

WEEE Theft from DCFs Project

FINAL REPORT

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Supported by



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1. Introduction

a. The Project specification stated the following as the desired outcomes:

- an estimate of the level of theft being undertaken at UK designated collection facilities (DCFs);
 - an overview of the waste electrical and electronic equipment (WEEE) that is being targeted for theft and the motivation for doing so;
 - a summary of actions that have been undertaken by councils to mitigate theft and the success of these measures - using case studies where available;
 - information to allow for the development of action plans to mitigate or reduce theft on DCF sites and to ensure more WEEE stays in the regulated WEEE system; and
 - a summary of data assumptions and study limitations and areas for further research.
- b. This was to validate an estimate produced¹ in October 2016 which suggested that approximately 96k tonnes of WEEE was being 'leaking' from UK DCFs through theft or unreported use. The report concluded that the majority of this was treated through legitimate routes but that approximately 9k tonnes of components – primarily compressors - was illegally 'treated'. The report also considered that theft was 'relatively widespread rather than isolated incidents'. The estimate, based on 2015 data, is shown in Table 1 and outlined in full in Appendix 3.

WEEE stream	Tonnes	Comments
Cat 1 Large domestic appliances (LDA)	77kt	Assumes 43% is lost through unreported use based on sales vs. returns ration for fridges
Cat 2 Small Mixed WEEE (SMW)	1kt	Nominal assessment
Cat 11 Display	10kt	Assumes 13.5% leakage from HP assessment
Cat 12 Cooling	9kt	Assumes ~6% unreported WEEE from 35% damage x 10 kg compressor removal
Total	96kt	Equates to 26% unreported WEEE and EEE reuse

Table 1: Previous estimated rates of theft from DCFs (source: WRAP/Valpak EEE Flows Report 2016)

c. This project was undertaken by 360 Environmental Ltd with support from LARAC.

2. Executive summary

- a. The project has interviewed a range of stakeholders from a number of sectors who have agreed a consistent position that, whilst there are some sites where it continues to be a significant issue, theft from council DCFs is now generally opportunistic and low volume – estimated to be <3%.
- b. The overall conclusions are that:
- i. theft from WEEE from DCFs is minor, impulsive and not part of any large-scale organised process;

¹ Valpak/WRAP EEE Flow Reported dated October 2016 <http://www.wrap.org.uk/content/weee-flows-report>

- ii. most councils do not perceive theft as a problem;
- iii. where theft does occur, the primary targets are flat screen TVs, non-ferrous metals and lead acid batteries;
- iv. theft in recent years has been reduced through a range of actions:
 - a) council DCF site security has significantly increased with CCTV now being commonplace;
 - b) the award of contracts for the management of DCFs to larger waste companies have seen tighter site security controls applied;
 - c) used EEE values have fallen with reduced scrap metal prices over the last 4 years and the general trend of falling prices of new equipment, and
 - d) the illegal export of waste – including WEEE - has seen more enforcement focus².
- v. alternative collection methods of WEEE – in particular, Regulation 43 collections by retailers - have reduced the amount of large domestic appliances collected through DCFs;
- vi. a significant amount of WEEE is unreported due to inclusion in scrap metal.
- vii. significant quantities of WEEE are lost to the reporting system through illegal removal of compressors and other high value items before arrival at DCFs;
- viii. from an environmental point of view, the issue of the greatest concern is the illegal removal of cooling equipment compressors; and
- ix. applying a calculation based on an average number of WEEE items per DCF and the estimated rates of theft per collection stream, it is estimated that the following volumes of whole items of WEEE are illegally removed from UK DCFs on an annual basis:
 - Approximately 3,000 tonnes of LDA
 - Approximately 2,600 tonnes of Cooling
 - Approximately 4,400 tonnes of Displays
 - Approximately 1,500 tonnes of SMW
 - This is a total of approximately 11.5k tonnes of WEEE per annum, approximately 2.8% of total DCF WEEE
- c. These figures are separate to the amount lost to removal in scrap metal. Back calculation using WasteDataFlow and the council survey data suggests that approximately 53k tonnes of LDA and 9k tonnes of SMW are being counted as scrap metal rather than separated WEEE.
- d. These figures are significantly different to the Valpak estimates suggesting that less LDA but significantly more SMW is 'leaking' from DCFs in scrap metal.

² <https://resource.co/article/environment-agency-clamps-down-illegal-waste-exports-12028>

3. Background

- a. Table 2 shows the quantity of Designated Collection Facilities (DCFs) registered in 2017. For the purposes of the project, only council Civic Amenity site DCFs were considered.

Site type	Number registered	Number of operators
WTS (Waste Transfer Stations)	309	177
CA (council Civic Amenity sites)	1134	216
Commercial DCF	248	143
Not for Profit/Charity	125	96
Retail Distribution Centre	29	15
Total	1845	647

Table 2: DCFs in 2017

- b. 2016/17 WEEE data were requested from all councils operating DCFs. 64 responded out of 200, a 32% response rate as shown in Table 3.

	Total no. of councils operating DCFs	Responses received	%
England	135	43	31.9%
Wales	22	9	40.9%
Scotland	32	6	18.8%
Northern Ireland	11	6	54.5%
Total	200	64	32.0%

Table 3: Response rate from council DCFs to a request for information

- c. The tonnage reported in the responses amounted to 32% of the total tonnage reported by the EA³ as being collected from DCFs although there were significant percentage variations between WEEE streams.

2016 data (tonnes)	LDA	Cooling	Displays	SMW	GDL ⁴	Total
Total from council responses	29,852	29,567	18,762	48,368	313	126,861
Total from WEEE returns	114,300	98,557	62,277	120,630	1,255	397,018
% of total reported	26.1%	30.0%	30.1%	40.1%	24.9%	32.0%

Table 4: Reported WEEE data for 2016 from council DCFs

- d. Whilst council public-access DCFs account for 61.4% of DCFs (1134 of 1845), the fact that 32% of councils produced 32% of the reported B2C WEEE (table 4) indicates that they represent a significant amount of the collected DCF WEEE albeit with variations between streams.

4. DCF WEEE flows

- a. DCFs have been the primary source of household WEEE since the WEEE Regulations began in 2008. Regulations 43 (previously Regulation 32) collections by retailers and more recently,

³ <https://www.gov.uk/government/statistical-data-sets/waste-electrical-and-electronic-equipment-weee-in-the-uk>

⁴ Gas Discharge Lamps

Regulation 50 (previously Regulation 39) collections have contributed with increased take-back by retailers on delivery of new items.

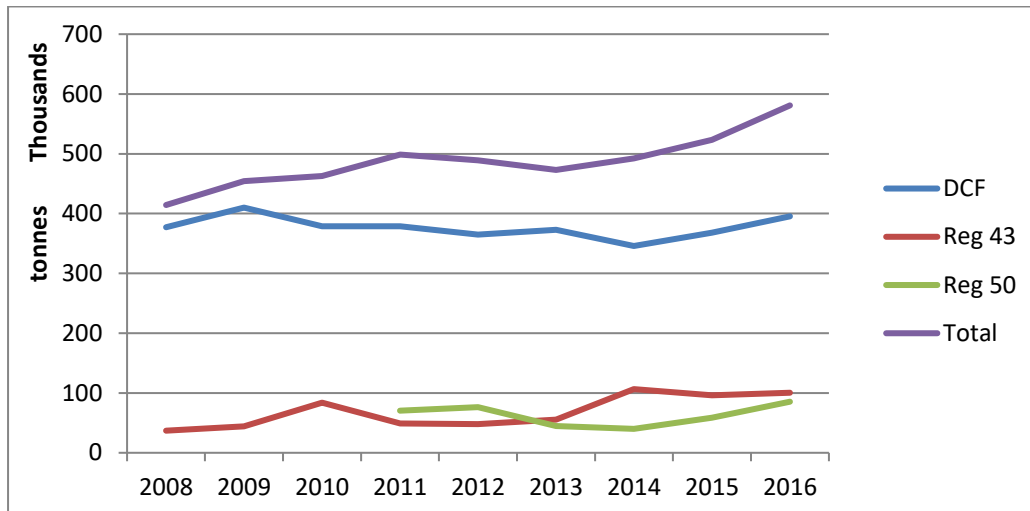


Fig.1. Split of source of household WEEE collections

- b. Whilst DCF WEEE arisings have been relatively flat, the composition has seen significant change with declining weights of display collections, as the market moves from heavy CRT technology to lighter flat panel screens, compensated by increases in small mixed WEEE.

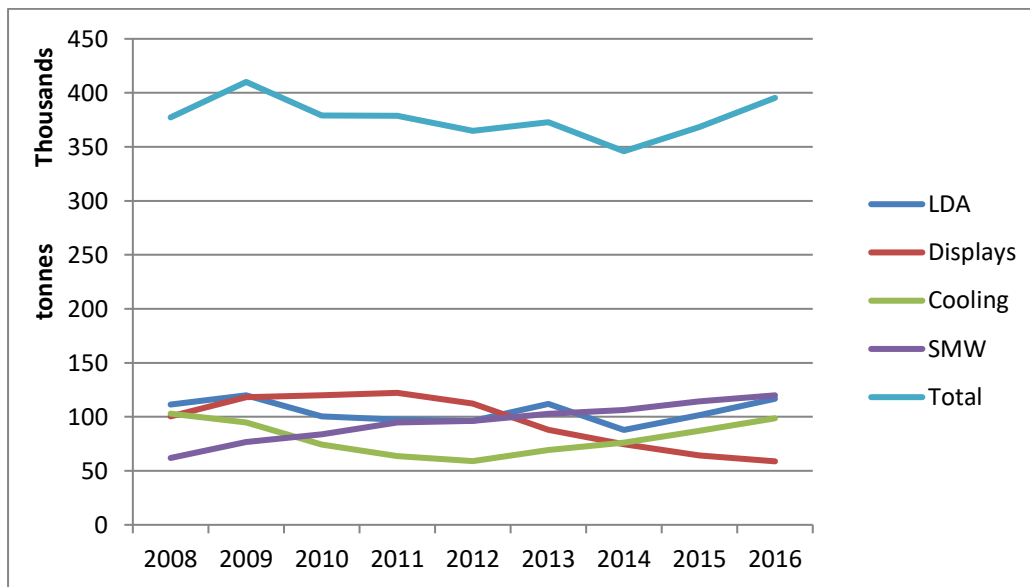


Fig. 2 Split of DCF collections by WEEE stream

- c. Council public-access DCFs are mainly Household Waste Recycling sites operated by Disposal Authorities (categorised as Civic Amenity sites in Table 2 above) and receive WEEE primarily from two sources:
- Household deposits where householders deliver WEEE – often along with other waste – under their rights to free disposal provided by Section 51 of the Environmental Protection Act 1990; and
 - Council deposits from the removal of fly tipped waste or via bulky item collection although, in many councils, this is deposited in waste transfer station (WTS) DCFs.

Many councils and waste management companies indicated that flytipped and bulk waste items are generally stripped of any value or so badly damaged as to have no theft value. These were therefore discounted from theft estimates.

- d. Under rules established through the 2013 WEEE Regulations⁵, the DCF Code of Practice⁶ requires DCF operators to segregate WEEE into 5 key streams:
- Large Domestic Appliances (LDA)
 - Cooling equipment
 - Displays
 - Small Mixed WEEE (SMW)
 - Lamps
- e. Where there are space limitations, operators may reduce the number of segregated streams. Generally, this will only apply to LDA which, on a significant number of sites, is mixed with scrap metal. LDA evidence is then calculated through a protocol⁷.
- f. All disposal authorities operating DCFs are entitled to free WEEE collection from Producer Compliance Schemes (PCSs). Normally, this will be by contracted supply between the council and a PCS. However, where a council is unable to source a PCS, the council may request WEEE clearance under Regulation 34 of the 2013 WEEE Regulations. In this event, the recently established PCS Balancing Scheme (PBS) now provides PCSs with an 'allocation' system of cost in the event of there being no PCS willing to collect its WEEE.
- g. Either the council, or by delegation, the DCF operator, will arrange for WEEE collections through the PCS. Commercial arrangements may see WEEE revenues pass to the council, its waste management agent or the operator of the PCS. WEEE collected from DCFs will be delivered to an Approved Authorised Treatment Facilities (AATF) that will then log the amount of WEEE received onto the Settlement Centre; this is referred to as 'evidence'. Theft of WEEE from the DCF system will therefore affect 'evidence' supply and the economics of collection.
- h. Figure 3 below illustrates the standard flows of WEEE through household-accessible DCFs.

⁵ 2103 WEEE Regulations <http://www.legislation.gov.uk/uksi/2013/3113/made#>

⁶ <https://www.gov.uk/government/publications/waste-electrical-and-electronic-equipment-weee-collection-code-of-practice>

⁷ LDA Protocol: <https://www.gov.uk/government/publications/weee-evidence-and-national-protocols-guidance/waste-electrical-and-electronic-equipment-weee-evidence-and-national-protocols-guidance#lda-protocol>

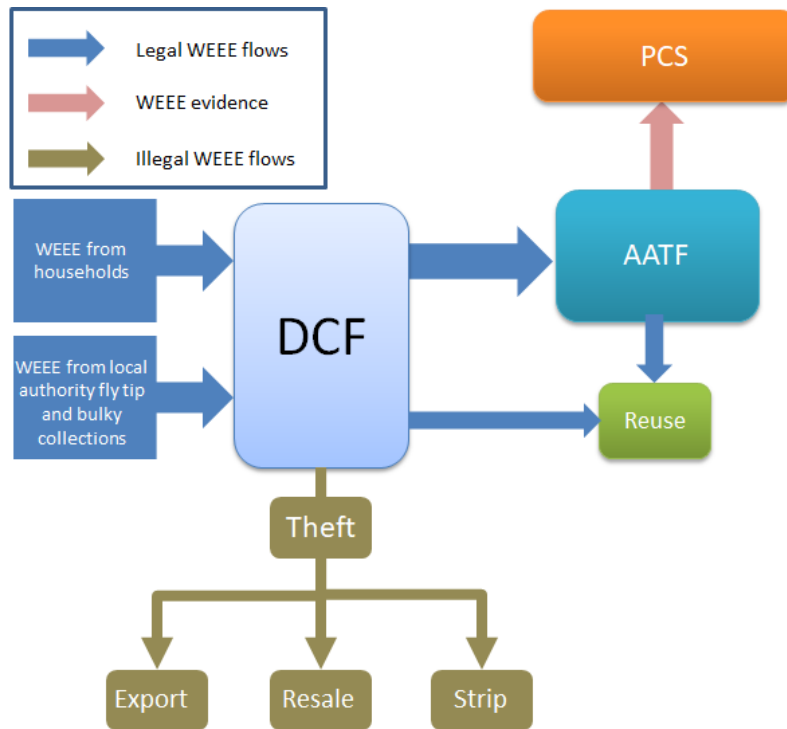


Fig. 3: Flow of WEEE through household-accessible DCFs

5. Project methodology

- a. The project commenced with an analysis of 2016 Wastedataflow⁸ as the only available centralised source of council WEEE data. PCSs are not required to report WEEE collections by site and there is therefore no central register of WEEE specific data.
- b. The analysis highlighted significant reporting anomalies such as zero LDA being reported by some councils. Discussion with councils indicated that LDA was sometimes included in their scrap metal data which limited the benefit of LDA data for comparative analysis.
- c. A survey was sent to all UK DCF operating councils by LARAC requesting their 2016/17 WEEE data. 64 councils responded, representing 435 DCFs out of 1134 council DCFs registered (38%). A copy of the survey is in Appendix 2.
- d. The data received from councils were analysed to consider variations to determine whether there might be obvious areas of theft.
- e. With no clear patterns emerging, a list of 18 target councils were identified for further questioning based on:
 - i. variations in the collected tonnage split compared to the national tonnage split;
 - ii. variations in streams as a percentage of the total collected by the council; and
 - iii. variations in streams in comparison to the least likely stream to see significant theft, assessed to be the SMW stream.
 - iv. geographic and demographic spread.

⁸ <http://www.wastedataflow.org/>

- f. In addition, a questionnaire was sent out to those 64 councils that had returned the data surveys asking if they had experienced theft at their sites.
- g. In parallel with the council surveys and analysis, data published by the English Environment Agency was also analysed to consider the impact of the split between DCF collections and collections made under Regulation 43 (retail take back) and Regulation 50 (systems set up by PCSs).
- h. In addition to the councils, the following were interviewed:
 - a. 3 PCSs
 - b. 4 AATFs
 - c. 2 waste management DCF operators
- i. All of the UK's four environment agencies (EA, SEPA, NIEA, NRW) were also contacted and all reported that they were unaware of theft of WEEE from DCFs being an issue. This was not unexpected, given that this would generally be reported to the police rather than to the agencies.

6. Results

- a. The data received from responding councils shows total annual WEEE arisings ranging from 361 tonnes up to 7652 tonnes per DCF.
- b. This indicated a wide range of relative proportions of the WEEE streams. Figure 4 shows the variation in DCF tonnes produced by each reporting council. The Y-axis shows the 64 council respondents in order of WEEE volume.

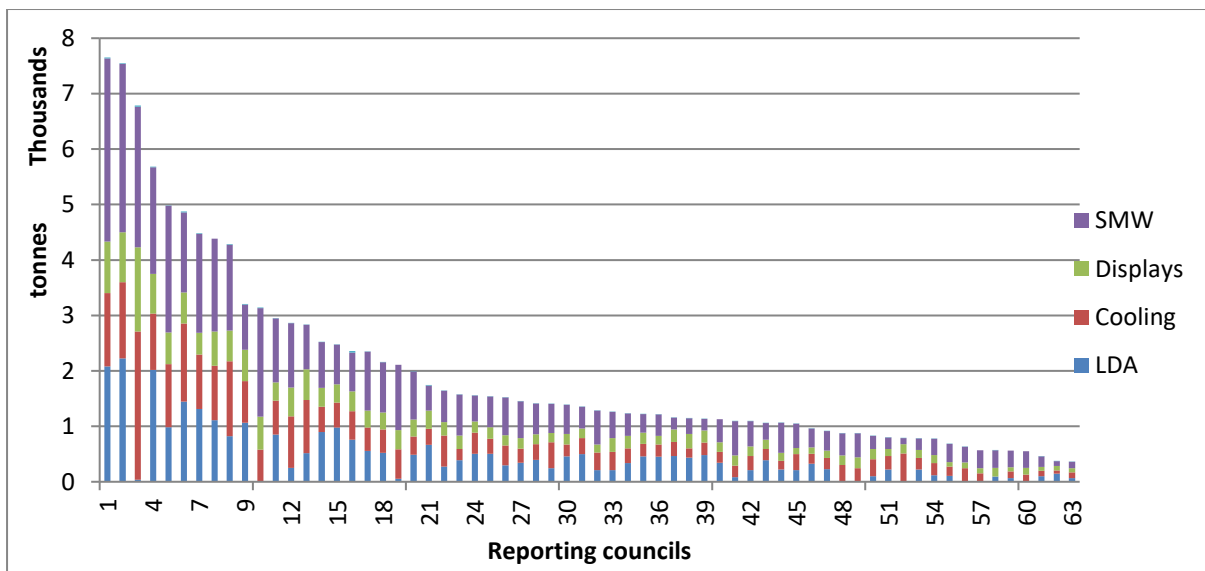


Fig. 4: WEEE Tonnages by data received from 64 councils ordered by amount of tonnage received.

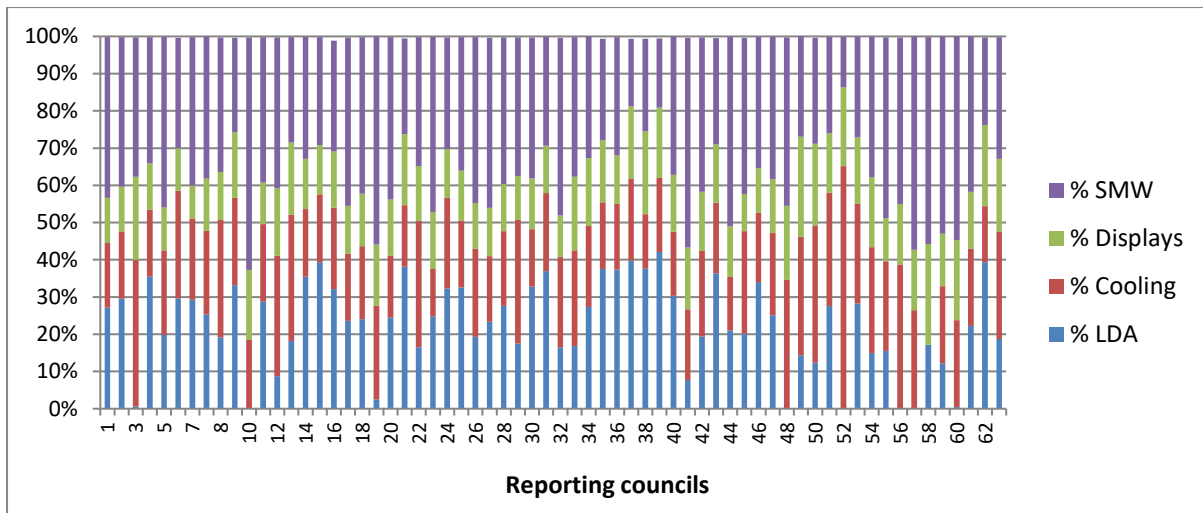


Fig. 5: WEEE stream percentage variations from data received from 64 councils ordered by tonnage received

- c. Figure 5 shows the widely varying proportions of streams between councils, the most noticeable differences being in LDA where five councils reported a nil return. Further investigation revealed that LDA was often removed mixed with the scrap light iron and included in council returns to Wastedataflow. The data shown in Figure 5 provided the basis for identifying councils for interview; the selected councils were those with significant differences in the percentage of the total DCF tonnage for each WEEE stream.
- d. The survey data highlighted a number of councils with similar proportions of WEEE their WDF returns. The average LDA to scrap metal ratio for the six councils with the highest levels of LDA and SMW was used to compare the overall ration on WDF. Adjusting that overall ratio to correspond to those six councils led to a calculation of approximately 53k tonnes of LDA and 9k tonnes of SMW being collected within scrap metal across the UK and therefore not reported as separately collected WEEE. For LDA, this is not too distant from the Valpak figure of 77k tonnes, given the margin of error. However, it suggests that considerably more SMW is 'lost' to scrap metal than had been previously estimated.
- e. The survey of councils, asking whether they considered theft of WEEE from DCFs a problem, received 17 responses (26.5% of those surveyed). The results were that:
 - i. 8 (47%) were aware of theft at DCFs.
 - ii. Of those only 1 (6%) indicated it was a serious problem with the others all believing it to be small scale break-ins or opportunistic thefts.
 - iii. 5 (29%) indicated that TVs were the main target with SMW and lead acid batteries considered to be the next highest targets.
 - iv. The one council indicating a serious problem believed the cause to be organised local crime conducting regular break-ins targeting high value metals rather than WEEE.
- f. Whilst the number of respondents was relatively low, direct interviews with councils suggest that this pattern is consistent with councils in general.

- g. 15 councils were directly interviewed and 8 DCFs were visited. The findings are listed below.
 - i. In general, councils were of the opinion that WEEE was well managed by their PCSs and their DCF operators.
 - ii. Most DCFs now have CCTV and ensure that potentially valuable WEEE – displays in particular – is kept in containers that are locked out of hours.
 - iii. There are varying levels of control imposed by site operators. Some refuse cooling equipment that has compressors missing. Some refuse gas operated cooling equipment. But overall, there is a view that a combination of security investment, better on-site control and greater PCS involvement has seen WEEE theft diminish significantly.
 - iv. Where WEEE theft occurs on sites, it is considered primarily to be small-scale opportunistic theft and therefore generally TVs or SMW such as computer equipment or perceived high value items, i.e. vacuum cleaners etc. that can quickly be removed by a single person and easily placed in a car.
 - v. However, some councils reported a significant problem with theft and vandalism, with TVs being the primary WEEE target, although often it was non-ferrous metals and batteries that were the main target (see Case Studies, Appendix 1, page 17).
 - vi. Specific issues reported for each WEEE stream.

a) LDA

There was widespread agreement across all sectors that LDA theft was not occurring from DCFs. Figure 6 shows the value of light iron scrap in relation to the amount of LDA reported as collected from DCFs.

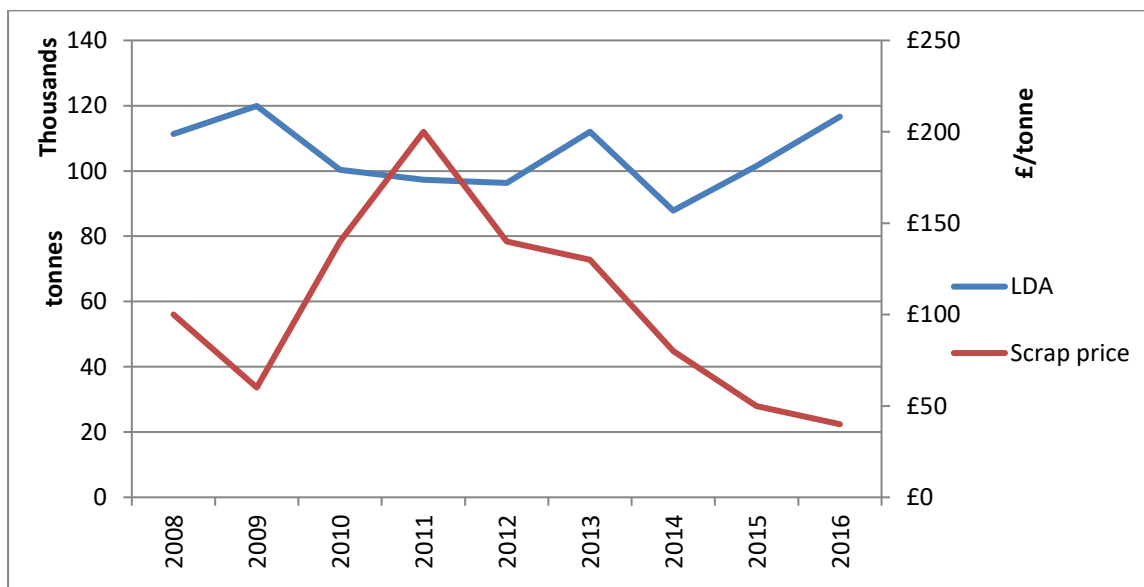
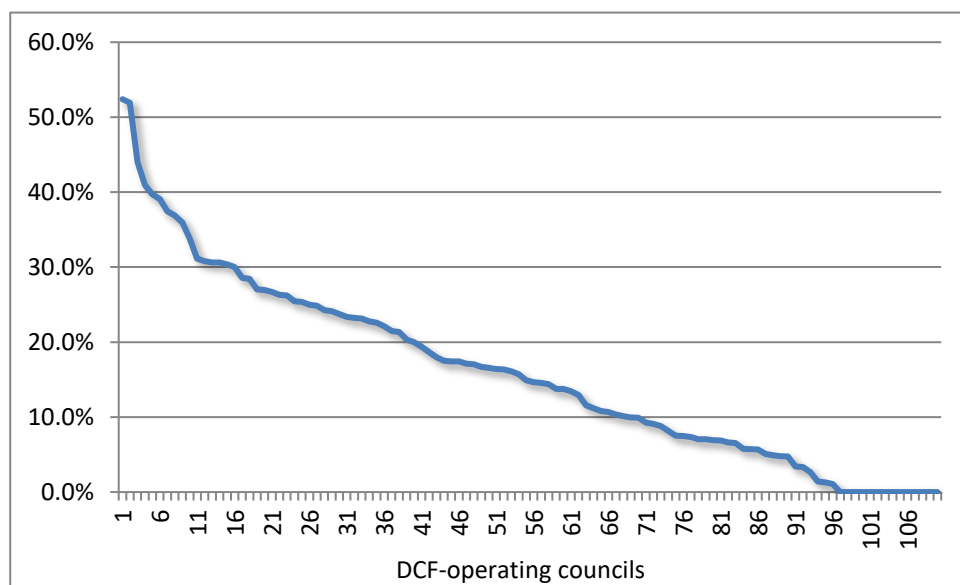


Fig. 6. Comparison of LDA collections with average light iron scrap price

With the practicalities of removing large-sized LDA and the sharply declining scrap value, the view was that this was simply not practical for individual unit theft. However, it is clear that with the number of sites where LDA is collected mixed

with light iron (13% of reporting DCFs) there is the potential for significant differences between the amount of LDA reported by councils and the amount recorded via PCS collections. 10 of the 64 reporting councils showed LDA as being less than 10% of the total WEEE reported compared to the national average in 2016 of 29.5%. Discussions with the UK's largest metal recycler indicated that they believed the standard 11.64% protocol for LDA in mixed light iron to be reasonable for substantiated estimates. However, analysis of Wastedataflow data (Figure 5) shows a huge variance in the proportion of LDA (0-37.7%) recorded compared to the proportion of scrap metal (28-95%) in the total metal/WEEE reported, which indicates that whilst direct theft might not be an issue, the reporting mechanisms and the potential for losses of LDA to scrap metal are significant.

Figure 7 shows the percentage of reported LDA in relation to the total reported scrap metal and WEEE streams for all the identified DCF operating councils. In theory, it could be expected that the proportion of LDA within the total WEEE and scrap metal streams would be reasonably similar, but the differences suggest that for many, much of the LDA will be mixed in the scrap. The level of reporting between the DCF operators and the PCS is not available, so it is not possible to compare what the council has reported on Wastedataflow with the WEEE reported on the Settlement Centre as evidence. This addressed in section



6d.

Fig. 7: Reported LDA as a relative percentage of total reported scrap metal and WEEE streams (Source: Wastedataflow 2015)

b) Cooling

Cooling appliances are received by DCFs primarily from two sources:

- Members of the public depositing unwanted units.
- Councils depositing bulk collections and fly-tip material.

There was widespread agreement across the disposal chain that appliances deposited at DCFs by members of the public were generally not suitable for reuse often being damaged beyond economic repair.

For items collected and deposited by councils (from fly-tipping or bulky waste household collections) a large proportion of appliances have had the compressor removed. Data from one large council DCF operator saw compressor losses between 55-95% in 2016. Further investigation linked the level of compressor loss to the proportion of cooling equipment deposited at the DCF from fly-tip or bulky roadside collections. It appeared to be a common factor that the majority of appliances collected by councils had the compressor missing on collection.

Estimates from one of the UK's largest fridge recycling companies suggest that approximately 12.5% of fridges from council DCFs are missing compressors. Council DCFs account for approximately 80% of cooling equipment WEEE with retailer collections accounting for approximately 20%. The average compressor weighs 8kg and contains 0.08 litre of oil, suggesting that approximately 1,800 tonnes of compressors are excluded from the WEEE evidence system and approximately 17,500 litres of oil are illegally drained either into storm drains or a permeable surface. Table 5 shows these calculations.

In addition, there will be significant leakage of cooling gases. It is estimated that for every CFC fridge –approximately 10% of household fridges collected – 100g of CFC is released into the atmosphere if the compressor is incorrectly removed. For pentane fridges – the remaining 90% - approximately 40g of pentane is released.

2016 DCF Cooling	
Tonnes reported as collected	98,557
Estimated average weight per unit (tonnes)	0.04
Total number of fridges collected @ average weight	2,463,925
Total collected from LA DCFs @ 80% of total	1,971,140
Average compressor weight (tonnes)	0.008
Total weight of compressors	15,769
Estimated average % missing on arrival at AATF	12.5%
Total weight of compressors missing	1,971
Oil volume per compressor (litres)	0.08
Total oil lost into unauthorised disposal (litres)	19,711
CFC lost (tonnes) @ 10% of total (100g/unit)	2.463925
Pentane lost (tonnes) @ 90% of units (40g/unit)	7.88456

Table 5: Impact of compressor theft from cooling equipment

Discussions with councils, DCF operators and PCSs indicate that these are not being stolen from DCFs and are therefore not within the remit of this study. There are questions as to whether some cooling equipment collectors are removing compressors following collections from DCFs, but to date, there is no evidence to support this and it must therefore be assumed that the vast proportion are being removed prior to deposit at the DCF. Examples could include:

- Fly-tipped/bulky collection items delivered by the council.
- Collectors who roam the streets looking for items left by the side of the road by householders but who may then remove the compressor before delivering the carcass to a DCF.

An increasing trend amongst DCF operators, however, is to refuse to accept cooling equipment unless the compressor is present.

Table 6 shows data from a PCS that has been recording missing compressors across three councils. It illustrates the scale and the difference between a largely rural council and two different urban councils.

Council	Total units collected	Missing compressors	% missing
Strongly urban London council	38,946	27,588	70.8%
Mainly urban London council	31,550	10,717	34.0%
Rural county council	27,153	5,229	19.3%
Total	97,649	43,534	44.6%

Table 6: Data from a PCS on compressor theft across three councils in 2016.

Discussions with a Midlands fridge recycling plant indicated that 1-20% of units delivered were missing compressors indicating wide variances, although the trend was for urban authorities to see generally higher levels of missing compressors than rural authorities.

c) Displays

At present, displays present the most attractive WEEE for DCF theft, both for organised and impulse thefts. Small enough to fit into cars and valuable enough to still have a perceived value, they have been attractive in the past to both organised illegal exporters and opportunistic members of the public. However, tightened site security has now reduced opportunistic theft to a minimum and the general view of operators and councils is that whilst site staff might remove the occasional high quality item, other than in localised pockets, this was minimal given the quality of disposed screens and the lower price point for new televisions. The relatively low cost of new TVs has also reduced their attractiveness to organised crime.

One council reported that TV theft was a major problem but only in so much as break-ins to DCFs was a problem for them in general, with lead acid batteries and non-ferrous metals being a similar target. No other councils indicated any problem beyond occasional theft.

One North East England DCF WEEE contractor reported significant and continuous theft aided by site staff. Whilst this was reported to the authorities, the lack of clarity over the legal status of waste with regard to ownership led to a lack of enforcement action.

A major display reprocessor stated that flat screen TVs represent approximately 30% by weight and 46% by quantity of the TVs received. In the majority of cases,

however, flat screen TVs are often damaged beyond reasonable repair and in many cases, the DCFs operators are told to remove cables to avoid impulse public removal. In all the sites visited, displays were kept in containers prior to removal. One DCF, which had previously experienced problems, had installed a CCTV camera above the container to avoid theft by the public and stated that there was no longer an issue.

Frequently the change in the average weight of displays sold is not reflected in comparative numbers of flat screens and Cathode Ray Tube screens received from DCFs by AATFs. There are assumed to be reasons other than theft that could account for this, including second hand use of flat screens, pre-DCF demand from traders and a tendency of some householders to retain an existing flat screen when they upgrade.

Overall, the feedback from respondents was that, whilst TVs were acknowledged to be the most attractive item of WEEE for theft from DCFs, increased security had resulted in the problem being effectively managed.

d) Small Mixed WEEE

In general, Small Mixed WEEE (SMW) is handled at DCFs in open containers into which the public place items not regarded by site staff as scrap metal, LDA, cooling or displays. Again, the widespread view was that whilst occasional theft of individual items by staff might occur, there was no evidence of any significant theft.

h. Reuse

- i. A number of councils now run reuse shops, often at one or more of their Household Waste Recycling Centres/DCFs.
- ii. However, it was reported by those with such facilities that the risk of liabilities from faulty equipment had seen direct sales of electrical equipment to the public significantly curtailed.
- iii. Those that run reuse shops take great pride in their community benefits and were very robust in their management of both the reuse items and the recording of them, using the Reuse Network⁹ weight charts to determine weights for evidence purposes.
- iv. Figure 8 shows the level of household reuse published by the UK's environment agencies from 2008-2016 highlighting the significant reduction in cooling and displays since the 2013 Regulations were introduced. Figure 9 shows this in percentage terms related to receipts at AATFs. For displays, much of this will be due to the trend of CRT replacement by flat panels.

⁹ [The Reuse Network](#) (previously known as the Furniture Recycling Network) is a charitable organisation that has produced a commercially available list of average WEEE weights approved by the UK environmental agencies as a basis for weight conversion from unit numbers.

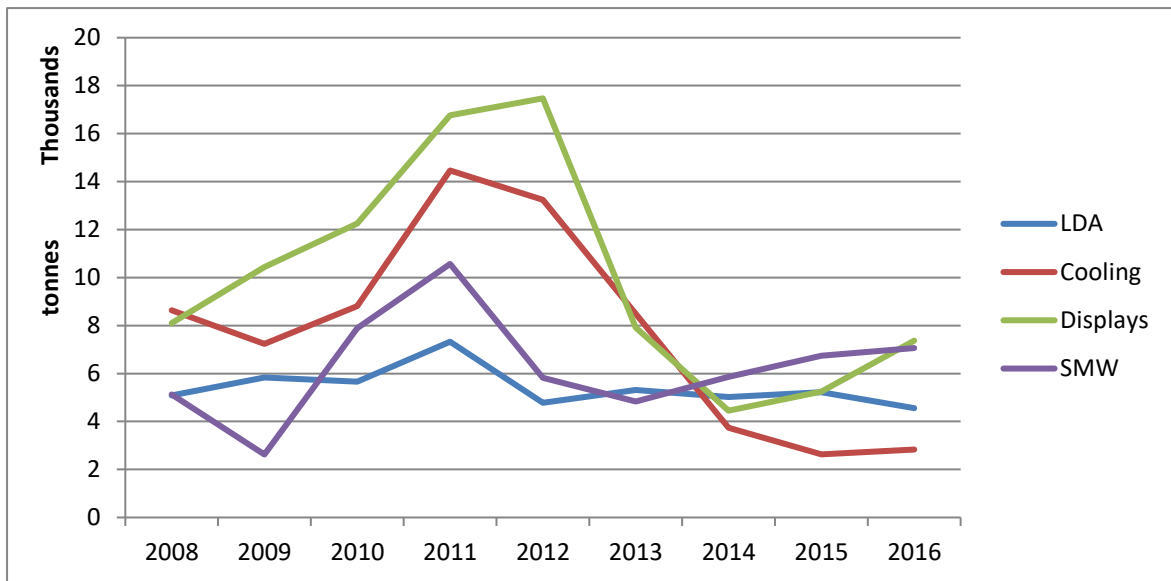


Fig 8: AATF Reported Reuse

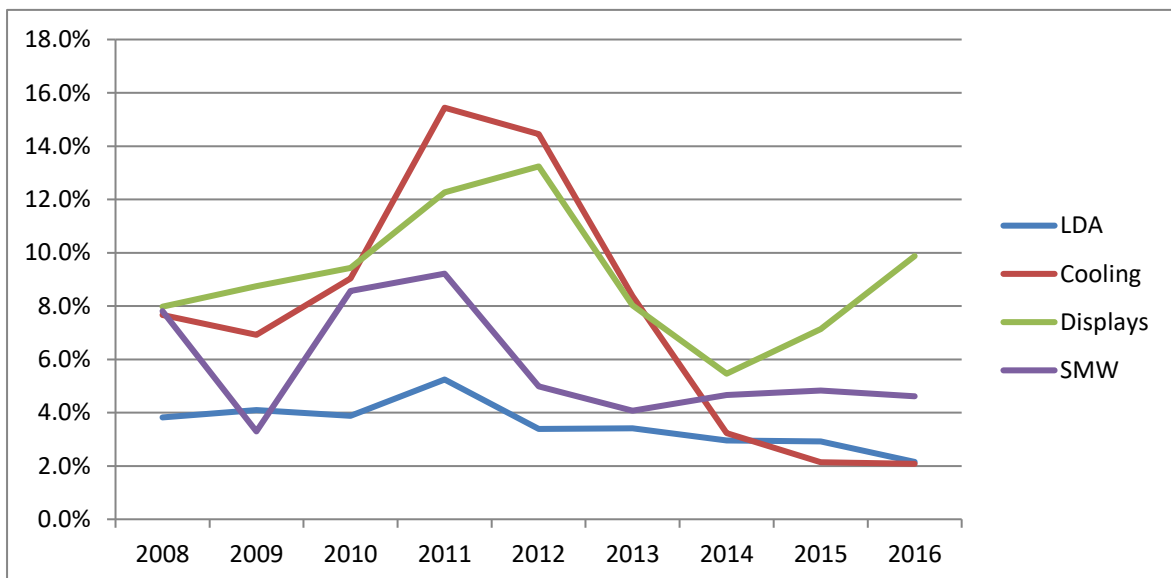


Fig. 9: Reuse as a percentage of AATFs receipts

- v. Whilst Figures 8 and 9 indicate a major decline in reuse activity of white goods WEEE, discussion with the third sector indicates that demand for used items continues to increase and the scale of reuse is far higher than indicated by the graphs, especially for cooling equipment.
- vi. The majority of LDA and cooling WEEE reuse occurs with appliances collected through retailer take-back on delivery of new appliances due to the much higher quality of item and lack of damage in transit, although this varies significantly between retailers. The drop-off of reported reuse is thought to therefore primarily relate to the classification of retail takeback returns as used EEE (rather than WEEE) on entry to some AATFS which only record those tonnages that go for recycling as WEEE.

- vii. Whilst impossible to quantify, it is also likely that more used items are kept in use through online platforms such as Gumtree and eBay.

7. Calculation of theft

- a. By its very nature, theft is an unknown that cannot be accurately calculated.
- b. Using average weights for the different streams from AATF and the FRN weight protocols¹⁰, an attempt has been made to assess the impact of low level occasional removal of items by site staff and occasional opportunistic members of the public on WEEE deposited at DCFs.
- c. With the improvement in site security controls indicated by respondents and the view by councils and DCF operators that for most DCFs, theft was no longer a significant concern, an estimate has been made of the average number of items that might be stolen per DCF per week. This is purely an estimate based on the available data that has arisen from this study, but has been agreed by LARAC as a reasonable basis for calculation.
- d. The calculations in Table 7 below provide a significant contrast to the estimates previously published by Valpak. The Valpak report estimates WEEE theft from DCFs as 97,000 tonnes, a difference of 84,500 tonnes from the conclusions of this report. However, the explanations provided by Valpak suggest that much of their estimate relates to tonnage that is not stolen from DCFs but which is lost prior to deposit at DCFs or through being mixed with other non-WEEE disposal streams, light iron in particular.

2016 data	LDA	Cooling	Display	SMW	Total
Number of council DCFs	1134	1134	1134	1134	
Average weight per unit of WEEE (kgs)	50	45	15	5	
Average number of WEEE items estimated stolen/week/DCF	1	1	5	5	
Estimated annual weight of WEEE theft	2,948	2,654	4,423	1,474	11,499
Total reported DCF collected WEEE (tonnes)	116,636	58,793	98,557	119,930	393,916
Total DCF WEEE including estimated theft (tonnes)	119,585	61,446	102,980	121,404	405,414
Theft as a percentage of total DCF WEEE	2.5%	4.3%	4.3%	1.2%	2.8%

Table 7: Estimated theft from council DCFs

8. Actions taken by councils to mitigate theft

- a. A range of actions have been taken by councils both to mitigate theft and to reduce deposit of commercial waste at DCFs.
 - i. **CCTV:** The use of CCTV is now commonplace on DCFs. Automatic Number Plate Recognition (ANPL) has also been installed in at least one council to capture

¹⁰ <https://reuse-network.org.uk/launch-of-licence-for-new-furniture-re-use-network-product-weight-protocol>

registrations and check against the local electoral roll to determine the potential for tradesmen depositing commercial waste at sites. The view is that CCTV has had a significant impact in deterring break-ins but not necessarily in reducing staff theft.

- ii. **Waste management operator contracts:** the tendency to move to contracts with larger waste management companies – rather than local operators – has seen more investment in site security and more control over site staff.
- iii. **PCS involvement in site security:** with the potential loss of evidence, PCSs are working more closely with site operators and councils to identify and tackle thefts. This is illustrated by an example of a site operator working with a PCS to install tracker devices in equipment to monitor movements.

9. Conclusions

The overall conclusions are that:

- a. Theft from WEEE from DCFs is minor, impulsive and rarely part of any large scale organised process;
- b. Consequently, theft of WEEE from DCFs is low priority to the police and the environment agencies as regulators. The police and the environment agencies are likely to become involved when there is a concern that theft may be linked to wider illegal activities such as illegal export;
- c. In the vast majority of councils, it is not perceived as a problem. Of 17 interviewed, only one council indicated that theft was considered a significant concern, two considered it a minor concern and the remainder considered it of little or no concern;

■ Significant concern ■ Minor concern ■ Little or no concern

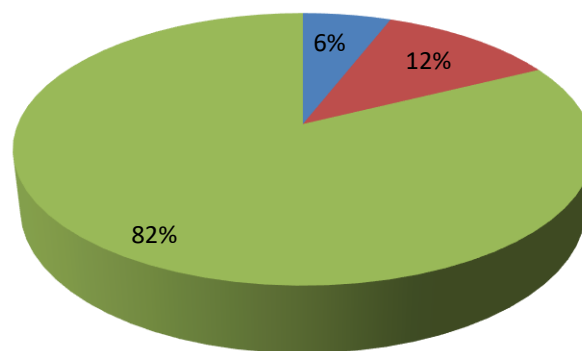


Fig. 10: Levels of concern over theft of WEEE expressed by DCF operators

- d. Where theft occurs, items most commonly taken from DCFs are flat screen TVs, non-ferrous metals and lead acid batteries;
- e. Whilst theft of WEEE might have been significant in the past, there are a number of mitigating factors that have caused its reduction:

- i. DCF site security has significantly increased in recent years with CCTV now being commonplace.
 - ii. Flat screen TV prices have reduced significantly making used ones less attractive.
 - iii. Scrap metal prices have recently been relatively low.
 - iv. There is greater scrutiny of WEEE exports.
- f. It is likely that there is less WEEE than expected in the DCF system because of alternative collection methods – Regulation 43 collections by retailers in particular – and due to theft of compressors from cooling equipment or the removal of other high value items before arrival at DCFs;
- g. A significant proportion of LDA tonnage is reported using the LDA protocol with the risk of under-reporting;
- h. From an environmental point of view, the greatest concern is the illegal removal of cooling equipment compressors. It is estimated that annually, some 17-18,000 litres of compressor oil may be drained into the ground or storm drains with a potential loss of approximately 1,750 tonnes of WEEE evidence. It is also estimated that approximately 10 tonnes of refrigerant gases (which are both frequently significant greenhouse gases as well as ozone depleting substances) will be released into the atmosphere per year;
- i. It is impossible to calculate the amount of WEEE that is delivered to DCFs but which is then subsequently missing due to theft. However, on the basis of feedback from councils, specific site visits and analysis of the data, Table 7 shows the conclusions in relation to each of the streams using the average weight of items indicated by AATFs and Reuse Network analysis; and
- j. This indicates that in total, less than 3%, equating to approximately 11.5k tonnes, is stolen from DCFs per year in the UK.
- k. However, despite the relatively low levels of actual theft at DCFs that the report identified, it is clear from the published data that there is significant leakage in the system that suggests the need for further research into theft or illegal activity outside DCFs.
- l. It is therefore recommended that further work is carried out to identify the scale and impact of these activities and measures that can be considered to reduce their environmental impact and increase the proportion of WEEE undergoing the Best Available Treatment, Recovery and Recycling Techniques (BATRRRT).

Appendix 1 – Case studies

Case study 1

- Urban council - London.
- This council operates 16 DCFs of which eight are publically accessible. Five sites operate as transfer station depots for the local collection council to deposit fly-tip and bulk collections.
- The publically accessible sites are all operated by a local waste management contractor. One large PCS has responsibility for the WEEE collections which are arranged through local collection contractors.
- The sites have secure containers for WEEE and each site has a separate secure container for items considered as potential reuse items for sale through their two reuse shops.
- The sites appeared to be well managed. Each is covered by Closed Circuit Television (CCTV) and have appropriate fencing and gates. The council is not aware of any theft issues with staff or third parties.
- However, there is a major ongoing issue with loss of compressors. Overall, the loss rate was 70% with one depot site recording 95% of cooling equipment delivered by collection authorities from fly-tipped and bulky collections missing the compressor.
- With the security measures on site considered to provide sufficient security to prevent theft on site, compressor loss is therefore considered to be the key issue.

Case study 2

- Mainly urban Household Waste Recycling Centres (HWRC) – North East England.
- Operated by a waste management company covering a number of HWRCs.
- The waste company operates sites with staff that have transferred under TUPE (Transfer of Undertaking (Protection of Employment) Regulations).
- The sites are generally experiencing high levels of theft of primarily TVs, but also high value vacuum cleaners, computers, audio equipment and fridge compressors.
- Secure containers have been installed but these have been removed as the locks were continually vandalised.
- The operators believes that theft comes from 4 key groups:
 - Site operatives
 - Collection staff
 - General public
 - Organised gangs
- Trackers have been fitted to flat screen TVs which have been seen to leave sites shortly after deposit. However, enforcement action has been limited due to legal confusion over the status of waste and a lack of resources.
- The company estimate that up to 25% of flat screen TVs are being stolen from their sites.

Case study 3

- Mixed urban and rural county in the South of England.
- Two sites were visited, one in an extremely rural location and a second one on the edge of a large urban conurbation, both under the same waste management company operation.
- The rural site was tidy, well organised and secure. TVs are kept in a lockable container, fridges on a curtain-sided lorry and other WEEE in 40 yard open containers.

- The site is surrounded by high fencing and covered by CCTV.
- The operator was confident that there was no theft from the site. All delivered fridges come from members of the public and none were missing compressors.
- The second site (urban) operated by the same company was used as a transfer station for TVs which are loaded from the locked container into a 40 yard open container at the rural site, crushed, delivered to the urban site for bulking onto a 40ft trailer for onward transport to a processor.
- The urban site also receives fly-tip and bulky collections. A significant percentage of the cooling equipment received arrives without compressors.
- TVs received on site are placed into a lockable container by members of the public. The operator found that there were sporadic thefts from this container by opportunist members of the public and has installed an overhead CCTV for the container that is thought to have prevented further theft.
- The site is fenced, gated and has CCTV, however, there had been occasional break-ins primarily targeting non-ferrous and batteries.
- The operator estimated that there is very little theft from the sites.

Case study 4

- Urban unitary – Midlands.
- The Council provides two HWRCs, both operated by a national waste management company.
- The sites are secure with appropriate fencing and gates and CCTV with Automatic Number Plate Recognition (ANPR).
- All WEEE streams are collected via segregated containers. WEEE is compacted in the containers using a mechanical waste handler.
- Small amounts of WEEE are sent for reuse.
- The operator believes that the site offers little opportunity for theft and that, whilst they accept that there could be occasional items removed, they believe the volumes are insignificant.
- No commercial WEEE is allowed on the sites which are only used for household deposits, not storage of fly-tip or bulky waste collections.
- The sites do not accept any cooling equipment missing compressors.

Case study 5

- Largely rural council – East of England.
- The council provides 1 urban and 7 rural DCFs, all operated by in-house staff.
- The sites are secure and have ANPR CCTV (see case study 4) which is regularly monitored by council staff.
- No commercial waste is accepted on site although this is only checked via a declaration from those delivering in WEEE that appears to be B2B (business-to-business) that it is actually B2C (business-to-consumer) e.g. display fridges.
- There is a significant volume of ammonia fridge supply onto site from council fly-tip collections and there have been disputes between the council and the PCS over whether ammonia fridges should be accepted as obligated household WEEE.
- There have been two recent thefts associated with staff who have both been dismissed.
- The council and operator do not believe there is any significant WEEE leakage from the sites.

Appendix 2 – WEEE survey sheet sent to all DCF operating Authorities

Council Name									
Contractor managing Household waste recycling centres/DCFs									
Please provide total tonnes recorded as collected from each DCF under you control for each WEEE stream for the period 1 April 2016- 31 March 2017 if possible but 2015/16 if not									
Period (from/to)									
DCF No.	DCF Postcode	LDA	Cooling	Displays	Small Mixed WEEE	Gas Discharge Lamps	Total	Council (autofeed from line 1 above)	Contractor (autofeed from line 3 above)
1							0	0	0
2							0	0	0
3							0	0	0
4							0	0	0
5							0	0	0
6							0	0	0
7							0	0	0
8							0	0	0
9							0	0	0
10							0	0	0
11							0	0	0
12							0	0	0
13							0	0	0
14							0	0	0
15							0	0	0
16							0	0	0
17							0	0	0

Figure 9 WEEE theft rates from DCFs

Category	Tonnes	Method
Category 1 Large Household Appliances	77kt (43% of reported household collected category 1)	This is calculated using the UK ratio of household fridges (28.03%) to LDAs (71.97%) on the market. Then applying these ratios to the off the market (collected) data for household and identifying the increase in tonnage required for LDAs to achieve the 71.97%. The assumed leakage is 43% which has been applied to household WEEE reported as collected from a DCF in 2015.
Category 2 Small Household Appliances	1kt (2% of reported household collected category 2)	This is an estimate based on Valpak experience. This is a nominal % to acknowledge motors, cables and Dyson vacuum cleaners which may be taken.
Category 11 Display Equipment	10kt (13.5% of reported household collected category 11)	Source: Yes WEEE Can: Designing Effective WEEE Systems. Presentation by Mark Dempsey (HP). Only refers to WEEE leakage, not specific to displays.
Category 12 Cooling Appliances	9kt (6% of reported household collected category 12)	This is calculated using Valpak Variance reports for WDAs. Approximately 35% of fridges on site are damaged. The items removed weigh ~10kg (17% of an average fridge/freezer, which is 59.8kg (Valpak EPIC Database). Therefore 17% of 35% reported cooling appliances is ~6% ²⁰ .
All other categories	0kt (assumed negligible)	Category 3 IT and telecoms equipment are not seen as valuable when second hand, especially when thrown in a skip at a DCF site, e.g. laptops, therefore it has been assumed that no theft of category 3 occurs at DCF sites. The same has been assumed for all other EEE categories too.
Total	96kt	Sum

Figure 11: WEEE theft rates for DCF reported by Valpak

¹¹ <http://www.wrap.org.uk/content/weee-flows-report>

A comparison was conducted between data received from councils from the 2017 survey and Wastedataflow (WDF) data reported for 2015.

The survey results for LDA were compared to the WDF reported LDA and were found to be broadly similar suggesting that the WDF data was sufficiently robust to draw conclusions.

The WDF LDA was then compared to the WDF scrap metal to determine whether a reasonable relationship could be drawn for those accurately reporting LDA. This averaged at 31.66% with a high of 41.65% and a low of 22.13%.

The total scrap metal reported on WDF by all English councils for 2015 was 296,995 tonnes and of LDA, 45,266 tonnes, a LDA percentage of 15.2%.

Using the 31.66% as a basis of assumption for what the LDA should constitute and assuming that the scrap metal figure was correct, it implied that that for 2015, 37k tonnes should have been reported as LDA, not scrap metal.

Comparison of other council survey reports to their WDF entries indicated that this approach is broadly representative.

In 2015, the amount of LDA reported as collected from DCFs was 101,552 tonnes. The type of DCF – whether council or commercial – and the regional split was not available, using the proportions of waste produced by households in each part of the UK to the English WDF tonnage indicates that approximately 67k tonnes of LDA ,might have been reported in relation to Council DCFs, suggesting that 35k tonnes would be from commercial DCFs.

Applying the uplift calculation to the 67k tonnes suggests that approximately 55k tonnes of LDA is removed within scrap metal from council DCFs rather than through separate collection.

This broadly supports the 77k figure in the Valpak report.