leaded glass made processing challenging.

Our research estimates the reprocessing capacity currently used and that which remains unused. Unused capacity should theoretically be available to allow for collections of WEEE to increase. The approach takes the number of large and small AATF's, assumes an average of 200T received for each small AATF, and for the remaining large AATF's, 85% of this tonnage is received by the largest operators across 43 AATF's. All the remaining large AATF's make up the remainder. As a result, the proportion of all WEEE received by these operators is the same(although in reality there are only a few AATF handling large volumes and a long tail handling much smaller volumes of WEEE), however as can be seen in Figure 3, the tonnage has steadily decreased in recent years. The same trend is mirrored by the remaining large AATF's based on the 85:15% split. The remaining Small AATF operators are seeing a decline in the contribution to the total weight of WEEE received. Figure 4 shows a steep decline that could threaten their business model in 5 – 10 years if the volumes received do not support their operation.

The analysis of AATF numbers and tonnages shows decreasing numbers of operators which could result in the demise of more small AATFs, and market consolidation in large AATF's if numbers continue to fall. See Appendix IV for further analysis.

By looking at typical recycling per site at the height of the market, we can project the minimum unused capacity at the bottom (being experienced now). Using this method, we identified there was 146Kt of unused capacity across large AATFs in 2019 despite the decline in the number of facilities. Although there appears to be spare capacity compared with current collection rates through the formal system, as we will see in Figure 6 later, if the UK is to collect a greater proportion of the total WEEE arising each year than currently, investment in WEEE processing capacity may well be needed.

Table 1; Estimated averages and total WEEE reported by AATF's [5]

Year	# of AATFs (total)	# large AATFs	# small AATFs	Average t / site for the top 43 AATFs	Average t / site rest of Large AATF market	Total t recycled at all Large AATFs	Total t recycled at all Small AATFs	Total t reported by all AATFs
2013	279	97	182	12,635	1,776	639,196	36,400	675,596
2014	278	88	190	12,398	2,091	627,207	38,000	665,207
2015	263	95	168	12,431	1,814	628,865	33,600	662,465
2016	259	99	160	13,538	1,834	684,850	32,000	716,850
2017	222	81	141	12,349	2,466	624,727	28,200	652,927
2018	206	85	121	10,644	1,923	538,472	24,200	562,672
2019	187	84	103	10,626	1,967	537,575	20,600	558,175

[5] As of time of writing, full 2020 data for tonnages received by all AATFs is yet to be released, therefore this analysis runs up to and includes 2019.

Figure 3; Estimated total WEEE received by different size AATF groups

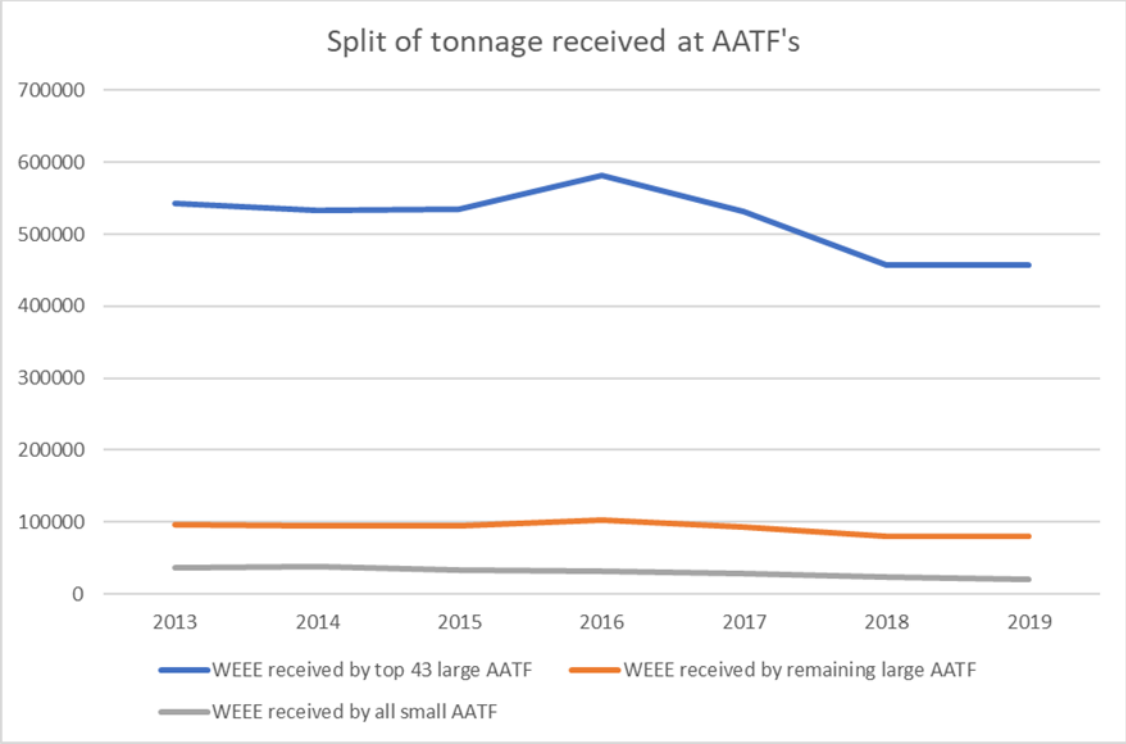
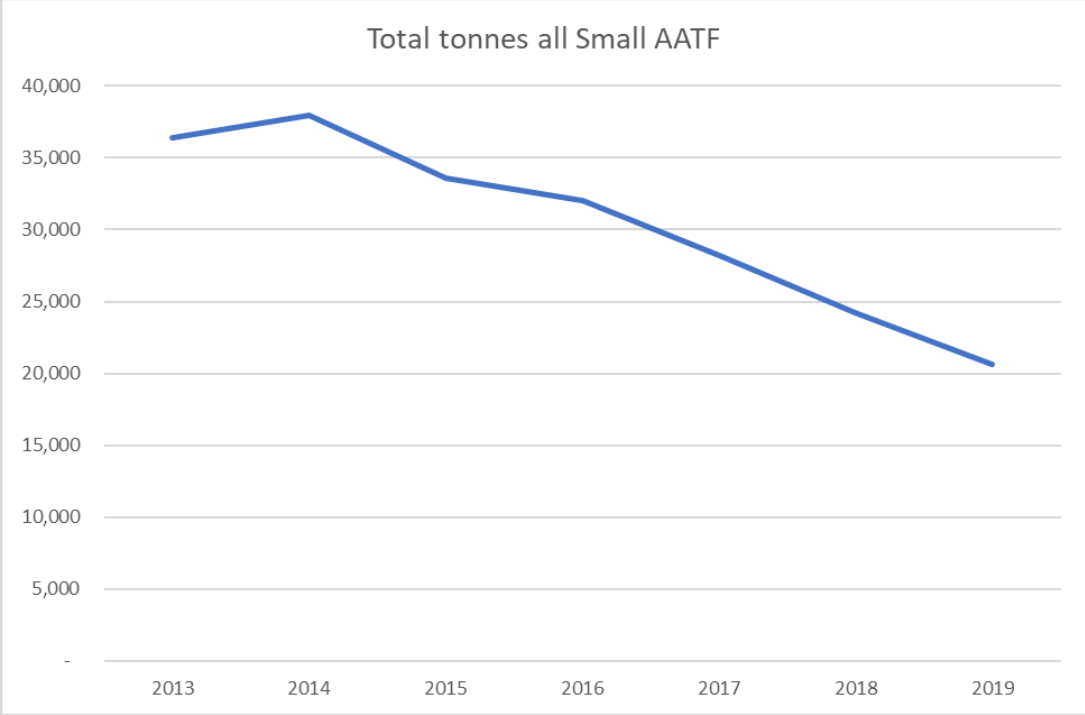


Figure 4; Estimate of total tonnage processed by Small permitted AATF's, highlighting the steep decline in tonnage in recent years



The major UK recyclers providing WEEE recycling services

The major WEEE recyclers in the UK are responsible for most of the reported WEEE recycled. Collectively they have handled more WEEE in years prior to 2019, indicating there is currently unused capacity despite the decline in the overall number of facilities. In this summary of the market, we profile some of the largest WEEE recyclers to better understand geographies, WEEE streams treated in-house, standards and the main infrastructure technologies used on site.

Figure 3; Geographical distribution of operators for the largest AATF licensed sites

Table 2; The UK's largest recyclers and their major WEEE recycling infrastructure sites

Company names	WEEE	Recycling standards and quality standards				Region(s)	# AATF sites	Main treatment technology
	Stream	WEEE-LABEX	ISO 90001	ISO 14001	R2			
AO	**LDA, Cooling**	✓	✓	✓		**West Midlands**	**1**	**Shred/disintegration (Andritz Mewa QZ fridge plant) & residue separation**
Mekatek/Eco Technology	**SMW**	No data available				**S. Wales**	**2**	**No data available**
Electrical Waste	**LDA, SMW, Display**		✓	✓		**North West Scotland**	**2**	**Manual sort and disassembly, then Shredding (SSI Shredding System) & residue separation**
EMR	**LDA, Cooling**		✓	✓		**North West South East Midlands**	**9**	**Shredding and shears**

Environcom	**LDA, Cooling, Display, SMW**		✓	✓		**East Midlands**	**2**	**Shred/disintegration (Andritz Mewa QZ fridge plant and shredder type),** **Hammer mill for SMW,** **Float / sink system for separation of POP's plastic, automatic compressor separation and copper extraction machine for cooling (CARRIE) CRT manual separation and auto-sort**
GAP Waste	**LDA, SMW, Cooling**	Est. late 2020	Est. late 2020	Est. late 2020		**North East**	**1**	**Shredding (Untha fridge plant), shredding SDA (SSI Shredding Systems) & residue separation**
Light Brothers	**SMW, Cooling, Display, LDA**		✓	✓		**South**	**1**	**Shredding (Untha fridge plant),** **Disassembly (display)**
London Mining	**LDA, SMW, Display, Cooling, GDL**		✓			**South East**	**1**	**Shredding (Small AATF permit)**
Mercury Recycling	**Display, GDL**		✓	✓		**North West**	**1**	**No data available**
Recycling Lives	**LDA, Display, SMW**		✓	✓		**North West**	**8**	**Fragmentiser for LDA. Manual dismantle for display then metal fragmentiser and plastic separation.**

S Norton	**LDA, SMW**		✔	✔		**North West**	**2**	**Shredding, Shredder residue separation and processing**
Sims	**LDA, SMW, Cooling**		✔	✔	✔	**Midlands, North East** **South West Scotland, S. Wales**	**6**	**No data available**
SWEEEP	**Display, SMW, LDA**					**South East**	**1**	**Pre-sort & Shred/disintegration (Andritz MEWA QZ plant including 2x TiTech optical sorting machines) & residue separation**
Viridor	**LDA, SMW, Cooling, Display**	✔ Closed Jun-20	✔	✔		**Scotland, (North West closed Jun-20)**	**1**	**Shred/disintegration (Andritz MEWA) for Cooling and SDA.** **LDA MEWA or compaction.** **Display (CRT) Proventia laser** **Display (FPD) MEWA (not currently operational).**

Business case for WEEE recycling infrastructure

For the purposes of this research, we are defining the UK WEEE system as the network of AATF's that provide reporting for the WEEE Directive targets only. We recognise that legitimate and illegitimate operators handle WEEE outside of this system, which impacts achieving targets, but at present these activities are not captured in the reported WEEE data.

There is a significant gap between EEE placed on market, c.1,700kT, and WEEE reported through the official system, c.550kT. Although not all WEEE comes off the market on a like for like by weight basis, the difference suggests there is an opportunity to capture more material from the residual waste stream and unreported activities.

As the volume of WEEE collections has declined from 2017 to 2019, so has the amount of material and revenue that can be recovered and re-sold.

WEEE recycler revenues can be categorised into two general types:

1) Service provider revenues (gate fees, EPR evidence revenue, collection and treatment service fees)
2) Material offtake revenue (sale of recovered materials to downstream processors, smelters, or similar).

Where recyclers can implement changes that can have a beneficial impact upon these revenue streams, it should create a more sustainable and attractive business case.

Gate fees as well as commodity market off takes are highly competitive. We have heard from industry that WEEE collected can accrue significant 'waste-miles' whereby collecting organisations and/or waste holders are trying to maximise the value and minimize costs e.g. seeking higher sales price for materials and lower gate fees from AATFs. Maximising revenue can also come from sales of material off takes from AATF on international commodity markets, or reducing service costs by seeking out lower cost logistics and processing gate fees charged by recyclers.

WEEE derived material analysis

We analysed the composition of the most common base metals, and some of the rare earth metals, in common WEEE items. Our meta-analysis covered 10 research papers, to determine an average composition for selected products. The averages applied are shown in Table 3.

Table 3; Material composition of WEEE (average percent per WEEE stream)

Averages % material composition for analysis per stream							
Materials	LDA	SMW average	SMW best	SMW worst	Display	Cooling	Average % all streams
Iron (Fe)	53.0	34.4	44.1	22.1	9.0	41.7	34.0%
Aluminum (Al)	3.0	9.2	12.6	6.3	1.2	2.5	5.8%
Copper (Cu)	4.0	5.7	7.3	3.7	4.2	18.3	7.2%
Other (e.g. wood, ceramic, concrete)	30.0	11.4	10.8	12.1	19.2	0.0	13.9%
Plastics	10.0	36.9	20.2	55.5	25.5	31.7	30.0%
Glass	0.0	2.5	5.0	0.0	41.5	5.8	9.1%
Silver (Ag)							0.002141%
Gold (Au)							0.000645%
Platinum (Pt)							0.000214%
Total %	**100**	**100**	**100**	**100**	**101** [6]	**100**	

If we then take data to show WEEE received at AATF sites from 2019, apply these average compositions for the major metal groups and apply recovery rates per metal between 80-95%, it is possible to estimate the material potential that is already coming from the WEEE that is collected.

[6] As a result of averaging the % from meta-analysis the total average is slightly above 100%

Table 4; Estimated material composition of WEEE by tonnage already collected

WEEE reported composition per stream applying % meta-analysis (in Tonnes)							
Materials	LDA	SMW average	SMW best	SMW worst	Display	Cooling	Total Tonnes
Iron (Fe)	91116	56057	71857	36007	3983	61129	248293
Aluminum (Al)	4886	14206	19454	9709	503	3475	32778
Copper (Cu)	6515	8851	11278	5685	1761	25481	48294
Plastics	14477	50686	27683	76148	9504	39123	189937
Silver (Ag)	3.7	3.5	3.5	3.5	0.9	3.1	14.7
Gold (Au)	1.1	1.1	1.1	1.1	0.3	0.9	4.4
Platinum (Pt)	0.4	0.3	0.3	0.3	0.1	0.3	1.5

The assessment shows that:

- Plastics (190kT) and Ferrous metals (248kT) are the highest materials by weight in WEEE, although particular streams and product types vary.
- Most AATF's are capable of initial treatment for multiple WEEE streams. Some require specialist pre-treatment though (e.g. decontamination of cooling agents or mercury).
- Product composition determines material offtakes, which influences the value that can be obtained through WEEE recycling.
- The material values actually being recovered from the UK household collection system, particularly for Small Mixed WEEE, are typically lower than the compilation of prior research meta-analysis composition theory and market data suggest, according to recyclers interviewed in this research.
- Stakeholders suggest the average market prices are considerably lower because of the quality of the metals derived from WEEE e.g. Copper is £1,000 instead of £5,000/T and the composition of plastic means there is a cost of >£100/T instead of a material rebate. These lower rates are comparable with much lower quality grades of non-ferrous metals than those visible on the London Metals Exchange. Stakeholders also suggested that the levels of rare earths they find are lower than that illustrated in the webinar that was from our desk-based research (See Table 3), suggesting the product composition is lower value devices with greater proportion of lower value materials.

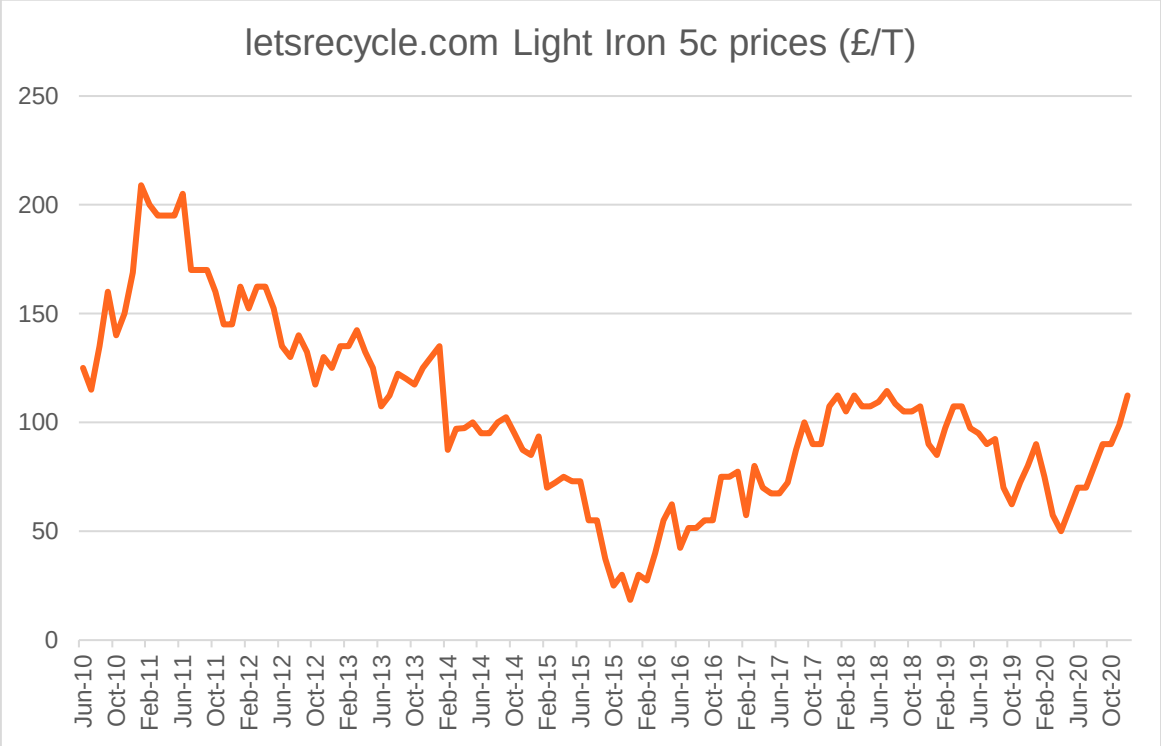
- Some streams and product types are more economically attractive than others due to their material value minus the operational cost (e.g. IT & Telecoms which have a higher value material composition).

Further analysis of the market for WEEE derived materials found other factors influencing costs and revenues for recyclers:

- The availability of markets for downstream recycled materials impacts UK recycler offtake markets (tier 2 processing and beyond is typically outside the UK so further material revenues are not recouped by UK reprocessors).
- Future developments in treatment technologies, as well as different treatment/dismantling requirements for particular product streams, means that costs for CFC-containing appliances are likely to decrease. Flat panels are expected to cause an increase in total costs due to processing including removal of hazardous components and materials like mercury.
- The price of light iron is variable and generally inverse to recycling rates (i.e. increasing metal commodity values causes a decrease in the weight of WEEE formally reported in recycling). This is predicted to be because more WEEE finds its way into scrap metal skips where it may command a higher material price than the revenue from EPR fees via the mixed WEEE skip and material off take estimates, but lower cost of gate fees. See Figure 3 for details.
- Data from the London Metals Exchange illustrates the market trends for the major metals, plus gold as an indicator for the platinum group metals. Prevailing market trends are as follows:
    - 2010 to 2016 general market decline e.g Aluminum fell from 2750-1500USD/tonne
    - 2016 to 2018 general market rise e.g. Copper increase from 4,500-7,000 USD/tonne
    - 2018-2020 general market decline e.g. Steel decrease from 375-250USD/tonne
- See Appendix II; LME Metal market pricing for detail; Steel for 2016 -2020, Aluminium and Copper for 2010 -2020 and Gold for 2017-2020.

- All of these metals (other than gold) have been on a recent downward trend, with a recent upturn most likely as a result of the COVID-19 pandemic, as some supply sources have closed so the alternatives that remain open can demand a higher price. The low material values put pressure on recyclers due to the lower returns they can expect from material, making recycling activities less profitable, especially when overheads and costs remain fixed. The result is a less attractive proposition or business case for further investment, growth or new market entrants. It may be the case that the trend of increased gold price may be based on other market speculation rather than linked to recycling outputs.

Figure 3; Lestrecycle.com average Light Iron (5c) market price



Material value comparisons – desk-based meta-analysis versus market feedback

During the project, we held a webinar to present the initial findings (see Appendix VI for slides). It highlighted a disparity between what UK recyclers were seeing, compared with the materials theoretically available to them through product composition.

Those on the front line of recycling described a markedly different experience of products and materials recovered from the UK WEEE household collection system, receiving the least valuable items in the official system, with most of the more valuable products and materials passing through other unreported channels.

The desk-based analysis of WEEE composition data and the real-world feedback from stakeholders significantly differed;

- Material prices quoted by stakeholders are around a quarter of that used in the modelling of additional revenue (£10M instead of £40M based on SMW).
- Around 75% of the weight of SMW reported on the market is not making its way (at the same weight) to the reported recycling system, as indicated in the 2020 report; 'Electrical Waste: Challenges and Opportunities'[7] . Therefore some potential material recovery opportunity is lost, leaving a smaller proportion that can see value recovered.
- Plastics arising from HWRCs have a net cost instead of a revenue – the composition arising from the UK collection network and fed to AATF's is the lower quality material.

[7] https://www.recycleyourelectricals.org.uk/press-releases/electrical-waste-challenges-and-opportunities/

- The initial increase in treatment costs where plastics potentially containing Persistent Organic Pollutants (POPs) or with hazardous waste classifications is initially carried by recyclers, with relief through EPR funding thereafter following price negotiations in many instances.

WEEE operational costs analysis

In order to make the WEEE recycling sector viable and attractive for growth and investment, the revenues from services and material sales must be greater than operational costs. Our research into these costs briefly considers those relating to the treatment of different streams, to highlight the most and least expensive WEEE streams to process.

- Cooling and display WEEE streams have the highest operational costs, but the recoverable material is higher value e.g. copper in cooling, resulting in a medium level of economic benefit.
- LDA has a high material value because of high metal content but low operational costs.
- SMW is highly dependent on the particular products involved because of the variable material composition.
- The impact of managing operational costs against revenue may be a reason for the reduction in the number of smaller registered AATF's, with material instead finding its way to the larger AATF which can operate more profitably through economies of scale.

The study 2008 Review of Directive 2002/96 on Waste Electrical and Electronic Equipment – Study No. 07010401/2006/442493/ETU/G4[8] estimated typical costs and material values for each WEEE stream. We have updated the values for 2019 based on Bank of England inflation rates and converted from Euro to GBP. See Table 5.

- Operational costs for recyclers have increased as a result of increased staff costs, maintaining environmental, operational and off take standards, and for the upkeep of ageing technology.
- Although the original research is dated, we believe the relative differences between each stream are still likely to be indicative of current markets.

[8] https://ec.europa.eu/environment/waste/weee/pdf/final_rep_unu.pdf

Table 5; Estimated operational costs AATF (GBP / tonne)[9]

	LDA £/T	SMW £/T	Display £/T	Cooling £/T
Transport and collections	200	178	188	257
Shredding, sorting, dismantling pre-treatment	81	343	563	788
Incineration and landfill	13	16	33	16
Total	294	537	784	1060
Nett economic attractiveness	***Medium/High***	***Low to High depending on products***	***Medium***	***Medium***

Some stakeholders interviewed raised concerns around the cost of repair for ageing technology (direct and indirect downtime losses). This included increased risk and damage from contamination (including battery fires and other explosions, and the cost of fire insurance rising by up to four times in some instances). These are believed to be industry wide challenges.

Forecasting future demands

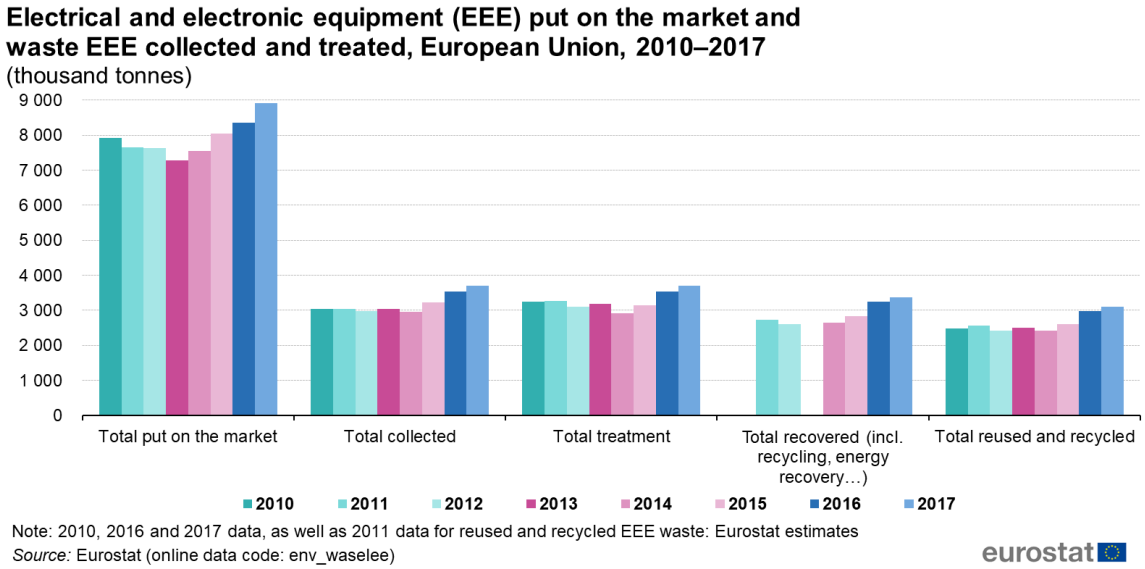
The consumption of EEE is predicted to increase globally as new markets open and the presence of technology in everyday life grows. Sales volumes (by weight) in the UK have fluctuated in recent years, with increasing sales offset by other material factors such as light weighting.

EEE Sales forecasts

The fluctuation in sales of EEE in the UK makes it difficult to build a long term forecast by simply looking at historic performance. Prior research suggests some level of growth in the weight of EEE on the market each year, continuing the European wide growth trend that has shown a 2Mt increase between 2013-2017. However as technologies and behaviours change the exact path will be influenced by many variables.

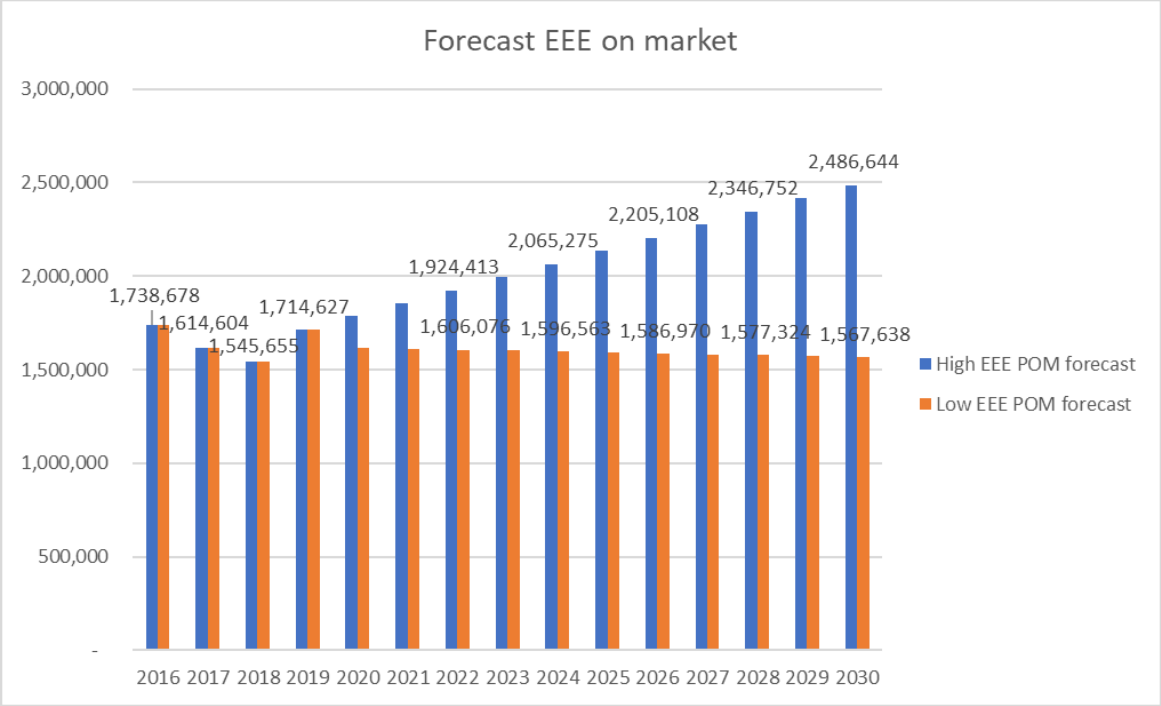
[9] converted from Euro source data 1 EUR to GBP = 0.90 British Pounds

Figure 4; Eurostat EEE and WEEE historic data



- We have considered the outlook in sales by weight with influencing variables including:
    - new business models (lease, rental, service provider)
    - product light weighting
    - downsizing products,
    - growing size and/or weight of large domestic appliances,
    - consumer behaviour aggregating multiple used and in-use devices in the home affecting disposal rates,
    - consolidated functionality of devices (one product performs multiple functions),
    - and other social & economic factors (consumer trends, brands, consumer confidence and disposable incomes).
- Our future forecasts vary from a relatively flat rate of EEE placed on Market (POM), to growth, depending on the source of the modelling.
- We have used two models to estimate growth for EEE placed on market.
- 1) Model 1 takes a regression analysis of historic data trends per stream from Eurostat reporting then profiles this forwards resulting in a low rate of growth in EEE based upon historic data trends.
- 2) Model 2 takes the ratio of EEE POM for 2019 and latest estimated UK population to determine a weight of EEE per capita then profiles this forwards using Office National Statistics population growth forecasts (from 66.8M in 2019 to 69.8M in 2030) in the UK. The results from model 1 project a lower EEE placed on market by 2030 than model 2 as shown in Figure 5.

Figure 5; Forecast EEE on UK market



WEEE arising and collected

Although the connection between EEE reported by producers as placed on the market, and WEEE arising for collection is not always direct (e.g. hoarding behaviours, differing product life spans), the EU Member State targets are calculated based upon these EEE sales.

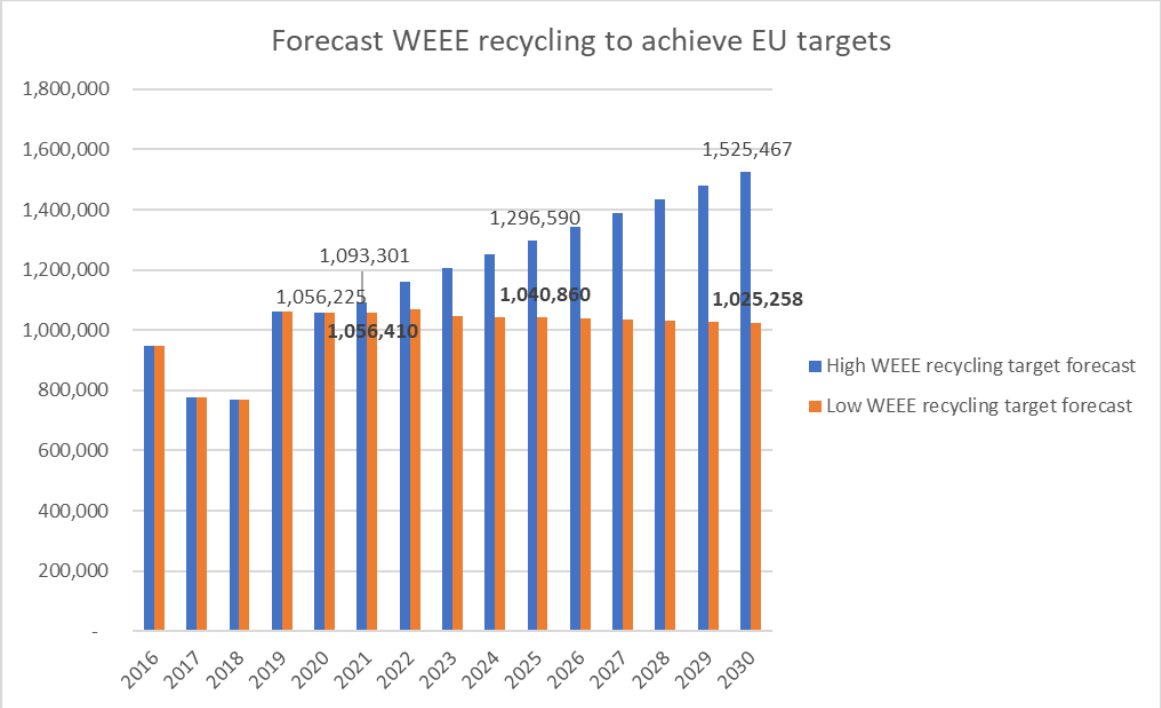
The UK currently relies on the official reported WEEE system (UK EPR financed collections), and substantiated estimates to reach the EU member state targets. There is expected to be an increasing gap to the 65% target, unless other unreported WEEE is captured or counted according to Valpak UK EEEFlow - Update Report , 2018[10].

Using our projected EEE POM data results (figure 5) we forecast the tonnages required to meet future collection targets, by profiling 65% of the last three years' sales.

- Calculated targets for 2020 are around 1,056kT.
- Subsequent targets by 2025 are forecast between 1,040kT to 1,297kT.
- The forecast tonnages widen in range up to 2030.

[10] https://www.valpak.co.uk/more/material-flow-reports/eee-flow-2018

Figure 6; Forecast WEEE targets to meet 65% target.



Enabling infrastructure investment to meet future WEEE arising demands

Infrastructure investment summary

The WEEE recycling sector has seen limited recent growth through investment, which have been targeted at recognised bottlenecks in the treatment system e.g. cooling equipment.

Less than half of the 14 largest recyclers have shown evidence of increased recycling capacity and/or new technology investment during the last 10 years. Our research suggests that this low level of investment is indicative of the wider WEEE sector.

Where investment has been made:

- It is generally attached to capital costs (infrastructure), which provides some guarantees through asset resale to offset the risk.

- The evidence that is available publicly, is of businesses investing in operational improvements (e.g. depollution, processing), quality and service operational costs (e.g. waste characterisation and reporting, compliance and standards), or office and administrative overheads (e.g. non-production personnel).

Evidence of investment and growth in the sector is presented in Table 6.

The value of infrastructure investment differs dependent on the infrastructure technologies. Stakeholders have suggested indicative costs for the type of WEEE Infrastructure that investment could be spent on per plant. However, the exact impacts of these investments in terms of capacity and/or processing quality increases are not known;

- Sortation equipment £500k
- POP's treatment for plastics £2M
- Metal and plastics processing £3-4M
- Specialist WEEE plant e.g. cooling £10M.

Table 6; Examples of investment in AATF's

Recycling company	How the recycler is growing	Notes on how infrastructure was funded
AO	2017 - Opened a fridge and LDA recycling facility. This facility means AO can also now process plastic from E-waste 2018 - Opened a second fridge recycling facility 2019 - opened a recycling facility for WEEE plastic	Paid for infrastructure themselves

Recycling company	How the recycler is growing	Notes on how infrastructure was funded
Environcom	2010 - Invested £10 million to increase capacity of WEEE reprocessing plant 2011 - Opened WEEE reprocessing facility. Increased capacity by 60,000 tonnes a year (Resource Futures 2012) 2019 - Installed a dismantling facility at its WEEE treatment facility enabling safe dismantling of compressors from refrigerators and other cooling appliances. Partnership with REPIC	
GAP Waste	2016 – Opened new WEEE treatment facility and increased the capacity of their cathode ray tube (CRT) recycling facility and commercial reuse facility	
Recycling Lives	2019 - Acquired Metal & Waste Recycling Ltd resulting in 12 more sites in England and Scotland	Investment came from Three Hills Capital Partners who invested £50 million and now has now acquired a 21 per cent stake in Recycling Lives
Sims	2006 - opened new WEEE treatment facility (Note - In 2019 Sims sold several of its European WEEE recycling facilities but the UK facilities were not included in this deal)	2006 facility - £8m facility has received partial funding from the Welsh Assembly Government's Regional Selective Assistance Programme and from the Associated British Port (no mention of where remainder of funding has come from)

Recycling company	How the recycler is growing	Notes on how infrastructure was funded
SWEEEP Kuusakoski	2018 - Invested in a new technology (granulator) to improve WEEE recycling operations 2018 - Invested in new sorting technology in facilities	Self funded via holding company

Types and sizes of investment funding for waste infrastructure

Financing for infrastructure can be categorised according to public or private arrangements and dependent on the risk, return, duration and sources. We have identified four sources for possible infrastructure investment:

Banks – debt funding from banks with payback terms and interest charges. These are only available for lower risk applications, but have lower interest charges.

Investors (operational support) – invest in company and/or asset, bring leadership and/or business support to grow the company such as Engineering, Procurement and Construction (EPC), increasing scale and operational value ready for handover or re-sale. These are open to higher risk projects, but expect higher rewards.

Investors (finance input only) – equity share of company or asset anticipating value growth and resale after typically 5-7 years, but can join at any point in business journey. Open to higher risk projects but expect higher rewards.

Funds and grants (one off financial contribution) – typically a one off or short-term financial contributions from a 3rd party (often government or department budgets), wishing to encourage growth or kick start an activity. Often helps to start up ideas and projects, or short-term initiatives that finish once funding ends.

More detail on the relevance of each of these possible funding sources to the WEEE sector is provided below

Banks

There is little evidence of significant debt funding from Banks, from both market research and stakeholder interviews. The perspectives offered from the investment community stakeholders, suggested the risks to banks and costs to borrowers were not attractive or viable in most instances in the WEEE sector in the current state.

The WEEE sector is not particularly big in comparison to other waste activities, and waste streams like residual household waste have attracted much more interest because of greater security of supply, revenue and rewards.

The Green Investment Group (previously The Green Investment Bank but privatised in 2017) historically made investments in the Waste industry. Since privatisation in 2017, the company has made four investments in the waste and resources sector – all in energy from waste facilities.

Investors

Equity investors will profile propositions according to best and worst case scenario outcomes, matching a project to their portfolio of investments and risks. Sector policy matters feature in

such portfolios, but are often viewed as part of a best case scenario, rather than a guaranteed outcome that would support a project.

All investors assess risk, but in different ways depending on their attitude and portfolio of anticipated returns. Risk is a variable, but factors that can de-risk a project can help encourage investors to participate. As recognised by industry stakeholders, examples of de-risking in the waste sector include:

- Supplier contracts – commitments from suppliers and/or customers with longer contracts offer more confidence, lower risks, predictable returns e.g. Private Finance Initiative (PFI) contracts for local authority waste management.
- Strong market data – financial performance that historically tracks well or an indication of upcoming increased demand for infrastructure outputs. e.g. Material Recycling Facility fixed costs elements and share of material revenues.
- Long term policy or regulatory landscape stability – subsidy or anticipation of a relatively smooth regulatory journey over the period of investment. E.g. landfill tax was mapped out for years ahead through a long-term escalator in early inception, that in turn encouraged investors.

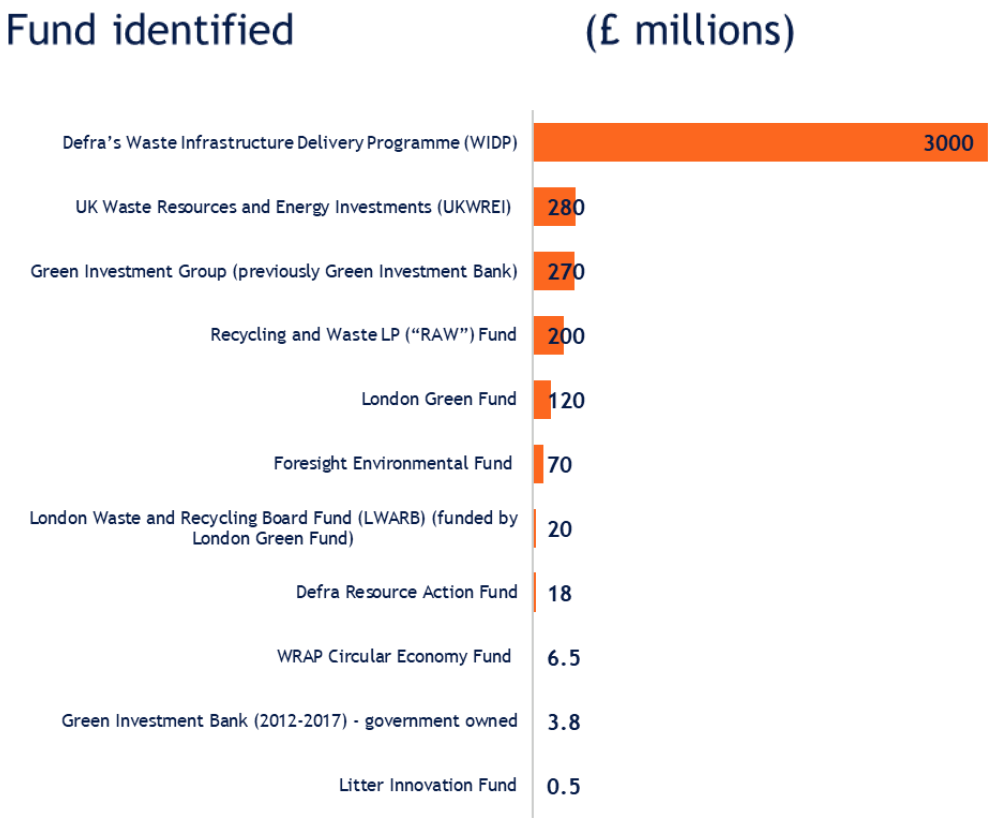
Some infrastructure investments are from public-private partnerships – the main type being Private Finance Initiatives (PFIs).

- The Government has historically used private investment through PFI's as a way to fund waste infrastructure projects.
- PFI contracts involve an initial capital investment from the private sector, to fund large public infrastructure developments. Public finance is then used to pay back the project over a long-term period.
- The highest proportion of public and private infrastructure investment is through the DEFRA Waste Infrastructure Delivery Programme (a form of a PFI) – most of the investment from this source has been in energy from waste infrastructure.
- In 2018, the Government announced it would no longer use PFI agreements.
- In 2019, the Government reviewed its support for waste management infrastructure. This explored alternative possibilities of using Government tools for supporting private investment in waste infrastructure to replace the PFI financing model. This was in the context of the UK's changing relationship with the European Investment Bank, after the UK leaves the EU.

Funds and Grants

Current investment funds targeted at the WEEE sector are limited. There have been some funds that recyclers may be eligible for that are illustrated in this section, however there has been little uptake from the leading operators, and qualifying criteria play an important factor in those who can apply.

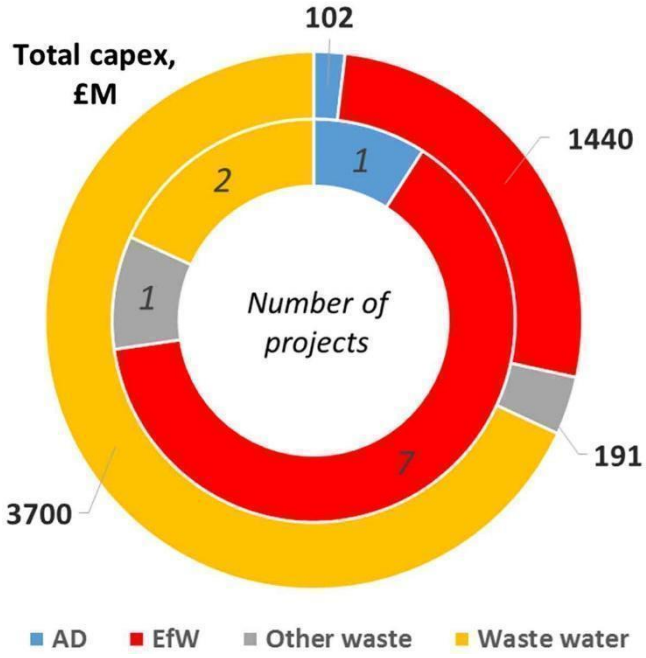
Figure 7; Investment funds examples



Our investigations into investment in the waste sector have indicated that most funding sources are via government grants or funds, as a policy measure to address a shortfall or a problem with a certain waste stream. There is little evidence that the WEEE system, or particular household products, have been singled out for this support, although the previous EAC panel investigation did bring some focus here in 2019.

Research has also shown that historically there has been little funding for the WEEE recycling sector, instead, money has been allocated to Energy from Waste (EfW) activities, as shown in Figure 8;

Figure 8; National Infrastructure Delivery Plan 2016-2021; investment funds and grants financed (AD = Anaerobic Digestion; EfW = Energy from Waste)



Welsh Government (through funds and grants)

Investment into the Circular Economy, from the Development Bank of Wales (start-up finance), and opportunities through the CWMre Initiative (Creating Welsh Markets for recyclate programme, now closed) and small Scale Circular Economy Fund Grants (£25-£750,000) are particularly focused on waste and recycling.

- Funds appear to be more readily available via Welsh Government.
- EU Development fund and Welsh Government budgets support these activities.

Defra Resource Action Fund (WRAP coordinate this program)

From 2019 there has been a grant from the Resource Action Fund, which focused on increasing reprocessing infrastructure for plastics.

- E.g. Plastics Packaging Recycling Grant - will provide new infrastructure to help significantly increase recycling capacity and capability for currently difficult to recycle plastic.

Public - private partnerships

Plans to build over 250 Kt of plastic recycling capacity have been announced by WRAP. This includes the UK's biggest multi-polymer recycling plant, being developed by Viridor near Bristol.

Barriers and opportunities to Investment in WEEE infrastructure.

Industry engagement exercise background and approach

The findings below are a culmination of research into reports and publications, together with the outcomes from a stakeholder engagement exercise. The results are an overview of the main factors considered to be challenging the WEEE sector as a whole, but focused on the ability to seek and gain investment in the space.

A stakeholder engagement exercise was carried out during August and September 2020. The purpose of this exercise was to better understand experiences and stories from the pursuit of infrastructure investment, and what makes investment possible or more attractive. Anthesis approached both WEEE and investment sector representatives to get a view from both perspectives.

15 interviews were carried out across the supply chain, including an investor category to understand perceived risk and reward. The stakeholder responses are aggregated to anonymise responses and to consolidate findings. The stakeholder groups cover; Producers, Retailers, Collectors and Recyclers, Trade associations and Private Investment Banks. The findings provide:

- further insights in the existing lack of funding (risks, returns, payback) and perceived opportunities and impacts for a new investment fund;
- additional commentary on the future funding needs in terms of type, volume and requirements;
- policy and regulatory requirements to provide 'investable' conditions for private sector funding from debt and equity providers; and
- and, what type of funding that is likely to be needed.

Anthesis used an open-structured questionnaire to gather stakeholder opinions through telephone calls. A full copy of the questionnaire and summary (anonymised) responses can be found in Appendix III.

The research shows that there are only a few examples of significant investment being made across WEEE infrastructure, and major spends have been from organisations' own cash reserves rather than external funding. The following section summarises the factors that affect WEEE investment and the ability for the sector to grow through a list of barriers and opportunities.

Barriers

- The sector has experienced a major system overhaul, impacting how it has been financed and funded by producers;
    - The 2013 Regulation change, moving from a 'must-buy' evidence system to a targets system set by DEFRA, requiring producers to finance collection and treatment of WEEE to meet the national target.
    - 2016 saw the introduction of the Compliance Fee for PCS's who fall short of their members' recycling obligation. This allows PCS's and their producer members to remain compliant even where they do not collect and treat enough WEEE to meet their target.

    - The 2016 industry-led initiative known as the Producer Balancing System, to collectively pay for orphaned DCF sites' collection of WEEE, thereby leaving LA's and AATF's with shorter term arrangements for these collections.

- Recent examples of failed investment (Euro Closed Loop Recycling[11] received infrastructure investment in plastics), and the instability of markets (commodity values and the source and quality of WEEE from local authorities) are said to have de-stabilised confidence in the sector from investors' perspective.

Market changes and regulation

- Materials markets have experienced higher levels of volatility in the last 5 years, led by international policies on classification and acceptance of waste materials.
- The China National Sword policy disrupted secondary commodity supply chains and markets on a global level, though there was advanced warning of this. The continued raising of material quality standards is effectively closing the door on exports of many WEEE scrap-derived materials to the Chinese market, traditionally a major market for the UK and Europe.
- The displacement of this material to other Asian markets was a partial and temporary fix, the gradual tightening of standards and capacity in these countries contributed to the gradual decline in market conditions, and has been a major contributor to the current low material market values for UK recyclers and exporters.
- Other EU waste and circular economy policies and regulation around classification of waste, and increasing operational costs (wages, environmental standards, insurances) further add to the cost burdens carried by recyclers with no way to generate extra revenue.
- With limited UK facilities processing the WEEE, and even fewer managing WEEE residue materials, the UK has little capability to ride out market disruptions without reliance on European operators and markets. Offtake revenues have been eroded, pushing some operators to breaking point, and others have relinquished their AATF status in an effort to reduce costs.

Quality

- Quality is a major concern from customers of AATF's; the lack of trust in secondary materials could be supported by traceability, quality control, improved or selective separation and better control of hazardous materials.
- In addition; the price of virgin versus secondary materials: competition between quality, price and availability of recycled versus virgin materials does not drive sufficiently high demand for recycled materials.
- AATF's which operate waste management organisations and have contracts with Local Authorities have said that the quality of material arising in HWRC's is said to be low due to the combined impact of lower quality products, handling methods preventing re-use, contamination with non-WEEE items or WEEE in other waste streams.
- Losses from the system through selective product (some display and IT) and component picking (fridge compressors and cables) or theft are well recognised by independent studies from waste management firms, PCS, and the 2020 'Electrical Waste: Challenges

[11] https://www.letsrecycle.com/news/latest-news/administrators-brought-euro-closed-loop-recycling/

and Opportunities'[12] report conducted by Anthesis for Material Focus, which calculated 114kT was lost from the system in 2017, that stakeholders suggests takes place between the householder depositing the product and the skip being removed from the HWRC.

Standards

- As raised at a recent EAC panel enquiry and commented upon by several stakeholders, the approach taken in the Republic of Ireland is seen as a positive case study, in terms of implementing mandatory recycling standards (CENELEC), incentivised take back services (retailers and collectors paid per unit) and a complimentary HWRC network (collects smaller proportion of WEEE compared to UK). Collectively the aspects of scheme delivery appear to contribute towards a better recycling rate of 10.2kg per capita[13] (compared to the UK's 8.4kg per capita). However, recyclers have said there is a higher price to pay to maintain these different standards (e.g. CENELEC) and extra takeback fees and services (both a barrier to entry) and there is no customer demand from brands, producers, PCS's or waste disposers to pay for and use this higher level of treatment standard for disposal of WEEE.

Opportunities

Standards

- Standards feature prominently in our research findings, both in the published research as well as stakeholder feedback. Prior research by the EERA[14] investigates harmonising standards as part of ongoing policy discussion, as a means to level the playing field for operators and giving better access to WEEE for recycling.
- Most established harmonisation initiatives focus on the CENELEC standard and the WEELABEX certification. Four Member States have made compliance with CENELEC standards mandatory: France, Netherlands, Ireland and Belgium.
- In these countries where the CENELEC standard is obligatory, a large number of certified WEEE treatment plants operate. The respective recycling rates were calculated to be 11.2kg per capita, 9.4kg per capita, 10.8kg per capita, 10.8kg per capita (Eurostat 2018)[15] [16]
- In seven Member States, all PCS's request compliance with CENELEC standards. These are Belgium, Ireland, Greece, Luxemburg, France, the Netherlands and Slovenia. In 5 Member States, some but not all PCS's request compliance with CENELEC standards: Czech Republic, Denmark, Estonia, Sweden, and Hungary.

[12] https://www.recycleyourelectricals.org.uk/press-releases/electrical-waste-challenges-and-opportunities/

[13] https://irishtechnews.ie/weee-ireland-sets-new-records-for-waste-electrical-and-battery-recycling/

[14] https://www.eera-recyclers.com/files/weee-final-workshop-all-presentations-20200514.pdf

[15] https://globalewaste.org/statistics/country/belgium/2019/

[16] https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_waselee&lang=en

- The Environment Agency Austria[17] estimates that individual facilities implementing an EU wide minimum treatment requirement would cost 10k-80k EUR each. The benefits this could bring would be more equal market competition where all operators have the same requirements.

Policy

- Phased policy can positively influence market conditions under which recycling markets can flourish, and with the upcoming WEEE Regulations review in the UK this could allow for innovative change to the system, thereby encouraging investment where investors take a fresh look at market opportunities and certainty. Considerations might include:
    - Legislation: including greater enforcement, landfill bans, more landfill taxed, taxation models on virgin material, the use of recycling versus recovery targets and more.
    - Quality assurance systems: this could be achieved through traceability, certification, and the introduction of standards, among others, with the aim of also increasing the acceptance of the materials worldwide.
    - Green public procurement with the use of recycled materials: this could be encouraged to help to create a market, as well as raise acceptance of the use of these materials, setting the example for the market to follow.
    - Measures to improve the WEEE system's stability in a competitive market, that brings greater certainty for the recycler, producer compliance schemes and producers themselves.

Investment

- Examples from beyond the UK include the European Investment Bank (EIB), which has a track record of financing Circular Economy projects and innovation. The EIB aims to create favourable investment conditions and presents several financing options for investment in circular economy and innovation.
    - Direct financing includes projects of a larger financing volume, with a more complex lending procedure and is typically used for projects such as highways, commercial buildings and waste treatment plants.
    - Intermediated financing entails more risk with cross equity, yet more return. This is available for smaller financing as well, where there is typically another intermediary.
    - The European Fund for Strategic Investments (EFSI) has helped InnovFin meet the high demand by SMEs and small midcaps for access to risk finance. One of the many categories of finance is for infrastructure in the environment and natural resources fields of SMEs & Small Midcaps Service. The typical lending amounts are between EUR 7.5 and 25 million, with 50%[18] loan guarantee backing from European Investment Fund (EIF).

- The ESA report 'Planning for a Circular Economy' published in 2017, estimated the waste sector as a whole could attract £10 billion of investment in new waste management

[17] https://www.eera-recyclers.com/files/weee-final-workshop-all-presentations-20200514.pdf

[18] https://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-finance_en.pdf

infrastructure, boosting GDP by £3billion. A proportion of this could benefit the WEEE sector.

- 'Urban mining' can offer much higher concentrations of rare earth materials than that of traditional earth mining. There is a recognised potential in these recycled material sources but at an unknown cost e.g. one recycler in China produces more cobalt than the country mines in one year (WEF 2019, A New Circular Vision for Electronics; Time for a Global Reboot)[19]
- Success stories for WEEE (e.g. the Environcom investment partnership for compressor treatment with backing from REPIC) and packaging (e.g. Viridor plastic contracts with Unilever, INEOS and Klöckner Pentaplast) are possible through longer term agreements, securing supply of material and/or demand from material offtakes.

Product and system design

- Improving the materials used in products and infrastructure in a combination of design for recovery and through the development of end-of-life recovery technologies would improve the management of WEEE. These would require improvements and investment. The Knowledge Transfer Network (KTN), 2016 suggests:
    - Technologies to recover the valuable and critical materials used in low-carbon energy and transport systems, in particular lithium and cobalt (used in high-performance batteries in electric vehicles) and rare-earth metals (used in high-strength permanent magnets for electric motors in vehicles and generators in wind turbines).
    - Advances in robotics, automation and sensing/vision technology will allow a wider range of materials to be more efficiently and reliably sorted especially if combined with tagging of materials for easy identification.
    - Opportunities and challenges presented by hyper-connectivity i.e. the 'Internet of Things', both in terms of data management and exploitation (opportunity) and the inclusion of WEEE in almost every item of packaging, clothing etc.
- 2014 research by the Green Investment Bank suggests a significant number of long term local authority waste contract arrangements will soon come up for re-tendering, but some still yet to secure funding; "Public–private partnership (PPP) finance agreements for local authority waste processing infrastructure are coming to an end, with around £1.7Bn of further investment required by 2020 of which £0.5Bn has yet to secure finance" (Green Investment Bank, 2014).

[19] WEF 2019, A New Circular Vision for Electronics; Time for a Global Reboot

Options to encourage further investment in the WEEE system

Consolidation of feedback, best practice and new ideas into a longlist of options

In summarizing the report findings from the desk-based research, stakeholder meetings and interviews, a combination of ideas are brought together to offer a series of options that can be explored and tested. The outcomes from the desk-based research, initial stakeholder meetings and interviews were used to develop a list of options for further exploration and testing. This was then further refined to a shorter list.

The research suggests that an investment fund itself is not the solution. There are some opportunities to refine infrastructure processes and bring greater control over processing capabilities into the UK that could be addressed beforehand. Currently there is little evidence of market confidence and attractiveness to generate outside investment, whereas the growth we have seen has come from within the sector. However, we believe there are ways to improve this by altering the value of the services offered for WEEE management and improving outputs derived from WEEE recycling activities.

This is reflected in the long list of options below:

1. Increased Tier 2 (and beyond) infrastructure capabilities in the UK to encourage onshoring of material processing and value recovery within UK markets and businesses. If leaving the EU may improve the viability of more UK operations.
2. Adopting mandatory recycling standards for all operators handling WEEE, to level the playing field of competition for processing activities so a common approach becomes adopted, with the anticipation that the impact would channel WEEE into the better operations who are able to meet new standards.
3. Grants for updating sortation and recycling technologies for sites meeting minimum standards/permit requirements, resulting in higher quality material outputs and improved recovery rates.
4. Funding plastics processing plant in the UK to handle the variety of polymers found in WEEE. This would feature technologies to better sort plastics to increase the revenue from recycled plastics sales through cleaner higher quality polymer separation.
5. Investment into improved infrastructure at HWRC sites such as material separation and access for residents allowing them to dispose of more materials in material specific streams and less as residual non-recycled material. Also, activities to maintain site security, support correct disposal of WEEE and scrap metals, adherence to DCF code of practice and improve the quality of material ultimately arriving at AATF's. Both changes could improve recycling rates and onwards flow of material to the correct recyclers.
6. Increased collection infrastructure for bulky waste and other e-waste removals from curbside to improve collection rates. Combining a secure booking system to reduce informal and/or illegal street collections and pre-treatment, and greater capacity at HWRC sites to store, separate and possibly testing for re-use of LDA.
7. Subsidised research and publicly shared findings into the latest scalable technology to improve separation of dangerous or difficult to handle materials (POP's and batteries are two current examples). The results would be freely available to a target audience of recycling technology manufacturers, collectors, and recyclers

themselves, thereby giving all operators an opportunity to improve processes without initial research costs that would be duplicated if carried out independently.

8. Increased audit program of recycling infrastructure with consistently applied, interpreted and measurable requirements and regulations by independent 3rd party experts, thus more consistent interpretation of standards and level playing field of recycling activities.

Recommendation of shortlisted options to encourage investment in the WEEE system

Summary

To intervene with suitable investment fund opportunities and progress a priority of options, a summary of the ideas and best practice from the long list is presented in the top 4 recommendations. These are options to consider individually or combined, but in no order of priority. This short list of options addresses some of the barriers and opportunities to make WEEE infrastructure activities more viable in the long term, and build a stronger business case for outside investment in infrastructure and recycling activities. This short list offers options for investment across the broader supply chain from the feedback and findings gained through the research and engagement activities.

These ideas have been developed as the basis for future work in testing and application of the project frameworks described, by building them into more refined business cases or project plans in partnership with other key stakeholders.

We have included a narrative about the possible barriers for implementation, framework of project and approximate timelines.

Option 1; Mandatory WEEE treatment standard for any waste permitted site handling WEEE

The option based on the improvement of treatment quality, suggesting that greater value could be recovered from WEEE than is currently the case. Development of new or adoption of existing quality standards, with appropriate enforcement, could bring clearer and measurable comparisons between different recycling facilities, so that it is clearer to compare different activities against a common standard. If only permitted sites can handle WEEE, then external economic conditions, such as commodity prices, could have a reduced effect on whether WEEE ends up in a licensed, or unlicensed facility.

Barrier to implementation; operational cost increases for those sites not already achieving the newly imposed standards. Would result in far-reaching impacts across the waste management sector because all site operators would need to meet the new standards if WEEE arises, especially for those where WEEE is not the target waste stream but does occasionally arise.

Framework; development of new (or adoption of existing e.g. CENELEC) standard that requires any site handling WEEE to meet the requirements as a condition of their site waste permit. Implementation date set in the future to allow for awareness, site updates, registration system and independent governance system to be setup. Standards would cover handling practices, processing, and recovery rates for material fractions.

Timeline; 12-18 month development of any new standard, then up to 12 months (or end of compliance period) before implementation deadline to allow for adoption by industry. Mandatory measures would take considerably longer.

Option 2; Grants for developing new Tier 2 and beyond WEEE derived material recycling infrastructure

Stakeholder feedback suggests there is more that could be done for secondary processing in terms of processing to increase material value and capturing this value within the UK. There appears to be existing primary processing capacity within UK infrastructure already, which recover the more prominent ferrous and non-ferrous metals, albeit the quality of this is not clear as suggested by some respondents, who said values are lower than the open market data

suggested. This may leave a gap in the market for improving quality of metal recovery and precious metals that are more advanced in the separation processes, that may be more suited to tier 2 or additional activities and infrastructure alongside tier 1 facilities.

Barrier to implementation; uncertainty of business viability beyond that of start up grant, appetite for risk (material supply and commodity market volatility) of current banking investor sector is low for WEEE sector, longer term supply contracts with AATF's (or similar) would be necessary to maintain adequate volumes for technologies to work and validate a business case.

Framework; a grant fund for establishing new downstream material recovery or as part of existing AATF's that are recipients of WEEE or WEEE derived materials from UK AATF's. Applicants would need to demonstrate adequate scalability of the operations that can treat the off takes from AATF's in the grades and volumes that arise, and at a competitive rate to that of the overseas counterparts that we understand more material is currently flowing to. Applications can be scored based on impact, longevity and business case strength and evaluated by an independent panel.

Timeline; This could be a quick win once funding is identified and management organisation can oversee judging and implementation of the infrastructure, whilst supporting startup operations.

Option 3; Understanding and addressing the challenge of lost WEEE

There is evidence from the Material Focus 'Electrical Waste - Challenges and Opportunities' report as well as stakeholder feedback, that there is more to be done to capture WEEE through the official system. The loss of household WEEE (155kT/year) is being tackled through awareness, education and behaviour change, however there are still concerns around business derived WEEE, be that Commercial and Industrial (C&I) waste (145kT/year) and/or Business to Business (B2B) asset managed (90kT/year) disposal practices that may not be entering the official system and whose whereabouts is not clear. Further work could be done here to address these losses.

Barrier to implementation; Advocacy of recycling from the general public is increasing, but volumes of WEEE recycled through the reported system are not seeing the same increase. Embedded behaviours and lack of understanding for correct disposal in the home and workplace are difficult to engage.

Framework; More targeted project to engage with end users (businesses) to identify why and how WEEE is being lost from the official system. Volumes have already been calculated for C&I and B2B through prior research, but greater understanding is necessary to challenge these behaviours before providing an alternative service or behaviour change program to capture these losses.

Timeline; Preliminary research within 9 months, before campaign design and roll out after a further 6 months. There is a consensus amongst stakeholders that any recycling campaigns need to be regular and long lasting to have an ongoing impact. This would need to be considered in a project design as well as longevity of funding to support activities.

Option 4; Improved system stability and certainty

The EPR policy review provides an opportunity to overcome some of the barriers identified from this research and address the instability in supply agreements that recyclers say are holding them back from investing, whilst recognising the benefits of a competitive environment for collectors and PCS's.

Barrier to implementation; Local authorities and waste management operators have existing contracts that last a number of years, whereas producer compliance schemes contracts to clear these sites on behalf of member obligations, are much shorter. Local Authority waste

management agreements (some long term private finance initiative) are also not all in sequence so a blanket UK wide update would be challenging to modify simultaneously.

Framework; A revision to the EPR policy requires industry wide consultation and various impact assessments. A better understanding of what type of treatment and the capacity of each that is necessary to support the WEEE arising and being channeled into the official reported system. What does this look like financially through EPR funding, and what would be required to achieve this. Modelling the impact of revised arrangements between Local Authorities, their waste management operators, PCS's and the recyclers on minimum contract duration and volumes necessary to initiate investment would help blueprint a model for stabilisation.

Timeline; The current WEEE Regulation reform may be an early opportunity to address some of the knowledge gaps, and re-designing the arrangements between PCS and the Local Authorities. Lessons may be learned from the Packaging Regulation Reform and could set a precedent for alternative WEEE system setup beyond 2023.

Potential impacts of investment

Short term and longer term investment

The evidence found in the research shows only small scale levels of investment into the WEEE sector. However, the possibility of a fund supporting a positive change to the market looks possible in a market with declining recycling rates, increasing volumes of EEE sold and consumed, and the quantified losses from the official system in prior research. In this section we take the 4 options and consider how an investment fund might be used against each, if applicable, and the short and longer term viability of the options for consideration.

Table 7; Investment options potential outcomes

Option number	Activity	How investment might be financed short term	Longer term impacts
1	Mandatory WEEE treatment standard for any waste permitted site handling WEEE	Increases in operational costs to achieve mandatory standards subsidised by EPR system through supplier price negotiations. Ultimate cost increases carried by PCS & producers, but may help incentivise WEEE to be channeled into these operators achieving the standard.	Stabilised market with harmonised and more clearly defined and applied standard to recycling, financially supported through EPR system and producer fees.

Option number	Activity	How investment might be financed short term	Longer term impacts
2	Developing new Tier 2 and beyond WEEE derived material recycling infrastructure	Grant funded kick-starter funds to support operations gain a foot-hold in the supply chain against traditionally non-UK downstream customers. Geography and impact of UK-EU trade negotiations may help this become more viable or attractive to the UK market or those seeking to secure precious metal fractions and/or recycled content for new products.	Higher quality material extracted and captured in UK creates self-financing system (more value extracted increases revenue). Where businesses use these green commodities, the product credentials can be used as a market differentiator compared to virgin sources. On-going start up funding may be necessary to start other new material operations. However if business case is robust with early test cases, investors may take this forwards independently.
3	Understanding and addressing the challenge of lost WEEE	C&I and B2B research and awareness campaigns are included in current research projects being considered by Material Focus. Areas like commercial waste and asset disposal, and theft of WEEE are reported to be other major losses but little is known about the behaviour and/or motivation of end users and collectors. Research fund to understand and then target action to address these supply chain losses.	On-going support campaigns would be needed for behaviour change campaign delivery after initial research identifies why and where supply chain losses are most prominent, if this is the root cause of why WEEE is lost to these destinations.
4	Improved system stability and certainty	N/A - Policy changes would not seek funding.	Changes would be embedded into the WEEE system, and impacts of these challenges can be reflected upon retrospectively in subsequent analysis of WEEE system.

Conclusions

Over the last ten years, the EEE and WEEE markets have become increasingly dynamic. The current situation is not favourable or sustainable for recyclers looking to increase WEEE recycling, and the business case for investment in the current system is unattractive.

Investment can only be seen as a success if it is self-sustaining and drives the UK towards more and better quality recycling and re-use, with tangible results. This research has shown that there is an opportunity in the valuable materials that can be captured by an official system, avoiding loss and poor treatment standards.

However, to leverage this change will require a higher level of investment and change than currently seen in the market in recent years, which will stretch the WEEE sector as a whole. By implementing changes in the right places, it could be possible to influence how and where WEEE is captured, the standards it is treated to and the recovery of valuable commodities, allowing different types of investment to be more viable.

We believe the priority areas to be:

1. Improving material quality

2. UK capacity and capability for material recovery

3. Increasing collection of WEEE from businesses

4. Stabilising the WEEE system

Further development of these project ideas should be collaborative, so that stakeholder needs are recognised and to increase the probability of a long-lasting solution. A better approach is an integrated one, and it is believed that where these options are employed together, they would complement each other and reduce the overall risk of investment in the industry.

Appendix

Appendix I; Anthesis Consulting Group

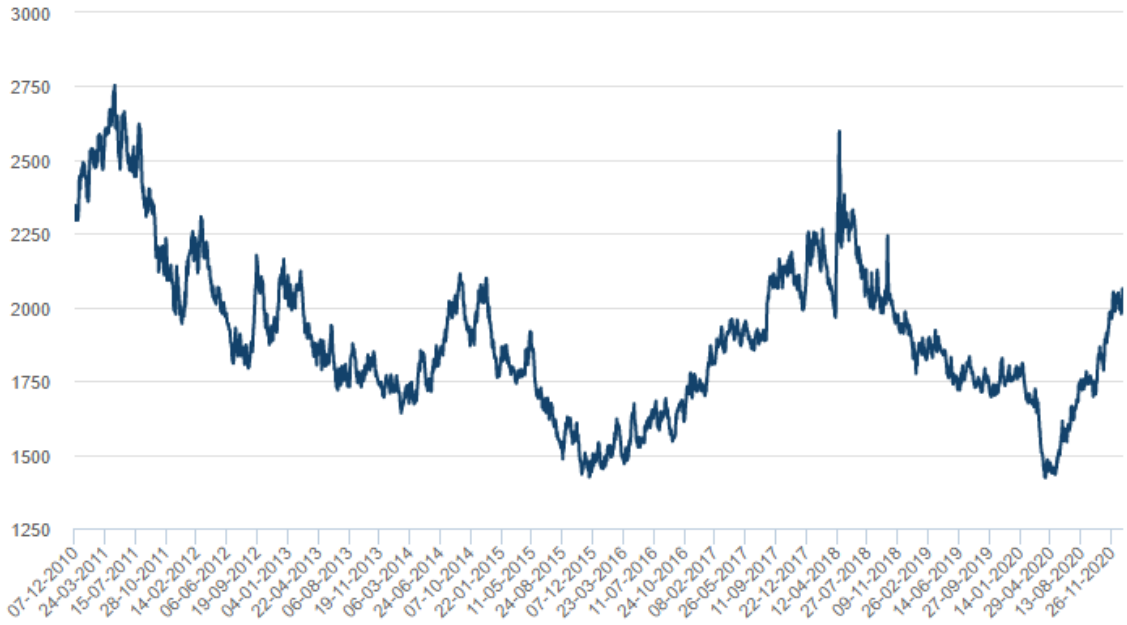
Anthesis is the sustainability activator. We seek to make a significant contribution to a world which is more resilient and productive. We do this by working with cities, companies, and other organisations to drive sustainable performance. We develop financially driven sustainability strategies, underpinned by technical expertise and delivered by innovative collaborative teams across the world.

The company combines the reach of big professional services groups with the deep expertise of boutiques. Anthesis has clients across industry sectors from corporate multinationals such as Reckitt Benckiser, Cisco, Tesco, The North Face and Target, and also supports early stage companies through Anthesis Ventures.

The company brings together 500 experts operating in 40 countries around the world and has offices in Andorra, Brazil, Canada, China, Colombia, Finland, France, Germany, Ireland, Italy, the Middle East, the Philippines, Spain, Sweden, the UK, and the US.

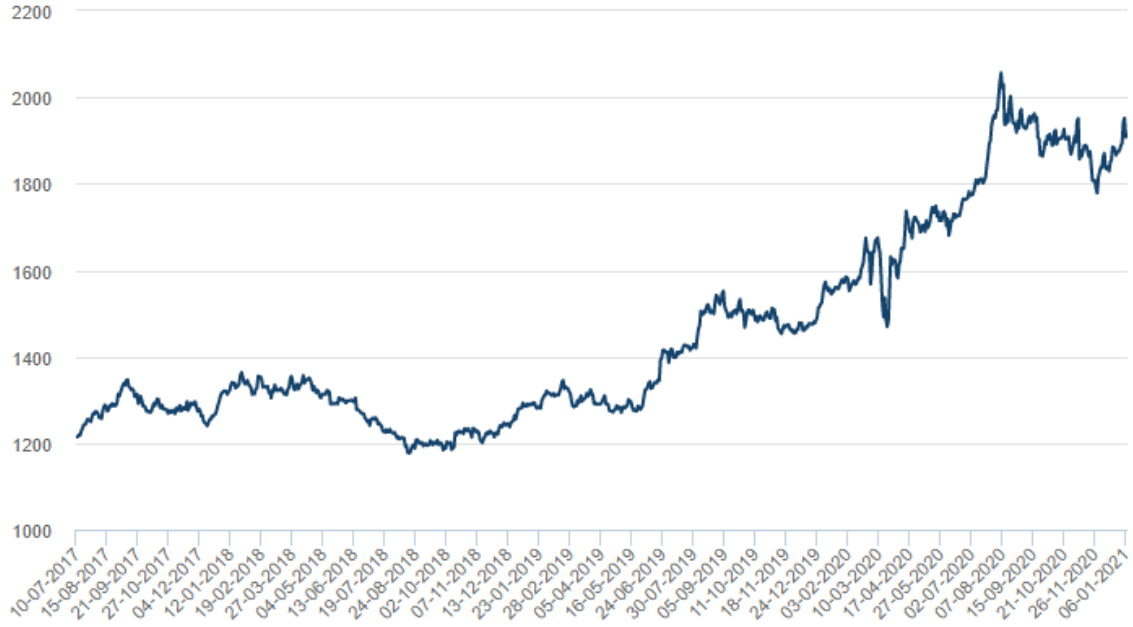
Appendix II; LME Metal market pricing (USD/Tonne)

LME ALUMINIUM HISTORICAL PRICE GRAPH



LME COPPER HISTORICAL PRICE GRAPH

LME GOLD CLOSING PRICES



Appendix III; Summary of stakeholder responses

Stakeholder Group	Questions and Responses
	1. Describe your previous experiences and/or understanding of funding sources, and what has helped and hindered the success of these investment sources;
Recycler	Cash reserves/off own balance sheet only viable way to get money
Recycler, PCS	Banks not interested - bad processes undermining legitimate operations taking away feedstock security and returns do not match banks repayment terms
Recycler	New volumes are not available to present viable business case for external investment
Producer	Few grants available from organisation like WRAP anymore
Producer	Balance of costs vs savings on producer compliance fees
PCS	Partnerships only way to get investment particularly with LA's
Recycler	Some investors may find asset financing attractive because fall back is resale of asset, but for survival not growth so unsustainable
Recycler, PCS	Very limited funds & grants either eligibility criteria or sector target application
PCS	EU funds too slow, burdensome and strictly governed to make it attractive to apply or seize opportunity
Recycler	Tier 1 & 2 might be interested but rates become too costly
Recycler, Investor	Business case hard to present securities and longevity needed for return on investment, and competitive 'race to bottom' market
PCS, Recycler	Market not attractive for investment - history failure, fire, policy and Regulatory changes, lack of 3y min. contracts
PCS, Recycler	investments are too small to warrant returns sought by some investors

PCS	Low priority; WEEE as proposition to other LA waste streams is very small 2-3% WEEE vs everything else.
Investor	Few approaches from WEEE sector seeking funds

	2. How do other successful examples of recycling infrastructure investment support those sectors? (includes national/ international, WEEE and non-WEEE)
Recycler	Enforcement, penalties and rigorous standards applied e.g. logistics and haulage sector monitoring of vehicles, create level playing field for operators and better opportunity to invest
Recycler, PCS	Partnerships between stakeholders (PCS & recyclers)
Recycler	Where long term agreements in place, gives security for investment e.g. EfW, energy, Waste PFI's
Recycler	Mandatory changes to policy and Regulation force hand of industry to change and seize opportunity
Recycler	None; should be generated from commodity sales and compliance money (which hasn't been coming through, but they are pushing system in race to bottom)
PCS	PFI contracts, but now fallen out of favour
PCS	Deposit Return system tied back to infrastructure funding under discussion so yet to materialise
PCS, Producer	Some producers implement their own brand specific circular models (Dell, Apple, HP). Helps end user and investment.
Recycler	Waste To Energy (EfW) - 500kT /yr. feedstock no problems securing investment
PCS	Packaging Regulation EPR systems seems to ringfence money into investment and there is desire to bring innovation
Recyclers	Investors willing where waste sector overlaps with Energy in EfW projects or operations e.g. Viridor

Recyclers	Primarily through long term contracts/partnerships with WDA

	3. What are the priorities (i.e. lowest hanging fruit opportunities); WEEE streams, materials and revenue sources that recyclers cannot access or access enough, others?
Recycler. Retailer	Push WEEE to be collected by most responsible operators e.g. retailers who rely on brand and consumer trust to succeed - better retailer collection systems. Smaller WEEE via kerbside
Recycler	Getting material to be treated by recyclers with consistent standards, therefore they should have similar overheads to meet those same standards
Retailer	Huge volumes lost to residual/black bin. Better communications to public to address this
Retailer	Capturing WEEE lost through unreported channels that simply don't meet reporting but are recycled.
Recycler	AATF need more feedstock as priority, then can look at quality. Capture more lost through scrap, Non-AATF and HWRC losses.
PCS, Recycler	Significant loss of compressors ~15% incomplete that is about 3kT WEEE missing, and 60% value in compressor.
PCS	Significant volumes lost from official system - address theft of WEEE and, DCF address contamination (WEEE in Light Iron & Black bins)
Recycler	Definition of Waste vs Used EEE
Recycler	Short termism - long term arrangements essential
Recycler	Technology is old and poor sortation to achieve cleaner higher value off takes. Keeping old plant running because not viable to replace.
PCS	WEEE lost to Commercial & Industrial should be separated out
PCS	Onshoring treatment and financed through producer EPR (e.g. compressor recycling would have huge environmental benefit compared to where poorly treated overseas).

Recycler, PCS	Stop DCF leakage; trial showed 85% not making its way to AATF (trackers in FPD's).
Recycler	Example from Breweries; industry decision for all kegs to be treated by one organisation, otherwise illegal. Application to WEEE could be one type of licenced operator treats compressors in UK.
Recycler	WRAP study on valuable materials and CRM in PCB lost because not sufficient quantities, even for UK there is not enough value when mixed with other lower value WEEE. Better to put high material value items back through product specific returns system
PCS	Standards reflects this getting WEEE into the right places (those sites with the right standard) that are consistently applied and enforced by Regulators (NRW, EA, SEPA, NIEA).
PCS	Improved auditing of recyclers - bring back annual AATF audits.
PCS, Recycler	Behaviour change, education, long term communication projects for consumers - tackling SMW lost through black bins
PCS	Not knowing what is coming next – Regulation or interpretation aspects. If managed better then would create stable market.
Recycler	HWRC collections for reuse not viable. Online business with takeback is model for future for re-use and increasing WEEE.

	4. What are the top 3 factors affecting the availability of WEEE for (reported) reuse and recycling, and why?
Recycler, Producer	Preventing leakage outside the system (black bin, theft, non-AATF processing)
Recycler	Classification as UEEE or WEEE (consistency needed particularly product returns that are subsequently exported)
Producer, Recycler	Public awareness for correct disposal (HWRC or retailer take back)
PCS, Recycler	Inadequate enforcement of non-AATF recyclers and DCF code of practice activities at HWRC

Recycler	Stop leakage into Light Iron - zero reuse LDA from HWRC compared to retailer takeback
PCS	Scrap metal price – taken out of reported WEEE system when high metal prices
Recycler	B2B obligation for recycling
Recycler	Hoarding
Recycler, PCS	High costs for collecting more WEEE
Recycler	High value WEEE does not enter HWRC

	5. How is the composition of WEEE arriving at AATFs affecting processing and profitability (meeting standards, toxic nasties, feedstock quality, selective picking…etc)? What is needed here to address these difficulties?
Recycler	Material not really changing, but classification has changed (Haz, POP, leaded glass)
Recycler	expect to see heat pump tumble dryers as future problem due to same design as fridge but unrecognisable at point of disposal
Producer	Not much changing
PCS	SMW contamination bas bottles and AC units are costly problem to monitor for AATF - extra personnel to employ. LDA cooling mix also contamination issue for AATF where shred processing. Both impact fire risks as well.
Recycler	positive model from AATF community collectively dealt with POP's. Common process, same time, well communicated with PCS and producers = whole market moves and everyone adopts the new approach.
Recycler	Presence of batteries and lack of continuity as to removal pre-shredding. Not coordinated via AATF community therefore some disadvantaged. This is opposite of POP's industry led solution.
PCS	Incomplete products (cables, compressors). To resolve this, better security, enforcement, education, DCF CoP enforcement,

PCS	PCS often waste management company. Prevention of vertical integration could better serve individual function rather than serving another.
Recycler	Start with getting it right at HWRC; educate public, reduce contamination, reduce leakage, stop parts harvesting and treatment, increase enforcement
Recycler	Separation technology (i.e. basic shredding) massively affecting the quality and value of recovered materials. First stage processing is mixing most materials to point were it is lost
PCS	10-20% fridges incomplete.
PCS	Collection, storage and treatment system for WEEE is not fit for purpose with current product design
PCS	SMW material composition fairly stable, but increasing presence of plastics in LDA pulling down material revenues.
Recycler	Presence of Gas bottles, Batteries, Non WEEE, Wrong plastics increasing burden on AATF. All not managed at HWRC correctly
Recycler	Anything of perceived quality/value does not get to the recycler (flat panels, smart tech, IT goes to national and international second hand markets

	6. What part could new treatment technologies play in improving quantity and quality of WEEE recycling? Where is investment most needed?
Recycler	Too far ahead to worry consider technology itself. Processing and sorting are not the priority. Need volumes to warrant Return on Investment (RoI).
Recycler	Most investment is used to replace worn out kit or improve compliance levels none of which feed down to bottom line
Producer, Recycler	Only small number FPD plants (Veolia & WERCS), and not many CRT. Seems to need more for FPD - See FPD Recycling Plant due 2021
Producer	SMW - are technologies working to recover properly? Lots of variation in plant make-up. Improved separation

Recycler	POP's need most immediate action - suggest CF or producer funded research for results to be shared widely across recyclers to adopt same processing technology - cannot afford to do this individually. Incineration removes all BFR even if not POP's, so loosing material.
PCS	Smarter technology to deal with difficult fractions - POP's Leaded glass, Mercury….
Recycler	Technology to better process shredder residues for increase valuable material recovery
Recycler	Due diligence on downstream processors is difficult – export and lack of visibility of operations.
Recycler	New technology will come when market opportunity arises - either through uniform enforcement of Regulation, or strong business case for better recovery of value
PCS	CRM recovery - mass recycling activity in UK does not get the value, instead extracted down the supply chain
Recycler	Lithium battery and cobalt removal – backlog of batteries might create short term opportunity
PCS	Not enough material or value to warrant new plants being built - fighting for same material not pulling out new sources
Recycler	New technology to raise standards and push out lower quality operators but only if market wants or is required (Mandatory Regs) to do so.
Recycler	£3-400K TOMRA/STEINER try to take out residual metal, even then might not meet material off take standards or international environmental standards to ship. TFS for mixed almost impossible, and international classification difference and reluctance to take material.
Investor	New tech can take time to build business case and become effective to lab based models - e.g. early AD investment

	7. Describe the current and future opportunities for infrastructure investment
Recycler	Investment possible but need to sort out treatment standards - common enforcement and interpretation standards and mandatory requirements.

Recycler	POPS plastic, large volumes possible but needs to meet special waste installation licences and site conditions and takes 12mths to get, but missing visible standards meeting those standards and licences with adequate monitoring and enforcement.
Recycler	WEEE System needs to change; If recast WEEE Regs for AATF have to operate to BS50625 (CENELEC) makes sure that everyone meets standards, proven through audited system, otherwise not allowed to apply for AATF. Look to impact of mandating this legislation in Ireland - prices initially go up then settle down within 1-2yrs.
Recycler	Recent investment only a result of capacity shortage realised in cooling back in 2016
Producer	As retail collection network comes on line there will be 1000+ collection network – support these retailers to implement reverse logistics.
Producer	Increasing reuse opportunities better through retail network through logistics and soft and secure handling.
Recycler	Gate fees for cooling dropped £20 when AO opened so might see opposite for Cooling & SMW since Viridor has closed this summer.
Recycler	Contracts, security operations (policy), standards equally applied, long term supply agreements
PCS	Market opportunity for batteries- household and automotive, but to treat in UK instead of off-shoring final processing in EU.
Recycler	POP's want to inhouse treat more processes
Recycler	Regulatory change - increasing onus on producers to fund more difficult to reach WEEE. WEEE is known to be a growing market but rates have been declining to untapped resource
PCS	Plastics recycling new operator may close gap (Sun International Recycling in Corby 2021)
Recycler	Customer, regulatory, voluntary all push factors. BATRRT just agreed and adopted – battery and mercury from screens need clearer standard requirements, but need something to report to prove this – need some kind of measurement and independent auditor to verify standards.
Investor	Longer term basis for subsidies or supply

	8. Describe the current and future barriers for infrastructure investment
Recycler	Lack of robust and credible enforcement - under resourced and lack of technical expertise.
Recycler	Criminal court process and powers insufficient to stop within adequate time - bound by red tape and risk based approach to prosecution
Recycler, PCS	Lack of long term agreements
Recycler	Too many PCS driving down price from producers to recyclers
Producer	Economic situation, budgets, consumer confidence and behaviour are not stable to build a business case for investment
PCS, Recycler	Comparison to other EU countries setup and contract arrangements – UK is highly unstable (e.g. France Veolia - FPD site in France for Veolia, example of long term agreements with 2 or 3 PCS and surprised at how often the UK changes agreements.)
Recycler	Cost per tonne black bin 4-5 times more than current costs. The gap to the next series of NEW WEEE sources is so much higher than current or CF. Centralised regulated quasi PCS with one target market, and funded from other producers and markets (to avoid price inflation of the existing evidence).
Recycler	When missing targets, the AATF feel financial loss. PCS have to pay the CF (but this comes from producers, and producers recover from sales). This leaves the recycler with no financing and financially exposed to UK missing target. Leads to commercial failures and closures.
Recycler	Higher CF is not driving PCS to collected more difficult to attract WEEE, 'High' CF is still cheaper than developing short term collection arrangements to attract 'new' WEEE sources. (Currently just displacing from one PCS to another).
PCS, Recycler	Negative impact of price competition – fighting for cost effective recycling solution – e.g. SWEEEP furnace pushed out due to cheaper alternative solutions. Investment needed to for battery facility, but lacking a coordinated approach for whole of UK pushing to the same solution (aggregation of material flow and money for investment to many different operators of many different locations (UK and NON UK).

PCS	Slow and late funding opportunities available to secure market opportunities. Welsh Government seems to have stream of different funding available resulting in more examples of waste related investment.
Recycler	Lack of budget to afford; Sortation equipment £3-500k, POP's treatment £2M, Metal and plastics processing £3-4M.
Recycler	Lack of innovation and distribution of Waste collection agreements to PCS's not proportionate to multi PCS approach
Recycler	Dynamic waste compositions - reducing CRT and POP's why invest here? Increasing risk of battery but no financing system to pay for batteries that should not be in those waste streams
Recycler	Sector undermined by poor treatment and lack of enforcement or prosecution (Standards, theft)
Recycler	Standards inadequately applied and adopted – customer doesn't want to add the cost of things like WEEELABEX, and the AATF lowest standards is adopted even though not equally enforced.
Investor	Departmental objectives and alignment are not great, to give investors and lenders the confidence to say plant can be long term operable.
PCS	Lack of visibility long term targets - not like packaging system that seems to perform adequately
PCS	Targets help LA and infrastructure in planning. Need to get the contracts to mee the agreement, but would be happy to sign longer term if longer security of supply. 12mths is event too short, 3-5y is preference for LA to have meaningful impact.
Recycler	Too many PCS not collecting themselves
Recycler	Differing approach to regulation - e.g. POP's in cables for WEEE should be same for cables in ELV, but it isn't.
Recycler	High risk low margin. H&S /Fires/Explosions/recession
PCS	Cost of increasing collection volumes from HWRC out weighs the benefit of sourcing more WEEE from that LA contract

	9. How would increasing recycling targets and/or standards help investment for WEEE infrastructure?
Recycler	Not at all. Targets don't make a difference. Compliance fee not punitive enough to drive behaviour or major increase to costs paid by producers.
Recycler	Prosecution examples of failing to do things correctly (meeting targets or recycling standards) would have bigger impact - e.g. unlicensed sites holding WEEE, or, Northern Compliance £50k fine for missing target that would have cost over £1M sets a poor precedence
Recycler	The cost will simply go up regardless. Getting material in the system, but need to make producers and PCS's accountable for getting material in the system.
Recycler	Allocation system rather than the Producer Compliance Scheme Balancing System
Producer	If CF was more visible then it might drive them more to collect other sources, as can offset the costs of other new sources.
Producer, Recycler	Standards – making sure WEEE is being paid for by producer, beyond that of AATF, so all have reporting requirements. Increasing standards would improve quality of operations but not by huge steps, because unable to invest significantly to ultimately meet them. There is little or no recovery of these extra costs by improving standards because the supplier will not pay more, and the increase in the value of off-takes are not big enough to cover the investment.
PCS	With CF in LDA set at zero, opportunity to collect more for material value reasons, but this doesn't happen
PCS, Recycler	New facilities not starting because standards not recognised and voluntary. Producers need to demand a type of evidence.
Recycler	Finance from increased targets does not reach the recycling sector as paid by producers.
PCS	Better alignment of Agencies would help facilities to operate equally.
Recycler	Longevity of product, reuse, repair targets would have more positive impact upstream on products themselves
PCS	Improving intelligence based target setting like reducing contamination, improve segregation, different targets on PCS and LA's retailers.

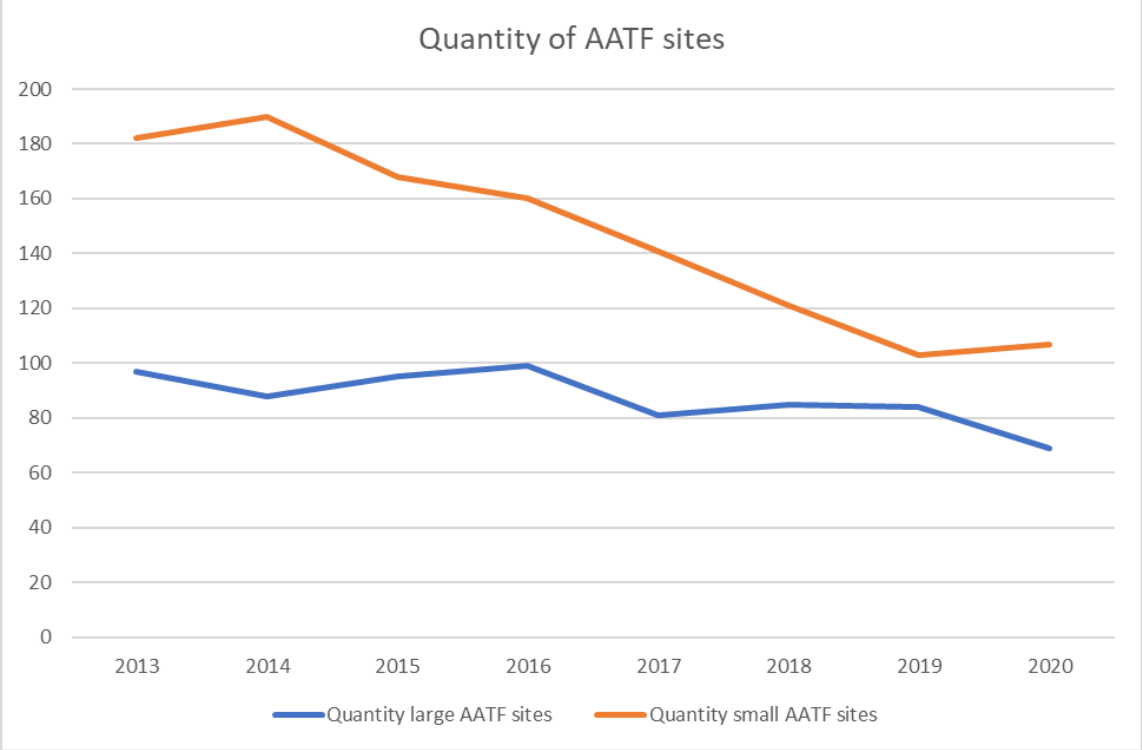
PCS	Standards – unofficial acceptance that regulators are unable to regulate complex operations of WEEE plants – either in house or outsource via 3rd party regular auditing (like previous years through auditing).
Recycler	Target for behaviour, black bin WEEE composition, scrap yards and Theft from HWRC, BATRRT conformance, audit standards more regular testing
Investor	Landfill tax and visibility of escalator was bog incentive for previous recycling investment - without industry would not develop. Need carrot and stick approach
PCS	Need to put money into awareness and information, to get more WEEE instead of displacement.
PCS	Mandatory kerbside collections will not return enough - even most affluent areas (best recyclers) generate only 2T /month, and costs for retrofitting vehicles would run into millions across whole of UK.
Recycler	Need long term allocation system rather than short term PBS arrangements

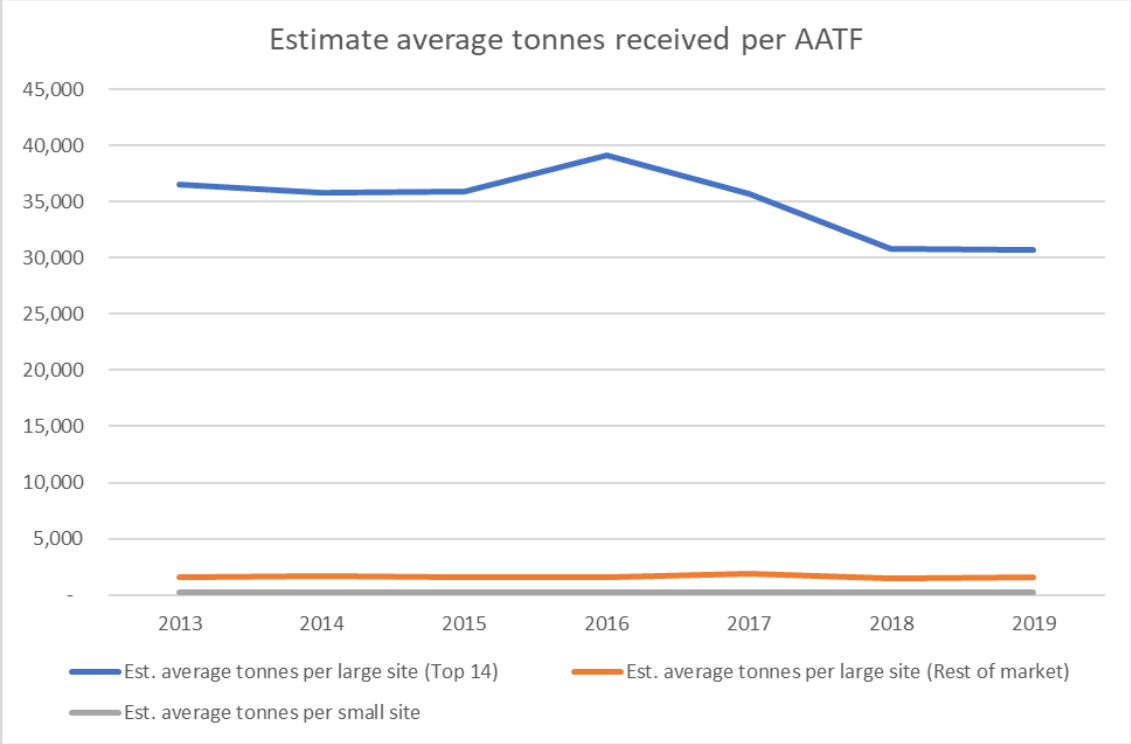
	10. What part could incentives and support play in increasing quantity and quality of recycling?
Recycler	Motivation behaviour change – bans (smoking & landfill) deposit return (packaging), nudges to disposal (ongoing positive communication)
Recycler	EPR is supposed to be a incentive, however not sufficiently influential
Recycler	Subsidised R&D to improve operations
Recycler	Collection and communications – so much of responsibility on LA (who have no money) if additional funding available – this could impact quantity most. More collection points more opportunity to capture from those without easy access.
PCS	Incentives for HWRC to improve separation and contamination.
PCS	Trade in / Scrappage programs trialled on individual producer basis but not financially attractive enough (discount vs new sale), however does help improve better technologies (e.g. car scrappage and tumble dryer safety concerns) where energy and safety play a part in motivation

PCS	Increased support for communications projects reaches lots of people (but does it have a material impact on behaviour, or a long game with incremental change that we are yet to see the full impact?)
Producer	Fixed fee model Ireland has positive impact on recycling rates
Producer	SMW is now just a cost - material value lower than processing costs
Producer	Retailer takeback incentive has a bigger impact in Ireland and more secure returns (managed like stock) compared to more open HWRC. Also better quality for re-use potential where not bulked, lightly compacted or dropped 6ft into a metal skip.
PCS	Incentives to go above and beyond target based system
PCS	Incentives for longer term contracts - better value and bigger impact opportunity for LA's.
Recycler	Changes in EPR system so producers paying real cost of collection, in a system that assists recycling (Article 8a)
PCS	Commercial agreement PCS-recycler should be enough
PCS	Tesco Clubcard and Carphone Warehouse trials had minor impact on behaviour, but its more driven by the intrinsic value of the device rather than the reward itself (i.e. there is something in it for phone & IT unlike toasters and toothbrushes)
PCS	Incentives must recognise different motivation of demographics, and how this targets new WEEE not displacement.
PCS	Policy change to incentivise all PCS to collect WEEE themselves
Recycler	visible fee to consumer - educational value as well as funding source for communications
Recycler	Manual separation or pre-sort, instead of mass automation that downgrades the material quality.
Recycler	Better utilisation of Prison social development programs - upskilling and untapped resource
Recycler	More tier 2 and 3 processing in the UK - retain value, accountability to treatment, reinvestment opportunities.

Recycler	Incentivise PCS to be more innovative in collection of WEEE, and getting more material into the right system (via HWRC, door step and retailer takeback) is priority
Recycler	WEEELABEX is not an incentive - insufficient market demand, cheap to setup (£/tonne) but very costly per tonne to maintain (££/tonne).
Recycler	Incentivise transparency and accountability of recyclers - currently too easy to hide away from un measurable standards that are not black and white enough (hence the difficulty in regulating and enforcement)
PCS	Incentivise making methods of collecting and back haul easier - retailers and transfer stations see paperwork as burden not worth resourcing
Recycler	There are not enough disincentives. Risk-reward is in favour of those flouting the Regulations and consequences are not significant enough

Appendix IV; AATF and Tonnage analysis





Appendix V; Full AATF tonnage and site quantity analysis

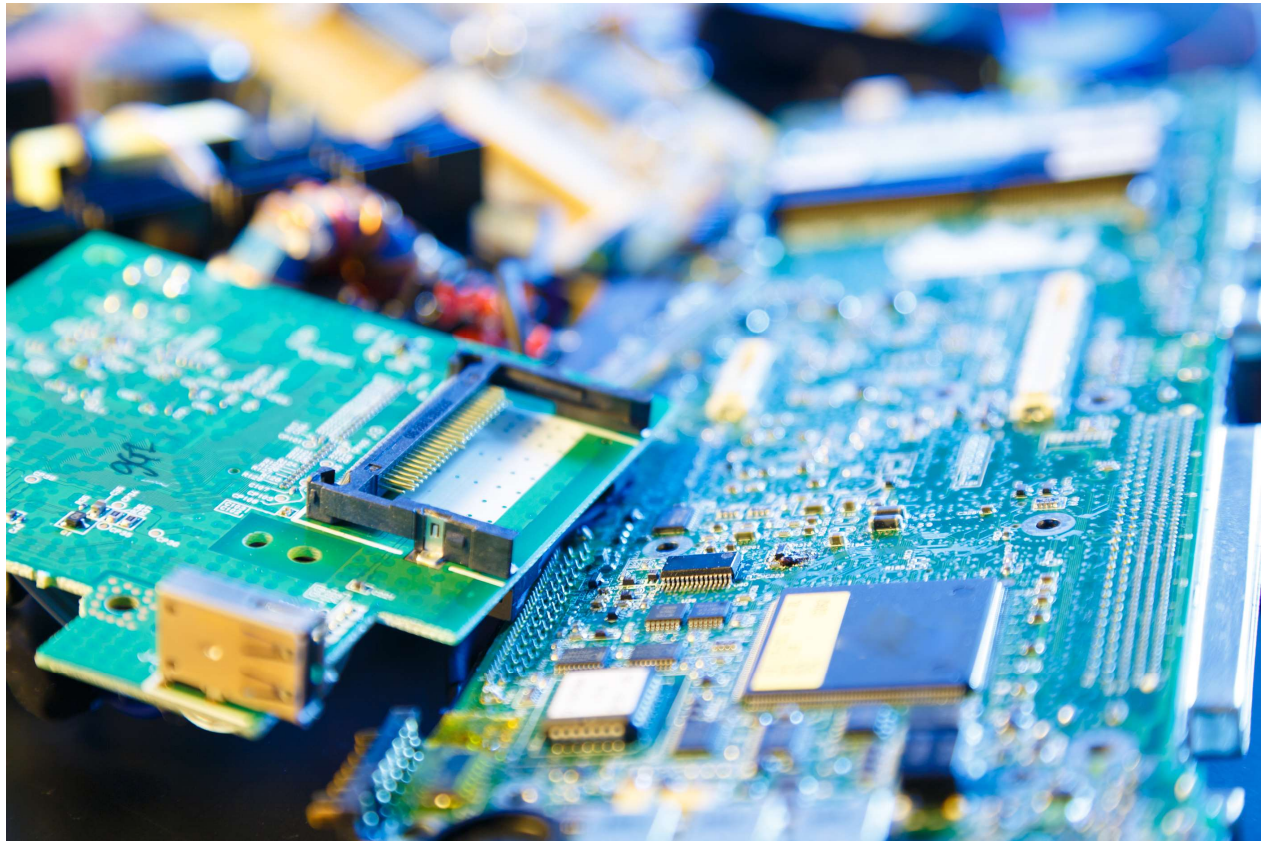
Year	How many AATF (total)	Quantity large AATF sites	Est. average tonnes per large site (Rest of market)	Est Tons per ea. 43 registered sites in AATF forum = 85%	Total tonnes all Large AATF	Quantity small AATF sites	Est. average tonnes per small site	Total tonnes all Small AATF	Total WEEE collected by AATF (tonnes)	POM Kt	% WEEE in large AATF	WEEE received by top 14 large AATF	WEEE received by remaining large AATF
2013	279	97	1,776	12,635	639,196	182	200	36,400	675,596	**2886**	94.6%	511,357	127,839
2014	278	88	2,091	12,398	627,207	190	200	38,000	665,207	**1671**	94.3%	501,765	125,441
2015	263	95	1,814	12,431	628,865	168	200	33,600	662,465	**1769**	94.9%	503,092	125,773
2016	259	99	1,834	13,538	684,850	160	200	32,000	716,850	**1739**	95.5%	547,880	136,970
2017	222	81	2,466	12,349	624,727	141	200	28,200	652,927	**1615**	95.7%	499,781	124,945
2018	206	85	1,923	10,644	538,472	121	200	24,200	562,672	**1546**	95.7%	430,778	107,694
2019	187	84	1,967	10,626	537,575	103	200	20,600	558,175	**1715**	96.3%	430,060	107,515

Appendix VI; Stakeholder webinar August 2020

EVALUATING OPPORTUNITIES FOR ESTABLISHING AN INFRASTRUCTURE INVESTMENT FUND FOR WEEE

Version 1.0

July 2020



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INTRODUCTION

Sharing our findings to start a discussion with industry stakeholders to evaluate the opportunities for establishing an infrastructure investment fund

To better understand needs and experiences from industry

Research commissioned by Material Focus (formerly the WEEE Fund) - a not-for-profit organisation driving the UK Recycle Your Electricals campaign

> ***This research proposal from Anthesis will investigate the opportunities for a specific investment fund, to be set up for the UKs WEEE infrastructure, to help make the sector more resilient when tackling increasing future challenges such as higher collection targets and treatment standards***
>
> Anthesis research proposal

Agenda

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01 What has been achieved up to now?

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ELECTRICALS MARKET TRENDS

- In 2016, 44.8 million tonnes of e-waste were generated globally.
- Only 17% of this is formally collected today – 32% in the EU.
- In the UK between 2016 and 2019 this has fallen from 717 to 558 thousand tonnes reported as recycled.
- Our research 'Electrical Waste – challenges and opportunities' suggests nearly 900 Kt recycled

- From 2016 to 2017, EEE put on the market in the EU increased by 6.5% from 8.4 million tonnes to 8.9 million tonnes.
- However, in the UK between 2016 and 2019 EEE reported on market has fluctuated between 1.7 – 1.5 million tonnes.

EEE on market and WEEE recycling rates

There is not a immediate correlation between electricals (EEE) reported as sold on the market, and waste electricals (WEEE) coming off the market and reported as recycled.

The amount of WEEE collected through the formal and reported WEEE system has reduced.

The weight based system may hide some of the real trends in WEEE and EEE unit quantities, however, the UK system does not record this information.

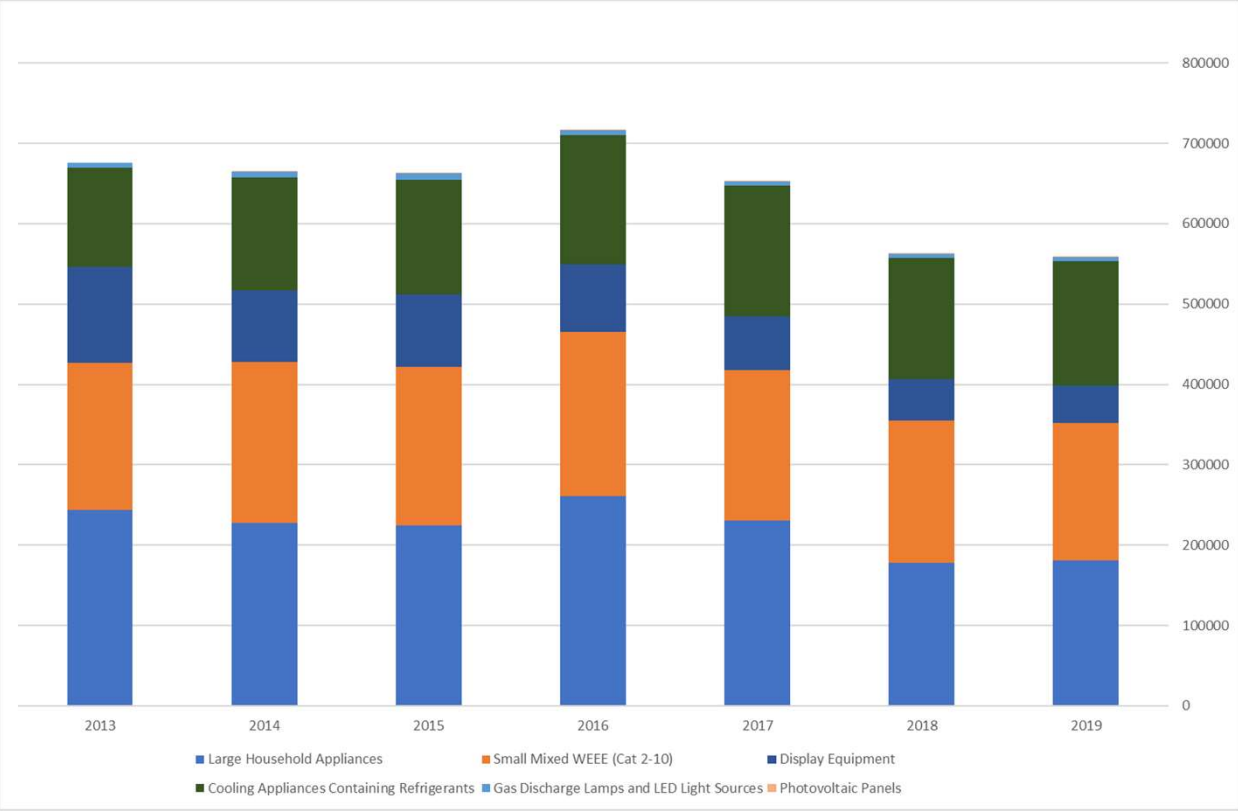
UK WEEE infrastructure faces new standards, changing targets, challenges with feedstocks, and increasing costs. Are these the causes of trends in WEEE reported?

WEEE RECYCLING TRENDS

- Reduced reported WEEE collected and recycled.
- Reduced number of AATF licenced operators.
- Small number of large operators make up over 80% of treatment capacity.
- Increasing potential for under utilized treatment capacity as a result of the reduction in reported WEEE collections and recycling.

Reduced WEEE reported in last 4 years, significantly influenced by trends in Large Household Appliances

WEEE reported received at AATF 2013 - 2019 by stream



AUDIENCE POLL

What is holding us back from increasing collection and recycling of WEEE?

Commodity market off take value?

Compliance fee alternatives?

Operational costs?

Inappropriate disposal by general public?

Targets?

Short term collection arrangements?

Other (please describe in 1to1 chat box)

02

How does this look for EEE sales and WEEE per head to 2030?

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HOW DOES THIS LOOK IN THE FUTURE?

By looking at prevalence of EEE in use we can seek to quantify the opportunity for collection

Historic EEE sales can give an indication of possible future EEE on market.

Developing this theory, EEE per head of population give us a benchmark for projecting EEE consumption and likely disposal of WEEE.

With increasing prevalence of EEE in the home, we expect to see a higher rate of turnover of EEE to WEEE available for collection.

> ***Using a regression analysis of reported EEE sales and building into this per-captia growth trends, we estimate 1.9 – 2.5 Million tonnes EEE sold by 2030***

OTHER POSSIBLE IMPACTS ON AVAILABILITY OF WEEE

- Impact of more products as a service
- Lease and rental business models
- Reduced traditional ownership in latest technology
- Shorter initial period of ‘ownership’
- Closed loop product supply and return – re-use/refurb/recycle?
- Producer/retailer take back recycling partnerships and incentives
- Opportunities for new partnerships in larger scale collection systems
- LA collection systems and services

Impact on material make up of components in changing technology

Metals and plastics used in electronics has changed and will continue to do so, thus impacting the value and recovery rate of commodity values.

Displays – size and technologies

IT equipment and Consumer goods – technologies, PCB and memory units.

Opportunities to identify new higher value product groups within WEEE.

03 Commercials of commodity recycling - off takes and market value

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COMMERCIALS OF COMMODITY RECYCLING

WEEE traditionally enters the system in the 6 streams, although specialist separation does exist but to a smaller extent.

Potential revenue sources for recycling:

1) Service provider revenue (recycling services)

2) Commodity sale revenue (material off takes)

Positively influencing these activities and inputs will therefore make investment more viable and attractive to funding applications.

“

1%

ESTIMATED CRM RECOVERY FROM WEEE

The LIFE 2014 CRM Recovery project

COMMERCIALS OF MATERIAL RECYCLING

A best estimate of the total revenue going into the WEEE system through service provider revenue is based upon the estimated UK EPR costs.

This revenue input is based on Government impact assessment data from introduction of 2013 WEEE Regulations, then benchmarked against market intelligence for WEEE costs.

Service provider revenue from recycling WEEE

Source/Calculation	Estimated revenue	Confidence grade
Waste Electrical and Electronic Equipment (WEEE) system IA No: BIS 0393 (evidence and gate fees) 10 year estimate	£841M	Medium - data from 2014
IA calculated (1 year equivalent)	£84.1M	Low-Medium - data from 2014, linear application 10yr IA modelling
Estimated Non-household WEEE service provider revenue	£1.5M	Medium - averaged costs applied to B2B WEEE collected

COMMERCIALS OF MATERIAL RECYCLING

Material composition summary by stream. By recognising the typical material composition of material we can seek to target the most lucrative sources for raising commodity sale revenue

Meta analysis of existing WEEE composition research for some materials in WEEE.

Material	Average % all streams	Potential material in WEEE received (tonnes)	Average Recovery rate	*Commodity market value (£/tonne)*	Low estimate potential revenue per material	High estimate potential revenue per material
fe	34.0%	190036	95%	200-250EUR/T	38M EUR	57M EUR
al	5.8%	32371	90%	1,100-1,500EUR/T	20M EUR	42M EUR
cu	7.2%	40242	90%	5,000-5,500EUR/T	197M EUR	248M EUR
other	13.9%		-			
plastics	30.0%	167253	80%	250-350EUR/T	22M EUR	31M EUR
glass	9.1%	51011	80%	50-55EUR/T	1.1M EUR	1.6M EUR
Ag	0.0021%	11.951	95%	0.52-0.59M EUR/T	6.0M EUR	6.7M EUR
Au	0.0006%	3.600	95%	52.911 M - 56.438M EUR/T	181M EUR	193M EUR
Pt	0.0002%	1.194	95%	24.692M - 26.455M EUR/T	28M EUR	30M EUR

COMMERCIALS OF COMMODITY RECYCLING

Based on the composition analysis, indicative commodity market rates, how much of an opportunity could there be out there by increasing the amount of WEEE that is collected and correctly recycled to a high quality standard?

> ***Achieving a 50,000 tonne increase to WEEE recycling could bring an additional £37 – 43 Million Euro into recycling system***

Estimated revenue increase uplifted recycling

04 Observations on technology opportunities

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OBSERVATIONS ON TECHNOLOGY OPPORTUNITIES

- New technologies
- Replacing recycling equipment
- Availability of new lease arrangements
- Increased focus on plastics recovery
- Pre-sorting operations to improve material feedstock
- Digitalisation and developing new collection arrangements
- Upgrading and/or increasing transport and logistics management capabilities
- Others?

As a result, increasing material recycled, improving input/output quality and standards, greater access to feedstocks, modernising service value offering

Where is infrastructure investment needed;

New recycling technologies?

Increased sorting and separation?

Increasing capacity?

Improving quality and quantity of supply?

AUDIENCE POLL

If an investment fund was available, what would be the best way to put this to use, with the objective of achieving a positive long term impact to the WEEE recycling volumes and standards?

New more efficient technology

Extra capacity (new and extra facilities)

Improved transport and logistics

Increased access to more WEEE feedstock

Input quality measures

Other (please describe in 1to1 chat box)

05 Current funding sources

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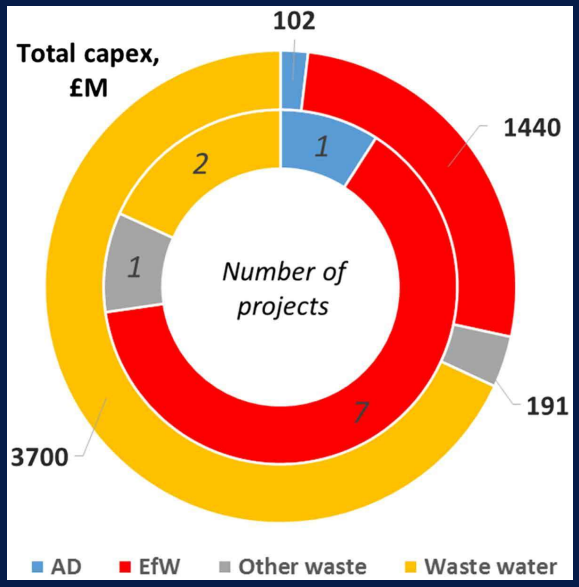
FUNDING SOURCES

Fund identified	(£ millions)
Defra's Waste Infrastructure Delivery Programme (WIDP)	3000
UK Waste Resources and Energy Investments (UKWREI)	280
Green Investment Group (previously Green Investment Bank)	270
Recycling and Waste LP ("RAW") Fund	200
London Green Fund	120
Foresight Environmental Fund	70
London Waste and Recycling Board Fund (LWARB) (funded by London Green Fund)	20
Defra Resource Action Fund	18
WRAP Circular Economy Fund	6.5
Green Investment Bank (2012-2017) - government owned	3.8
Litter Innovation Fund	0.5

Current access to investment funds and grants appears limited



Phil Purnell (2019) On a voyage of recovery: a review of the UK's resource recovery from waste infrastructure, Sustainable and Resilient Infrastructure, 4:1, 1-20, DOI: 10.1080/23789689.2017.1405654

06

Opportunities and barriers to investment - policy, finance, innovation

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OPPORTUNITIES AND BARRIERS TO INVESTMENT

Opportunities for the system

- Increasing consumption (and disposal) of WEEE into the correct recycling system
- Return on investment potential
- ESA: “£10 billion of investment in new waste management infrastructure, boosting GDP by £3billion”
- Suez invested excess of £10 billion in technologies to move waste away from landfill over last 10yrs
- Growth of waste sector; currently employs 140k with over £6billion turnover
- Willingness to invest demonstrated in merger and acquisitions activities (e.g. Renewi, Viridor, Corys)

Characteristics to encourage investment to the WEEE sector

How should opportunities be prioritised for investment?

AUDIENCE POLL

What is the biggest opportunity for the WEEE sector?

- UK Regulatory Reform
- Increasing demand for material as recycled content in new products
- Investment and grant availability
- Consumer awareness and behavioural change
- Other (please describe in 1to1 chat box)

OPPORTUNITIES AND BARRIERS TO INVESTMENT

Barriers to the system

- Planning restrictions
- Stability and clarity to government policy and alignment of Regulation to their environmental goals
- Market demand and international trade of materials
- Toxics in WEEE
- Public-private partnership (PPP) finance agreements for LA waste processing infrastructure ending

Characteristics to encourage investment to the WEEE sector

What is holding back the WEEE sector from growing, and how can this be overcome?

WEEE INFRASTRUCTURE SURVEY AUGUST 2020

Survey on opportunities and barriers to investment in the WEEE sector.

How should opportunities be prioritised for investment?

What is holding back the WEEE sector from growing, and how can this be overcome?

What are the characteristics of market, policy, and systems that will facilitate greater investment to the WEEE sector?

THANK YOU

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Appendix VII; Peer review feedback from steering group

Both options lists have been presented to WEEE stakeholders; trade associations, industry representatives and government departments, to allow a final commentary of the findings and suggested application of the options. The request was to help consider viability and potential implementation.

Responses were consolidated and summarized to provide a brief overview of how the options were received.

Peer review feedback of option 1 Mandatory WEEE treatment standard for any waste permitted site handling WEEE included commentary to suggest:

There is little or no case history of funding for developing standards, these costs are traditionally absorbed into the business because they have been developed by those adopting the standard.

The waste sector is supportive of adopting the CENELEC standard, with subsequent incremental development along with enforcement.

BATRRT as an alternative is not adequate

Peer review feedback of option 2 Developing new Tier 2 and beyond WEEE derived material recycling infrastructure included commentary to suggest;

Further detail and understanding needed here of opportunities in Tier 2 treatment to test a viable business case.

UK waste is a UK problem/opportunity and innovation is necessary.

Financial support better placed in higher commercial risk materials that are currently borderline business cases.

Clearer case for supply and demand (traditionally in manufacturing countries) economics necessary.

Peer review feedback of option 3 Understanding and addressing the challenge of lost WEEE

The public awareness campaign currently funded by Material Focus is designed to increase household collections. Research needs to be directed to other end user groups not just householders.

Lots of money spent here already on research, so should be able to direct this funding to the correct infrastructure by now e.g. targeting small WEEE lost to residual.

Peer review feedback of option 4 Improved system stability and certainty

Policy changes would not normally feature in a feasibility study for an investment fund other than setting the context for what cost will be picked up by distributors/producers in the forthcoming review (i.e. curbside collection infrastructure).

With a declining number of operators in the WEEE recycling system, there will come a point when there is insufficient capacity resulting in disruption. At this point the market is forced to react and economics change for recycling operators and investment. The alternative is AATF operating under capacity causing lower profitability or running at a loss.

System stability; The Monopoly system vs competitive system debate is complicated, but a reduced number of Not for Profit PCS's would deliver the benefit of longer term planning by the PCS's who will need to protect the UK capacity (infrastructure) to ensure future targets are achieved.

Other commentary;

Grants not normally solutions because not sustainable. Projects need longer term valid business case.

HWRC and bulky waste infrastructure; enforced EPR Regulation should support this.

DCF should have greater responsibilities.

Publicly shared research findings; seems unlikely but if taken forwards needs careful use and management of any fund.

Some in waste sector are supportive of increased 3rd party audit programs.

Material Focus is an independent, not-for-profit organisation on a mission to save valuable, critical and finite materials inside electricals from going to waste. We do this through

Insights

We identify, produce and share insights to improve the UK e-waste system and inform policy decisions.

Investments

We identify and fund projects that make it easier to reuse and recycle; or that encourage circular design.

Inspiration

We inspire, educate and encourage the UK public to fix, donate, sell and recycle their unwanted electricals through our Recycle Your Electricals campaign.

www.materialfocus.org.uk