Technical Report

UK EEE Flows 2016

Quantification of the volume of electrical and electronic equipment placed on the market (POM) and associated waste produced (WEEE) in the UK.

Project code: EEE530
Research date: March – September 2016 **Date:** 5 October 2016

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[WRAP, 2016, Banbury, UK EEE Flows 2016, Prepared by Carys White, Valpak]

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Executive summary

Robust up to date data on the volume of electrical and electronic equipment placed on the market (POM) and associated waste produced (WEEE Generated [WG]) is imperative to ensure an accurate assessment of compliance with recycling regulations.

This project aims to update the numbers the UK holds for this sector by reviewing existing data, gathering new data, and sense checking all the numbers with key industry stakeholders. Projections have also been made on POM and WG to be able to make an assessment of likely compliance with the European Directive's increasing targets in both 2016 and 2019.

The work has been commissioned by Defra and managed by Valpak and WRAP. As the project was commissioned before the outcome of the EU Referendum, we have not considered any implications to its development that may relate to the UK leaving the EU. This report is the key deliverable of the work and sets out the detailed methodology used, all assumptions made, the results of the analysis, conclusions and recommendations for Government and industry to consider.

The objectives of the project were to:

- Update and analyse current and projected flows of EEE onto the UK market and WEEE off the UK market ('flow') for the baseline year 2015 and projected to 2020.
- Assess the impacts of upcoming legislation changes and targets on 'flow' and achieving compliance:
  - In 2016 the UK is required to meet a 45% target to comply (based on previous three year average EEE sales);
  - In 2019, in addition to the increase in target, the way in which the target is derived could also change, currently with two options laid out as 65% of previous three-year EEE sales, or 85% of total WEEE generated; and
  - Changes in scoping and categorisation of EEE from 2019 may also impact recycling.
- Review and incorporate the data on large domestic appliance within the light iron stream.
- Quantify plastics in the EEE/WEEE supply chain.

Conclusions POM: 2015 and projections

Total POM in 2015 is estimated to be 2,001kt

The total tonnage of EEE POM is estimated to be 2,001kt in 2015. This includes registered producer data, plus estimates of exemptions from the current regulations and products placed on the market by unregistered companies.

Registered POM accounts for 88% of total POM

In 2015, EEE POM registered to the Environment Agency accounted for 88% of total POM. This is assumed to be a proportion that is relatively consistent year on year, although is likely to increase in 2019 when some current exempt products are anticipated to come into the scope of the regulations.

133kt (7%) is estimated to be placed on the market by unregistered companies in 2015

It is assumed that not all producers register or report their data to the Agency. This could be because they are unaware of the regulations e.g. small companies based abroad selling through market place sites may not be familiar with UK regulatory requirements. We have estimated that 133kt of EEE is placed on the market by unregistered companies. This is 7% of all POM in 2015. The majority of this tonnage is made up by PV panel producers, who, we have assumed, are less aware of the regulations since they have only been obligated for two years.

99kt (5%) is estimated to be exempt from the scope of the regulations in 2015; this will be lower in 2019

We estimate that 34kt of household luminaires and halogen lamps are currently exempt, 2kt of toys, and the remainder, 64kt being other equipment. The toys tonnage has not however been counted within the 2019 estimate, nor has the halogen lamps of 6kt (included in the 34kt), as we understand the open scope will not include the introduction of these items, therefore in 2019, we estimate the exempt quantity to be 92kt.

Total POM and registered POM are both projected to increase to 2020

Total registered POM in 2020 is projected to be 2,098kt, 19% higher than in 2015 (includes exemptions estimated at 92kt from 2019). Some product categories are projected to decline in tonnage up to 2020, however overall the projection is an increase. The increase in total POM is estimated to be 13% over the next five years[1].

Conclusions WEEE generated: 2015 and projections

Total WEEE generated in 2015 is estimated to be 1,528kt

Using 'The Study on Collection rates of waste electrical and electronic equipment (WEEE)' by the European Commission, October 2014[2] we have been able to estimate that the

[1] *Projections were made for each EEE category, depending on availability of data; where possible we used published reports and stakeholder insight, however where this was not available we used annual historic trend*

[2] *http://ec.europa.eu/environment/waste/weee/pdf/Final_Report_Art7_publication.pdf*

total UK WEEE generated in 2015 was 1,528kt. The UNU established this tonnage based on historic sales multiplied by product lifespan. This number includes all WEEE off the market including that discarded in the residual waste stream.

Reported WEEE accounted for 44% of total WEEE generated in 2015

We used Agency provided data to establish 2015 reported WEEE. A total of 679kt of WEEE was reported in 2015 as received for treatment or reuse by an AATF. This includes B2B, B2C and non-obligated and accounts for 44% of the total WEEE generated in 2015.

Unreported WEEE accounted for approximately 31% of WEEE generated in 2015, of this 71% has a higher degree of confidence whereas 29% is less reliable

Reported quantities of WEEE treated or reused does not account for the entire market. A lot of activity occurs outside of the producer responsibility WEEE system[3] and we estimate this to be 475kt (31%) of WEEE generated. This includes:

- LDA being treated within the light iron stream, which accounts for 57% (273kt) of the tonnage;
- B2B IT equipment treatment which accounts for 13% (63kt) of the tonnage; and
- Other unreported which is the remaining tonnage after all else is accounted for (including residual and reported), which is 29% (139kt) of the tonnage.

We have a relatively high degree of confidence in the tonnage estimates from the first two classifications being correctly treated, but a significantly lower degree of confidence in the third classification. We recommend further work is undertaken to verify this 139kt as at present it would cover all other activity including B2B unreported recycling, charity reuse, export for reuse, ATF activity, other asset management activity other than B2B IT and non-ferrous metal treatment.

WEEE in the residual waste stream accounted for 24% in 2015

We estimated that the quantity of WEEE entering the residual waste stream from businesses and from households placing WEEE in their residual waste bins or in the residual waste stream at DCF sites was 366kt in 2015. The stakeholder group considered this to be too high, particularly compared with collected tonnages i.e. this equates to each household disposing of more than 13kg per annum in their residual waste. No other data is available nor was a more robust methodology proposed with which to contradict this number for the UK.

6% of WEEE generated is stolen from DCFs. Of this is it believed that 9% is improperly treated

[3] *This activity is legal*

Theft from DCF sites outside of the Producer Compliance Financed scheme is estimated to account for 96kt (6% of WEEE generated). However much of this tonnage may end up being ultimately correctly treated through legitimate routes. Component parts being taken from cooling appliances at DCF sites however is estimated at 9kt; is considered not to be ultimately properly treated. This is because the removal of the components is highly likely to result in loss of hazardous fluids/gases to atmosphere and therefore prevents the equipment from being properly treated. This makes up 9% of the 95kt and only 0.6% of total WEEE generated. However due to the value of WEEE items and components (which fluctuates depending on market conditions), theft from the WEEE system is believed to be relatively widespread rather than isolated incidents, therefore it is an issue which is experienced by most local authorities in the UK.

WEEE generated and reported WEEE are both projected to increase through to 2020

WEEE generated is projected to increase by 1% and reported WEEE by 7% by 2020[4].

Conclusions compliance: 2016 and 2019

These conclusions are based on the compliance assessment discussed in section 8.3 of this report.

Including the substantiated estimate for LDA in light iron will enable the UK to comfortably comply in 2016 with the Directive WEEE collection target of 45% (based on % of average weight of EEE placed on the market in the three preceding years in the UK)

If projected reported data was used alone, then the estimates suggest the UK would not comply in 2016. However by including the substantiated estimate[5] for LDA in light iron, the projected collection target achieved would be 59%.

In 2019 the UK is projected to fall short of compliance even if all unreported estimates are included

In order to achieve a 65% of EEE sales target (based on average of the previous three year EEE sales), the UK will need to collect 1,201kt of WEEE in 2019 for treatment or reuse. However only including projected reported tonnage together with estimates of additional tonnage in which we have a high degree of confidence, namely LDA in light iron and B2B IT unreported treatment will see the UK achieve a collection tonnage of

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[4] Projections for reported WEEE were made for each WEEE category, depending on availability of data; where possible we used published reports and stakeholder insight, however where this was not available we used annual historic trend. WEEE generated was taken from The Study on Collection rates of waste electrical and electronic equipment (WEEE)' by the European Commission, October 2014: http://ec.europa.eu/environment/waste/weee/pdf/Final_Report_Art7_publication.pdf

[5] See section 9.3 for detail of substantiated estimates

only 1,050kt collected (57%). If other unreported tonnage in which we have a lower degree of confidence is also included, then the UK will still not comply (short by 11kt).

It is recommended that further work is undertaken to substantiate the 'other unreported' tonnage (139kt) estimated in this piece of work

If Government wishes to use the 'other unreported' element of the unreported estimate, which accounts for 29% of total unreported estimate (139kt), then it needs to conduct further work to substantiate this estimate. Further details are provided in section 9 of this report.

Even if our estimate of 'other unreported' WEEE tonnage is verified, the Government may wish to consider what other steps may be necessary in order to ensure the UK meets the 2019 collection target

Even if all 139kt of 'other unreported' WEEE is verified as being correct and correctly treated there is likely to still be a shortfall of 11kt for the UK to meet its 2019 collection target. Therefore the Government may wish to consider additional measures to increase WEEE collection rates between now and 2019.

UK compliance could be more achievable in 2019 if the UK target is based on 65% of EEE POM

If Government were to adopt a collection target deriving method in 2019 based on 85% of WEEE generated, then the UK would be likely to be further away from complying than if Government adopts a target based on the 65% POM data method. The shortage in 2019 based on WEEE Generated, and using all higher confidence unreported data is 262kt. This is larger than the equivalent gap if the target was based on EEE sales, which is 151kt. The gap only reduces to 123kt with the additional unreported counted, compared to 11kt if based on EEE sales.

Recommendations for further work

Section 9 of this report presents a series of recommendations which have been identified as a result of conducting the work. It includes areas where further data analysis is recommended based on current gaps in data availability, and also suggested follow-on work to make sure the estimates remain up to date and relevant for Government to use in future years.

Contents

Figures

Glossary

AATF	Approved Authorised Treatment Facility
AGR	Annual Growth Rate
ATF	Authorised Treatment Facility
B2B	Business to Business
B2C	Business to Consumer
BMRA	British Metals Recycling Association
BTHA	British Toy and Hobby Association
DCF	Designated Collection Facility
EA	Environment Agency
EC	European Commission
ELV	End of Live Vehicles
EPIC	Environmental Product Information Centre
EU	European Union
EEE	Electrical and Electronic Equipment
GDL	Gas Discharge Lamps
HP	Hewlett Packard
IT	Information Technology
kt	thousand tonnes
LDA	Large Domestic Appliances
LED	Light-emitting Diode
LIA	Lighting Industry Association
MT	Million tonnes
pa	Per annum
PCS	Producer Compliance Scheme
PE (HD)	High Density Polyethylene
PET	Polyethylene Terephthalate
POM	Placed on the Market
PS	Polystyrene
PUR	Polyurethane
PV	Photovoltaic
PVC	Polyvinyl Chloride
REA	Renewable Energy Association
SDA	Small Domestic Appliances
UNU	United Nations University
WDA	Waste Disposal Authority
WDF	Waste Data Flow
WEEE	Waste Electrical and Electronic Equipment
WG	WEEE Generated

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LRS Consultancy Ltd (Anthesis Group)
National Association of Waste Disposal Officers (NAWDO)
Panasonic UK
RD Trading Limited (RDC)
Renewable Energy Association (REA)
Recolight
Recycling Lives
REPIC
Reciproc8 telecommunications
Samsung UK
Sims Group UK Ltd
S Norton & Co Ltd
Sweeep Kuusakoski Limited
techUK
The Association of Manufacturers of Domestic Appliances (AMDEA)
The British Toy and Hobby Association (BTHA)
The United Nations University (UNU)
Veolia Environmental Services
WEEE Scheme Forum

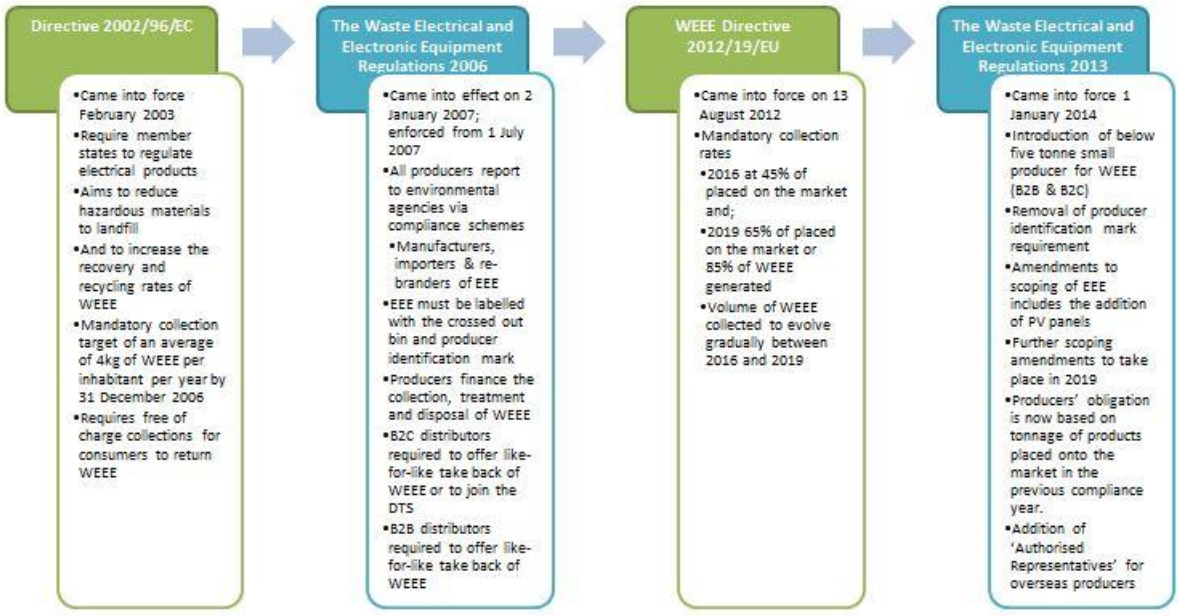
1.0 Introduction

The Waste Electrical and Electronic Equipment Directive (WEEE Directive) is the European Community directive on waste electrical and electronic equipment (WEEE) with the aim of reducing the amount of electrical and electronic equipment (EEE) ending up in landfill. It was first adopted as directive 2002/96/EC in February 2003 and was subsequently recast in 2012 by directive 2012/19/EU.

The UK Waste Electrical and Electronic Equipment (WEEE) Regulations were first introduced in 2006 and also subsequently replaced to reflect the revised Directive in 2013. The current Directive sets mandatory WEEE collection and treatment targets for Member States to achieve from 2016, with a further target collection rate set from 2019.

Figure 1 summarises the requirements of the Directive and how the UK adopted it to place obligations on UK organisations, in particular on producers. It is presented in the form of a timeline to illustrate the amendments made following the Recast WEEE Directive.

Figure 1 WEEE Directive timeline



2.0 Project background

In order to assess the impacts of the emerging changes in WEEE legislation (see Section 1) and inform the UK Government and other stakeholders of the implications of achieving compliance, a better understanding of current and projected flows of EEE onto the market and WEEE off the UK market (flow) is imperative.

We have therefore produced an overall analysis of current and projected flows of EEE and WEEE by reviewing, updating and expanding on information pertaining to (W)EEE Flow, through both primary and secondary research.

The output of this work includes updated numbers on (W)EEE flows and projections to illustrate progress towards the UK's collection targets, providing a starting point for a robust evidence base to support government reporting against targets.

As the project was commissioned before the outcome of the EU Referendum, we have not considered any implications to its development that may relate to Britain leaving the EU.

3.0 Project objectives & deliverables

The objectives of the project were to:

- Update and analyse current and projected flows of EEE onto the UK market and WEEE off the UK market ('flow') for the baseline year 2015 and projected years to 2020.
- Assess the impacts of upcoming legislation changes and targets on 'flow' and achieving compliance:
    - In 2016 the UK is required to meet a 45% target to comply (based on previous three year average EEE sales);
    - In 2019, in addition to the increase in target, the way in which the target is derived could also change. The UK will have to choose between 65% of previous three-year EEE sales (current method), or 85% of total WEEE generated; and
    - From 2019, changes in scoping and categorisation of EEE will also come into play.
- Review and incorporate the data on large domestic appliances within the light iron stream.
- Quantify plastics in the EEE/WEEE supply chain.
- Engage key stakeholders throughout the project to ensure up to date market information is used.

The key project deliverable is this publicly available report.

4.0 EEE Flow

This section provides a summary of the flow of EEE and WEEE, and how we have segmented the flow into key sections, which are continually referred to throughout the report.

4.1 EEE placed on the market

EEE placed on the market (POM) was investigated in three categories; registered, exempt and unregistered.

Figure 2 POM sub-categories

4.1.1 *Registered EEE POM*

Producers obligated under The WEEE Regulations[6] are required to report annual EEE sales (tonnes) to compliance schemes or the relevant agency. Sales figures are submitted to the relevant agency, where aggregated annual figures for the UK total are published.

Data taken for 2015 has been used for the baseline. This includes both business to business and business to consumer sales, and includes small producers that sell less than five tonnes of EEE. These small producers are not required to input financially to the recycling system in the UK, but do report their tonnages which means their sales are accounted for in the agency numbers.

4.1.2 *Unregistered*

It is assumed that some companies do not report their data to the relevant Agency, this could be because they are unaware of the regulations e.g. small companies based abroad selling through market place sites may not be familiar with UK regulatory requirements. The products that they sell may be within the scope of the regulations. The tonnage of product sold by these companies has been estimated and is referred to as unregistered.

4.1.3 *Exempt EEE POM*

Registered reported EEE does not account for EEE products that are exempt from the scope of the regulations. The Agencies provide guidance on what products are within the scope of the regulations and which are out of scope[7]. However, some of the current exempt products will come into scope in 2019 when the rules change (see section 7 for further information and analysis). Therefore, this study has investigated exemptions within its POM calculations.

4.2 WEEE generated

WEEE generated describes the quantity of WEEE that arises as waste. This covers all WEEE that is discarded at the end of its first life, including that destined for reuse and

[6] *A company is obligated is it re-brands EEE with its own brand EEE that was manufactured by another company, manufactures electrical or electronic equipment (EEE) under its own brand or imports EEE into the UK.*

[7] *https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/393740/LIT_7876.pdf*

WEEE in the residual waste stream. As with POM, we also split the estimation of WEEE generated into three categories: reported, unreported and other.

Figure 3 WEEE generated sub-categories

4.2.1 *Reported treatment of WEEE*

The quantity of business to consumer (B2C), business to business (B2B) and non-obligated WEEE treatment (including reuse) by Approved Authorised Treatment Facilities (AATFs) is reported to the Environment Agencies (EA) quarterly. The Environment Agency aggregates all AATF data and publishes it. The project team used 2015 reported tonnages by AATFs to estimate reported tonnage of WEEE treatment in 2015.

4.2.2 *Unreported treatment of WEEE*

Reported quantities of WEEE treatment under the producer responsibility system does not account for all WEEE treatment. A lot of activity occurs outside of the official WEEE system, much of which is legal activity. This includes WEEE that may be mixed with other metals and treated in mass shredding facilities, reuse through charities, Authorised Treatment Facility (ATF) activity which are not approved to undertake treatment on behalf of producers and therefore are not required to report activity to the Agency, and B2B recycling, that is not targeted under the WEEE system.

4.2.3 *Other*

As WEEE generated includes all WEEE discarded, we have included a category for 'other' which includes WEEE lost from or not entering the WEEE treatment system. This includes WEEE in the residual waste stream either from businesses or from the general public using residual bins to place small WEEE items (either at kerbside or at Civic Amenity sites). In this category we also looked at the impact of WEEE being stolen from Designated Collection Facilities (DCFs)[8].

5.0 Methodology and results

The project team engaged a number of stakeholders through a project stakeholder group and consultations with specific sector groups. Although this method does ensure most recent available data is used where possible, in some cases no information was available or there were restrictions on it being made available to the project. As a result

[8] *Hoarded EEE has not been investigated in this work*

we have had to extrapolate data and/or make various assumptions. Where there are specific limitations in data, these have been highlighted in section 9 Project Conclusions.

5.1 Total EEE POM and total WEEE generated 2015

In order to estimate total POM and total WEEE generated, we used 'The Study on Collection rates of waste electrical and electronic equipment (WEEE)' by the European Commission, October 2014[9].

The study focussed on WEEE generated, however the method for calculating WEEE generated involved a calculation involving POM, therefore the United Nations University (UNU) estimated 'apparent consumption' in each EU member state including the UK based on a formula of domestic production plus imports minus exports. Based on their 2011 and 2012 consumption, it is estimated that 11.59% of POM is unregistered/exempt. This % has been applied to 2015 registered tonnage of 1,769kt to estimate total UK POM 2015 of 2,001kt.

The study estimates that total WEEE generated in the UK in 2015 was 1,528kt. The UNU established this tonnage based on historic sales multiplied by product lifespan (with products having been categorised into 54 categories for the purpose of the UNU's analysis).

5.2 POM by sub-category

The total POM has been broken down into registered, exempt and unregistered using a number of data sources which are discussed in this section.

5.2.1 *Registered EEE POM 2015*

Obligated producers[10] are required to report to the EA the quantity of EEE placed on the market in a given year. Although there is a financing threshold for companies placing less than five tonnes of EEE on the market, all size companies are required to report POM data to the agencies. Therefore, we have used EA data to determine a registered tonnage of **1,769kt in 2015**.

5.2.2 *Unregistered EEE POM 2015*

To estimate unregistered EEE placed on the market we used a combination of industry estimations, data analysis and assumptions, as detailed here.

<u>Category 1 Large Domestic Appliances (LDA)</u>

The Association of Manufacturers of Domestic Appliances, the UK trade association for the manufacturers of small and large domestic appliances, AMDEA, believed the quantity of LDA to be placed on the market by unregistered organisations to be negligible due to the value of the products and therefore the unlikeliness of consumers

[9] http://ec.europa.eu/environment/waste/weee/pdf/Final_Report_Art7_publication.pdf

[10] *A company is obligated if it re-brands EEE with its own brand EEE that was manufactured by another company, manufactures electrical or electronic equipment (EEE) under its own brand or imports EEE into the UK.*

making purchases from unfamiliar companies. We have applied the same assumption to medical devices, monitoring and control instruments, automatic dispensers and cooling equipment.

Category 5 Lighting Equipment and Category 13 Gas Discharge Lamps and LED Light Sources

Recolight estimated that approximately 5% of lighting equipment placed on the market is by unregistered producers and 10% of Gas Discharge Lamps and LED Light Sources. This 10% estimate was supported by The Lighting Industry Association (LIA) and is mainly due to the fact that it is easier to ship LED products compared to fluorescent products to a householder and so there are many more online sellers than there ever were, because they're so easy to post: they're small, fairly durable, and often cheaper products.

Category 2 Small Domestic Appliances (SDAs) and Category 3 Information Technology (IT) and telecoms equipment

Both categories have been given a nominal 3% unregistered proportion to cover the likely small items being bought online and imported directly into the country, such as small memory cards etc.

Category 7 Toys, leisure and Sports

The British Toy and Hobby Association (BTHA) estimated that 5% of toys placed on the market are by those not registered with the regulations. A separate report, also provided by the BTHA suggested that 12% of sales were by counterfeit companies. However as the 'toys' category includes sports and leisure equipment as well as toys, the lower estimate of 5% has been used.

Category 4 Consumer Equipment and Category 6 Tools

Both categories have been assigned a midpoint percentage of 7.5% between the estimates made for toys and lighting, as agreed by the stakeholder group.

Category 11 Display

TechUK[11] suggested that the quantity of display items placed on the market but not registered would be negligible due to the relatively small number of suppliers operating in the market meaning that the likelihood of unregistered companies is relatively low.

Category 14 Photovoltaic (PV) Panels

Feed in tariff data[12] was used to estimate the number of PV panels that were placed on the market and not reported to the Agency in 2015. The data was converted to tonnes and suggested that 47% of placed on the market is not registered. PV panels see a high

[11] *TechUK is the industry voice for the UK tech sector, representing more than 850 companies. They have a number of EEE producers in membership which would fall into Category 3 (IT and Telecomms Equipment), Category 4 (Consumer Equipment) and Category 11 (Display Equipment).*

[12] *https://www.gov.uk/government/statistics/monthly-small-scale-renewable-deployment viewed 9.5.2016*

percentage of unregistered tonnage likely because they are newly introduced to the regulations therefore awareness amongst producers is limited in comparison to other product categories.

The total estimated unregistered tonnage is 133kt.

5.2.3 *Exempt EEE POM 2015*

We estimated this tonnage as a remaining tonnage after removing registered and unregistered from the total.
We also broke this down into key categories where possible.

We estimated 34kt of **household luminaires** placed on the market in 2015 as exempt from the regulations, using sales data provided by the LIA, including halogen lamps. We were also given an estimate by the British Toy and Hobby Association (BTHA) of the quantities of **toys** exempt from the regulations (estimated between 2-4% covering products where the electrical component is not the primary function). We used 3% which translated to 2kt.

Removing the 2kt toys and 34kt household luminaires/halogen lamps left a total of 64kt. This left over tonnage is likely to include other exempt products including small scale fixed installations.

The total estimated exempt tonnage in 2015 is 99kt (some of which will come into the system under open scope in 2019, see section 7).

5.2.4 *POM summary*

Figures 4 and 5 summarise the placed on the market numbers firstly by sub-category, then in Figure 5 by EEE category.

Figure 4 EEE POM results & methodology summary

Total	2001k	Total POM from "STUDY ON COLLECTION RATES OF WEEE", European Commission, October 2014: % applied to 2015 reported
Total registered	**1769k**	**EA Data**
Total unregistered	**133k**	**Sum of below**
Cat 1 Large Household Appliances	0k	Negligible - AMDEA
Cat 2 Small Household Appliances	6k	Nominal 3% - TechUK
Cat 3 IT and Telecoms Equipment	5k	Nominal 3% - TechUK
Cat 4 Consumer Equipment	5k	Assigned 7.5%: midpoint between toys and lighting
Cat 5 Lighting Equipment	2k	Estimated 5% - Recolight
Cat 6 Electrical and Electronic Tools	8k	Assigned 7.5%: midpoint between toys and lighting
Cat 7 Toys Leisure and Sports	3k	Estimated 5% - BTHA
Cat 8 Medical Devices	0k	Assumed negligible
Cat 9 Monitoring and Control Instruments	0k	Assumed negligible
Cat 10 Automatic Dispensers	0k	Assumed negligible
Cat 11 Display Equipment	0k	Negligible - TechUK
Cat 12 Cooling Appliances Containing Refrigerants	0k	Assumed negligible
Cat 13 Gas Discharge Lamps and LED Light Sources	1k	Estimated 10% - Recolight
Cat 14 Photovoltaic Panels	101k	Feedin tariff data converted to tonnes 47%
Total exempt / unaccounted	**99k**	**Sum of below**
Toys	2k	BTHA estimate 2-4% (used 3%)
Household luminaires	34k	Data analysis using LIA sales data
Other unassigned	64k	Gap between total and all that is already assigned

Figure 5 EEE POM results by EEE category

Category	2015			
	Reported	Unregistered	Exempt / Unaccounted	Total
Cat 1 Large Household Appliances	575k	0k	0k	575k
Cat 2 Small Household Appliances	179k	6k	0k	184k
Cat 3 IT and Telecoms Equipment	171k	5k	0k	176k
Cat 4 Consumer Equipment	63k	5k	0k	68k
Cat 5 Lighting Equipment	45k	2k	0k	47k
Cat 6 Electrical and Electronic Tools	105k	8k	0k	113k
Cat 7 Toys Leisure and Sports	56k	3k	2k	60k
Cat 8 Medical Devices	21k	0k	0k	21k
Cat 9 Monitoring and Control Instruments	79k	0k	0k	79k
Cat 10 Automatic Dispensers	13k	0k	0k	13k
Cat 11 Display Equipment	87k	0k	0k	87k
Cat 12 Cooling Appliances Containing Refrigerants	250k	0k	0k	250k
Cat 13 Gas Discharge Lamps and LED Light Sources	12k	1k	0k	14k
Cat 14 Photovoltaic Panels	114k	101k	0k	216k
Household luminaires	0k	0k	34k	34k
Other unassigned	0k	0k	64k	64k
Total	**1769k**	**133k**	**99k**	**2001k**

In Figure 6, we have illustrated the split of B2C and B2B tonnage. Registered data is already reported in B2B and B2C, for the unregistered, where it is not specified we have applied the same percentage split between reported B2B and B2C for each category to the unregistered POM. Exemptions have all been assigned B2C.

Figure 6 EEE POM results B2C versus B2B

	B2B (kt)	B2C (kt)	Total (kt)
Registered	336	1,433	1,769
Unregistered	8	124	133
Exempt	0	99	99
TOTAL	**344**	**1,657**	**2,001**

5.3 WEEE generated by sub-category

Similarly for WEEE Generated, the total number from the EC's report has been used and broken down using a variety of data sources and assumptions, as discussed here.

5.3.1 *Reported WEEE 2015*

Approved Authorised Treatment Facilities (AATFs) are the only facilities able to raise evidence on recycling activity. All WEEE treated by an AATF must be reported to the Agency. This will primarily be B2C WEEE but will also include some B2B WEEE and non-obligated WEEE (not financed by a Producer Compliance Scheme). In 2015, **679kt of WEEE** was reported to the Agency by AATFs.

5.3.2 *Residual WEEE 2015*[13]

B2C

The Defra Waste Digest and Waste Data Flow (WDF) were used to provide total household residual waste produced in the UK, split by that collected at kerbside and that collected at civic amenity sites.

Three published compositional analysis reports and an internal Valpak study[14] were used to estimate the proportion of WEEE within the kerbside residual waste stream across the UK (average 1.15%). The three published reports also provide an estimate of the proportion of WEEE within the residual waste stream at civic amenity sites, deposited by the general public, the average was 2.4%. Both percentages were applied to the applicable totals from the Defra Waste Digest to give a total tonnage of approximately 356kt of WEEE in the residual waste stream in 2015[15].

The published reports on composition analysis used are listed here:

- National municipal waste compositional analysis in Wales, WRAP Cymru, June 2016[16]
- Municipal Waste Composition: A Review of Municipal Waste Component Analyses, Defra 2009[17]
- The composition of municipal solid waste in Scotland, Zero Waste Scotland, April 2010[18]
- Valpak commissioned study with one English local authority, assessing kerbside waste during April/May 2016 (not published).

The total 356kt is 18% of the total EEE estimated to be placed on the market in 2015 and 23% of WEEE Generated. The stakeholder group considered this to be too high, particularly compared with collected tonnages i.e. this equates to each household disposing of more than 13kg per annum in their residual waste. It is also much higher than that documented in other European countries. The Netherlands, has documented

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[13] *Some WEEE, especially small domestic WEEE will end up in the household black bins (residual waste stream). Some B2B WEEE will also ultimately be consigned to landfill.*

[14] *The types of products recorded in the residual waste stream based on the Valpak study included, as examples, kettles, toasters, toys, remotes, lamps, headphones, electric toothbrushes, phones, cameras, walkie talkies. This residual waste stream is unlikely to include large items such as washing machines. Any of these items left out by residents will be captured within the LDA in light iron stream of this work, Figure 7 provides further details.*

[15] *It should be noted that all three published studies and the Valpak work detail the geographic spread and demographic coverage of the sample sets. In all cases they cover both rural and urban areas and follow a sampling technique based on official databases setting out demographics (socio-economic) classifications to ensure a wide spread of groups. They also range from 2010 to 2016, seeing very little change in the proportion of waste that is WEEE.*

[16] http://www.wrapcymru.org.uk/sites/files/wrap/Wales_compositional_analysis_report_2_.9076.pdf

[17] http://randd.defra.gov.uk/Default.aspx?Module=More&Location=None&ProjectID=15133

[18] http://www.wrap.org.uk/sites/files/wrap/Scotland_MSW_report_final.pdf

a percentage as low as 11% of WEEE generated. Italy has documented that between 1.6 kg/inhabitant and 2.3kh/inhabitant of consumer WEEE is improperly disposed of in residual waste, 10% of WEEE generated. A comprehensive study of WEEE undertaken in France evaluated the presence of WEEE in residual household waste at 1kg per inhabitant per year.

No other data is available nor was a more robust methodology proposed with which to contradict this number for the UK.

B2B

Hewlett Packard commissioned LRS Consultancy[19] to investigate the flow of B2B IT equipment. It is known that much of this category is subject to reuse activity outside of the WEEE system, through asset management facilities. The study estimated that the quantity of this type of equipment off the market was similar to the quantity on the market due to the short lifespan of business IT equipment, they also estimated that 13% of the products ends up in landfill. Applying this 13% to 2015 reported POM B2B category 3 suggests 10kt was sent to landfill in 2015. Data source: "Hewlett Packard B2B asset management in the UK and France" August 2014.
The total estimated tonnage discarded without treatment in 2015 is estimated as minimum **366kt.**

5.3.3 *Unreported WEEE 2015*

The unreported sub-category was split into three sections, B2B IT equipment, LDA in light iron and 'remainder'. Each is detailed in turn below.

B2B IT equipment (WEEE category 3)

In order to assess the quantity of B2B IT equipment being recycled or reused in the UK but not reported, the "Hewlett Packard B2B asset management in the UK and France" August 2014 report was used. This suggested that 87% of what is placed on the market is ultimately treated, even if outside the system. This 87% has been applied to the POM 2015 registered number, and after deducting reported category B2B tonnage gives a tonnage of 63kt of unreported category 3 B2B equipment. This is likely to be handled mainly through Asset Management facilities.

Large Domestic Appliances (LDAs) have been observed to be collected via the light iron waste stream. The amount of LDA recovered through this route, however, is unknown. Work was previously carried out by WRAP in 2013, to quantify the amount of LDA arisings in the light iron stream and produce a robust national estimate. This was done through sampling on treatment sites across the UK. Further details of the previous work can be found here: http://www.wrap.org.uk/user/login?destination=node%2F18591. The purpose of this follow-up work was to revisit the estimate of 4.5 MT light iron infeed to a shredder in the UK, and how the 11% estimated to be LDA is applied, to ensure there is

[19] *Now Anthesis Group*

no double counting across the supply chain, e.g. LDA already evidenced being included again in the light iron estimates.

Industry estimated that the total light iron infeed is lower in 2015, at approximately 3MT (excluding End of Life Vehicle (ELV) waste). This was corroborated by the British Metals Recycling Association (BMRA). However in order to estimate how much of this tonnage to apply the 11% assumed LDA to, we consulted with industry and used EA data where possible.

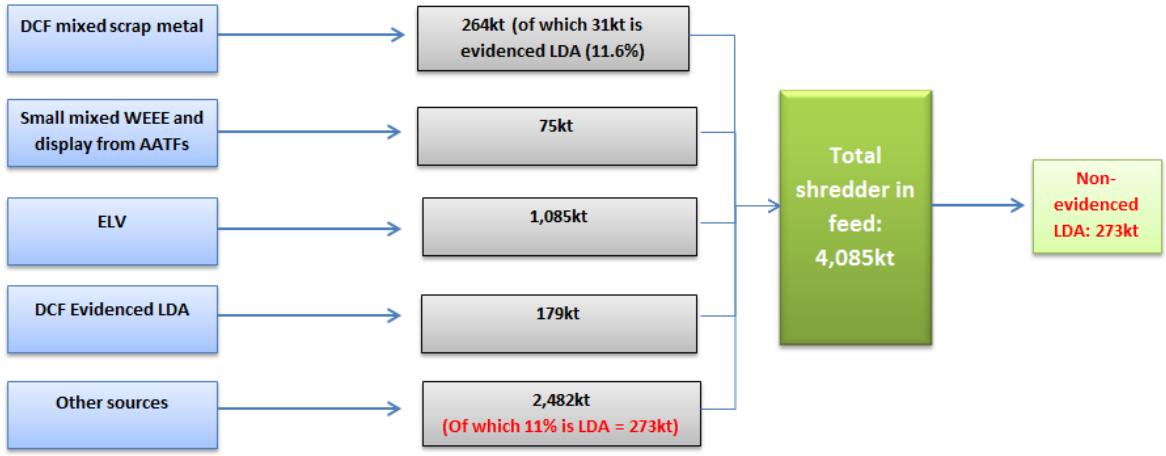
The detailed methodology for assessing how much LDA is in the light iron stream without being already accounted for is provided in Figure 7 and summarised thereafter in Figure 8.

Figure 7 LDA in light iron methodology and results

Source	Detail/Methodology	Tonnage	Total LDA in Light Iron
Total	Total light iron in-feed to a shredder 2015 (sum)	4,085kt	**273kt (11% of 'All other sources')**
DCF mixed scrap stream	Using Waste Data Flow we were able to identify the total scrap metal quantity arising at DCFs across the country. The Environment Agency protocol suggests that 11.6% of this mixed scrap is LDA but already evidenced, therefore the whole tonnage was removed from our total, as it's either already evidenced LDA or not LDA	264kt	
Small mixed WEEE and display equipment from AATFs	This equipment is assumed to already be evidenced by the AATF as the first receiving treatment facility and does not contain LDA. We estimated this tonnage using data provided by one AATF and its associated market share	75kt	
End of Life Vehicles (ELV)	ELV streams do not contain LDA. Defra provided official reported figures for 2014	1,085kt	
Separately collected LDA at a DCF site	We have assumed that all reported (to the EA by AATFs) LDA is part of the infeed tonnage. Therefore this tonnage has been removed as it is already accounted for within reported	179kt	
All other sources	This is all remaining tonnage making up the 4,085kt, having deducted the four categories above. It is likely to include ATF and other unreported activity. This is the resulting tonnage assumed to contain 11% LDA that has not been accounted for or evidenced elsewhere in the system	2,482kt (11% of which is 273kt)	

Figure 8 provides a summary of the input streams to a shredder, and how the 273kt tonnage has derived.

Figure 8 LDA in light iron flow chart



5.3.4 *WEEE stolen from DCFs*

There is an on-going issue regarding the theft of items destined for recycling or reuse. This can be the entire item, such as washing machine or components such as fridge compressors or filters being stolen from sites. This can significantly reduce the quantity of WEEE available for recycling in AATFs/ATFs, which affects local authority recycling levels. It is also a significant issue in terms of reuse as the theft of a fridge component worth 50p in scrap value can put a fridge worth £120 beyond economic repair.

Due to the nature of items being stolen from the WEEE collection system, it is difficult to quantify the exact amount of WEEE that is handled in this way. This is also demonstrated by the lack of publicly available information on WEEE theft rates.
Due to the impact of the issue Valpak have tried to estimate the quantity of WEEE theft which takes place, the results of this analysis are provided in Figure 9. These have been derived using desktop research and internal Valpak data, reports and expertise.

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

In 2015, there were 368 tonnes of WEEE collected from LA DCFs in total. This suggests 26% of all WEEE arriving at DCFs is stolen. We recommend that further work is conducted in this area to try and better understand how and why this is happening, and identify ways of reducing the levels. Due to the value of WEEE items and components, theft from the WEEE system is believed to be relatively widespread rather than isolated incidents, therefore it is an issue which is experienced by most local authorities in the UK.

5.3.5 Destination of DCF stolen WEEE

It is very likely that stolen small household appliances and display equipment would be treated in some way, therefore we have included the tonnages within the 'other unreported' numbers. It is assumed that the LDA stolen will be sent for shredding in the

[20] *It is important to note that the carcass of fridges having had compressors removed should technically not be in reported as the whole equipment has not been properly treated.*

light iron stream, therefore the 77kt estimated is likely already accounted for within the LDA in light iron estimate (see Figures 7 and 8). Since it is components only that has been accounted for within category 12 cooling appliances, we have not included this tonnage within the unreported element.

5.3.6 *Other unreported*

The remaining tonnage after removing reported (679kt), residual (366kt), cooling theft (9kt), B2B asset management (63kt), LDA in light iron (273kt) from WEEE generated is **139kt.**

This tonnage is likely to include other Asset Management activity, B2B recycling, other reuse activity, WEEE in non-ferrous and ATF activity. Since this is a remainder tonnage based on the total WEEE generated value of 1,528kt, we recommend further work is conducted in this area to check the robustness of the number and understand the activities involved in contributing towards it. Further details are provided in section 9 of this report.

5.3.7 *WEEE generated summary*

Figure 10 summarises the WEEE generated numbers by sub-category.

Figure 10 WEEE generated results & methodology summary[21]

WEEE Generated	Tonnes	Data Source
Total	**1528k**	**"STUDY ON COLLECTION RATES OF WEEE", European Commission, October 2014: WEEE Generated 2015**
Total reported	**679k**	**EA Data**
Total unreported	**475k**	**Remainder after removing residual, cat 12 diverted and reported**
Category 3 B2B Asset Management	63k	87% of reported POM: "Hewlett Packard B2B asset management in the UK and France" Aug 2014
LDA in light iron	273k	Stakeholder group, BMRA, Defra
Other unreported	139k	Total WG - reported, residual, cooling theft, B2B asset man, LDA in light iron
Total residual	**366k**	**Sum of below**
Residual B2C	356k	% WEEE in residual waste (average % from compositional analysis studies across UK)
Residual B2B	10k	Cat 3 only: "Hewlett Packard B2B asset management in the UK and France" Aug 2014
Total DCF diverted	**96k**	**Sum of below**
Cat 1 Large Household Appliances	77k	43% of reported hh collected LDA: data assessment. Assumed to be in light iron stream
Cat 2 Small Household Appliances	1k	2% of reported hh collected SDA: Valpak intelligence. Captured in Other Unreported
Cat 11 Display Equipment	10k	13.5% of reported hh collected Displays: HP presentation. Captured in Other Unreported
Cat 12 Cooling Appliances	9k	6% of reported hh collected cooling apps (components only): WDA variance reports. Not captured in Unreported

6.0 Key findings

This section presents the key findings of the research.

[21] *Illegal export has not been accounted for separately in this analysis. It may be that some of the other unreported or DCF stolen tonnages are ultimately illegally exported.*

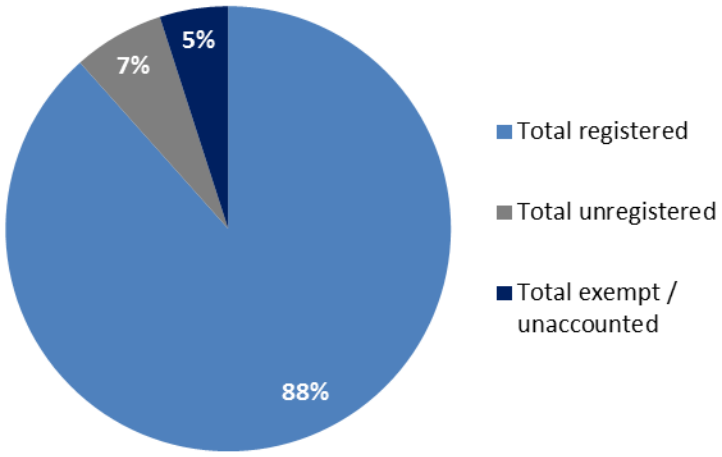
6.1 EEE POM

The total quantity of EEE placed on the market in 2015 is estimated to be 2,001kt, made up of:

- 1,769kt of registered EEE (88%) reported by producers and schemes under the regulations.
- 97kt of exempt EEE (5%) which is not covered by the current regulations and therefore does not have to be reported.
- 135kt (7%) of EEE estimated to be handled by companies not registered with the regulations but which should be registered.

This is summarised in Figure 11 below.

Figure 11 EEE POM by sub-category



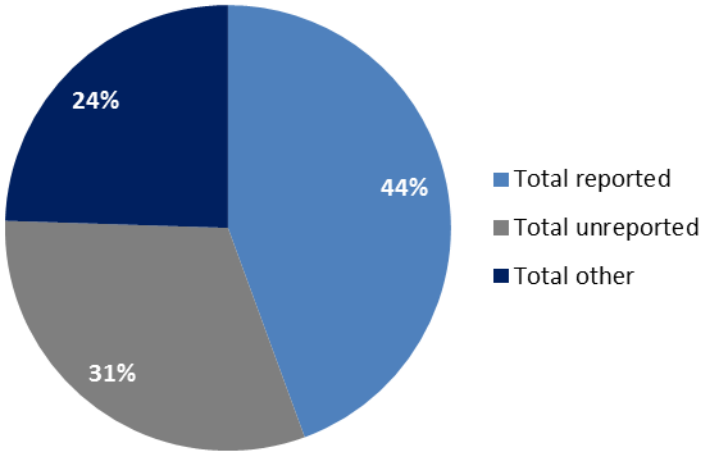
6.2 WEEE generated

The quantity of WEEE generated in 2015 is estimated to be 1,528kt, made up of:

- 679kt, of reported WEEE (44%). This is documented and controlled within the regulatory system.
- 475kt of unreported WEEE (31%). This material is outside the regulatory system and not as closely controlled or monitored as above.
- 374kt of WEEE lost from the system through the residual waste stream or components taken from cooling equipment (24%). This material is unlikely to be treated to correct standards.

This is summarised in Figure 12.

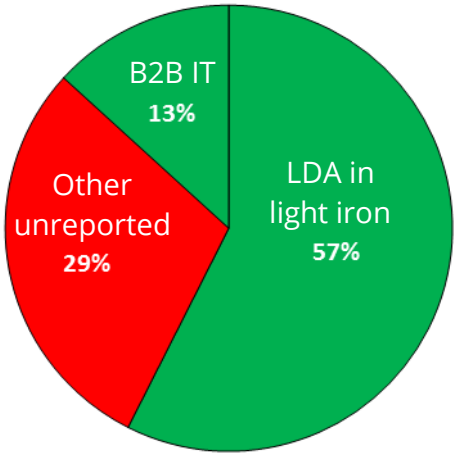
Figure 12 WEEE generated by sub-category



However, we feel there are varying levels of confidence in the data sets. Therefore, we break down the unreported treatment category further by the level of confidence we apply in the data sets.

Figure 13 illustrates the level of confidence in the data by red and green colour coding. Green means we would be confident in Government using the numbers and red means this number is less robust and requires further verification.

Figure 13 WEEE generated by sub-category

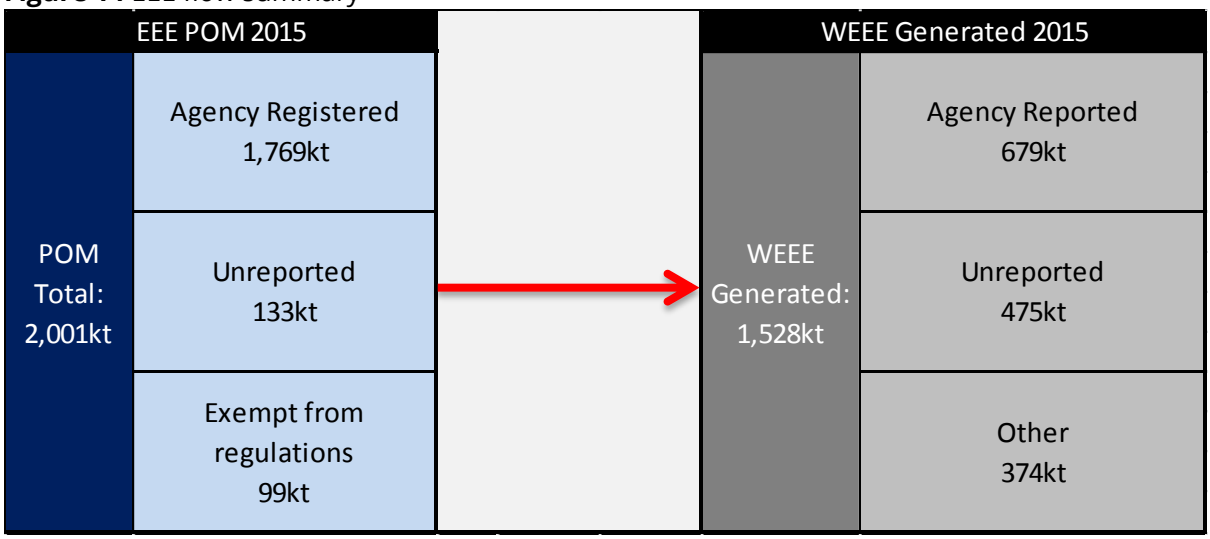


As can be seen the area we are least confident in the robustness of the data is the other unreported, which is a remainder tonnage after everything else already accounted for from the total WEEE generated (see section 5.3 'other unreported' for details). We are unable to verify within this tonnage whether all WEEE discarded has been captured or in what way the WEEE would be handled.

6.3 Summary EEE flow

Figure 14 summarises the EEE placed on the market and WEEE generated as concluded in this section.

Figure 14 EEE flow summary



7.0 Assessment of 2019 EEE scoping changes

In 2019, there will be a move to open scope. This means that all electrical and electronic products will be within scope of the regulations (unless they are specifically listed as excluded) compared to the current position where only products within certain specific categories are reported as placed on the market. The impact of this will see a number of products that are currently exempt from the scope of the regulations fall into scope. At the time of reporting, the exact scale of this move was unknown, for example we have assumed, based on information made available at the time, that items currently out of scope because the electrical component does not perform the primary function e.g. in the case of exempt toys, will still not come into scope under the new definition where a product requires electrical power to function properly. We have therefore assumed for the purpose of this assessment that in 2019 only household luminaires and other unassigned products from our POM assessment will come into the scope of the regulations.

64kt of currently exempt EEE are estimated to be exempt from the regulations and may come into scope in 2019. In addition just over 27kt is estimated to be household luminaries and all are estimated to come into scope in 2019. It is worth noting that in our estimate we have not accounted for possible change in sales volumes of these products over the next four years, therefore the estimate could be higher or lower that what is projected here.

We estimated that in 2019 an additional 92kt of EEE could come into the scope of the regulations.

As part of the move to open scope, reporting categories are also due to change from the current ten categories (or 14 in UK) to six. The new six will be:

1. Temperature exchange equipment;

2. Screens, monitors, and equipment containing screens (having a surface greater than 100cm^2);
3. Lamps;
4. Other large equipment (any external dimension more than 50cm);
5. Other small equipment (no external dimension more than 50cm); and
6. Small IT and telecommunication equipment (no external dimension more than 50cm).

New categories one to three are similar to the existing categories; however, all other categories will require dimension information, for example, microwaves were previously all in category 1 but from 2019 must be split by dimension.

Therefore, some categories such as display equipment and PV panels will transfer 100% into a new category but others such as LDAs and SDAs may be spread across more than one new category, which means producers will need to review the way in which they report their data to the agency.

8.0 Projections and compliance

8.1 Projections: POM

Projections have been made using registered producer data and applying annual growth rates based on a variety of data sources. It should be noted that latest available data was used at the time of data analysis; some of this data may have been superseded by newer information before this report is published.

Figure 15 sets out the methodology used to project forward for each category of WEEE.

Figure 15 Projections methodology: EEE POM

Category of EEE	Data Source / Methodology
PV panels	The Renewable Energy Association (REA) recommended we assume no change in PV panel levels up to 2020. However this is heavily caveated by a number of factors that could influence the market over the next few years, for example, with Brexit will the UK start trading on the World Market rather than the European market? Therefore we have assumed no growth for the purposes of this work. Unlike all other categories we have placed the flat growth on total POM as opposed to registered POM. However we estimate that in 2020 the unregistered tonnage will reduce from the current 47% to 7.5% (as per some of the other categories' unregistered levels in 2015 as estimated in the work). Based on this assumption, the reported tonnage increases up to 2020 as more of the total POM is registered, but the overall POM stays the same.

LDAs	We have projected this category in line with housing projections as per AMDEA. Therefore we have referred to 'Industry Insights, Construction Skills Network Forecasts 2016-2020[22] for housing projections.
Display	We have used a two-point moving average to project to 2020 as the trend seems to have been non-linear for some time but almost flat since 2013.
All other categories	Historic annual growth rate has been used with registered data.
Total POM	Same percent unregistered/exempt applied (11.59%) to every year. However in 2019 and 2020 the percent is lower as 92kt of currently exempt products is assumed to come into scope (see section 7).

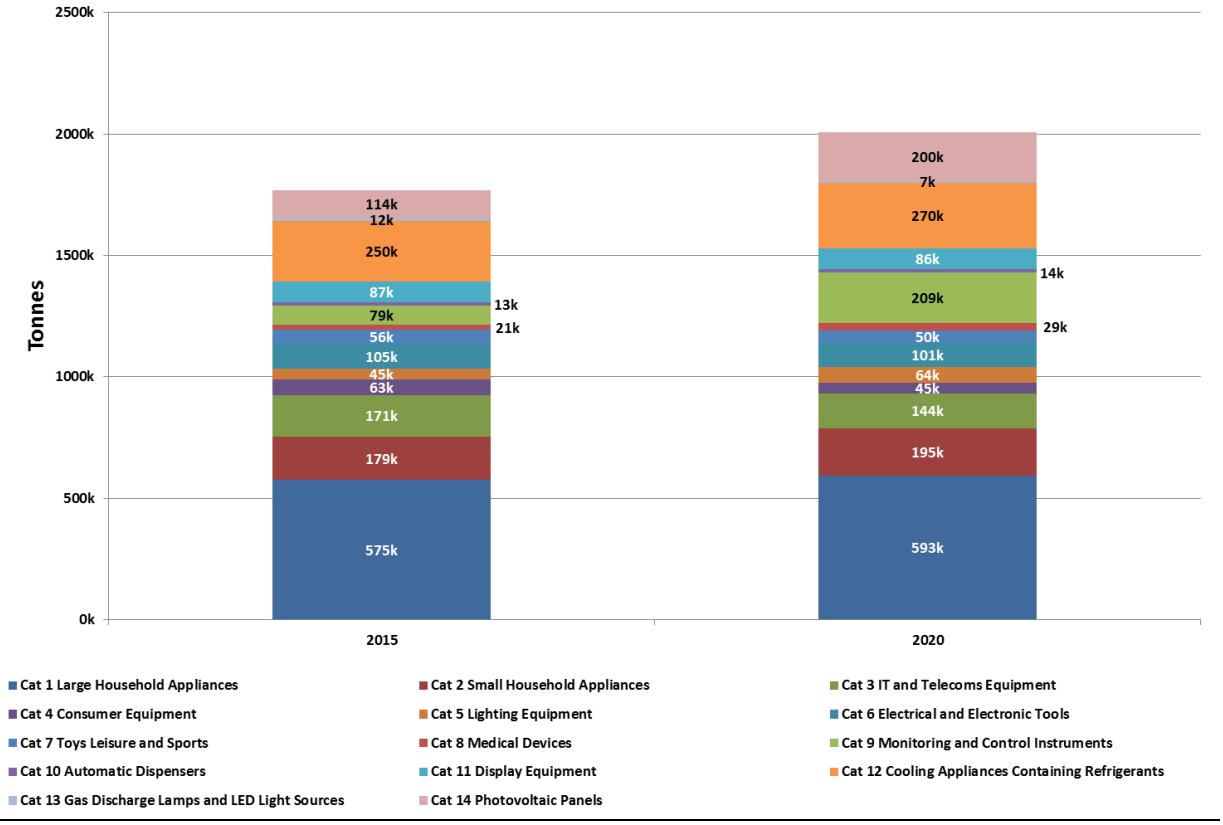
Figure 16 illustrates the resulting annual growth rates for each registered category of EEE based on the methodologies set out in Figure 15 and Figure 17 illustrates the tonnage changes within each category between 2015 and 2020.

Figure 16 Projections results: annual rates of change POM

Category	Annual Rate of Change	Source
LDAs	0.6%	House Builds
SDAs	1.83%	Historic AGR
IT and Telecoms	-3.44%	Historic AGR
Cons Equip	-6.55%	Historic AGR
Lighting Equip	7.5%	Recolight 5-10% pa
Tools	-0.75%	Historic AGR
Toys	-2.21%	Historic AGR
Med devices	6.70%	Historic AGR
Monitoring and control	21.30%	Historic AGR
Auto dispensers	0.62%	Historic AGR
Display	Oscillating around flat	2-year moving average
Cooling	1.62%	Historic AGR
LEDs and GDLs	-10.14%	Historic AGR
PV Panels	14.91%	REA

[22] https://www.citb.co.uk/documents/research/csn%202016-2020/csn_national_2016.pdf

Figure 17 Projections results: EEE POM



Total registered POM in 2015 was 1769kt. Total registered POM by 2020 is projected to be 2,098kt. This is a projected overall 19% increase over five years. Total POM in 2015 was estimated at 2,001kt. Total POM in 2020 is projected to be 2,266kt. This is a projected overall growth projection of 13% over the next five years.

8.2 Projections: WEEE

Projections have been made using reported AATF data and applying annual growth rates based on a variety of data sources. It should be noted that latest available data was used at the time of data analysis; some of this data may have been superseded by newer information before this report is published.

Figure 18 sets out the methodology used to project for each category of WEEE.

Figure 18 Projections methodology: WEEE

Category of EEE	Data Source / Methodology
PV panels	'End of Life Management Solar Photovoltaic Panels', June 2016, International Renewable Energy Agency (UK specific trend) – "The UK PV panel recycling market will probably remain minor over the next couple of years" therefore the same tonnage increase as 2014-2015 reported has been applied to every year projected.
Category 13	Recolight and LIA indicated that numbers will decline as the UK has reached a

GDLs and LEDs	peak in recycling tonnages. Appendix II contains a graph provided by Recolight that sets out the decline projected. The graph suggests that a decline of ~32% will be seen across Europe between 2015 and 2020. However Recolight predicts that the decline in the UK will begin to be seen later in the UK, from 2017, therefore we have assumed no change between 2015 and 2016 and a 26% reduction between 2017 and 2020, the same decline as suggested by the graph for the four year prediction of 2015-2019, only we delay it by a year. This is caveated by the fact that the decline could be much greater; Recolight suggests a reduction rate of up to 35-40% could be seen over the next five years.
IT and telecoms	As per POM trend: Tech UK confirmed that products are getting lighter and consumers are moving away from heavier desktops and laptops to more portable and lighter products. The market is now one of replacement rather than growth. The expectation is for waste generation to be consistent and overtime decline, to reflect this trend. Therefore we have matched the POM rate.
LDA	In line with housing projections, as per POM
Display	According to TechUK, a desktop monitor of 10 years ago has reduced by weight by 20-50% compared to those sold now, and at the same time has increased in size by 25%. Televisions have also undergone dramatic weight reductions as we are now seeing ultra slim LED TVs which are 91% the width of earlier models, with substantial reductions in weight offsetting the growth in demand for larger screen sizes. The market for flat TVs has flattened at 6m a year in the UK consistent with a saturated replacement market, following a peak in 2010 of 9m following the digital switchover. Therefore to reflect these trends, they expect collections to fall slightly over time. So instead a continuation of the rate of decline that has been seen between 2010 and 2013, we looked at the rate between 2014 and 15 (-6%) and gradually reduced this over time. This has been a manual prediction based on market intelligence and cannot be backed up statistically.
All other categories	Historic annual growth rate, using reported data.
Total WEEE generated	The Study on Collection rates of waste electrical and electronic equipment (WEEE)' by the European Commission, October 2014[23]

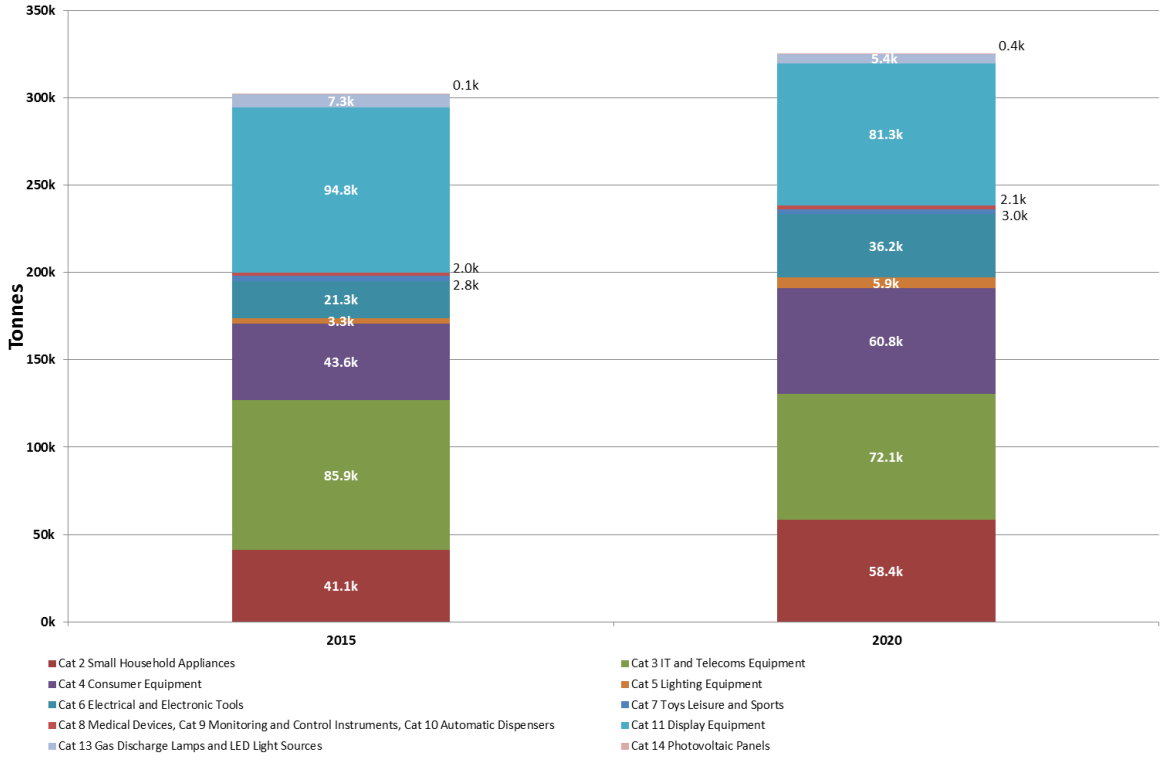
Figure 19 illustrates the resulting annual growth rates for each reported category of WEEE based on the methodologies set out in Figure 18 and Figure 20 illustrates the tonnage changes within each category between 2015 and 2020.

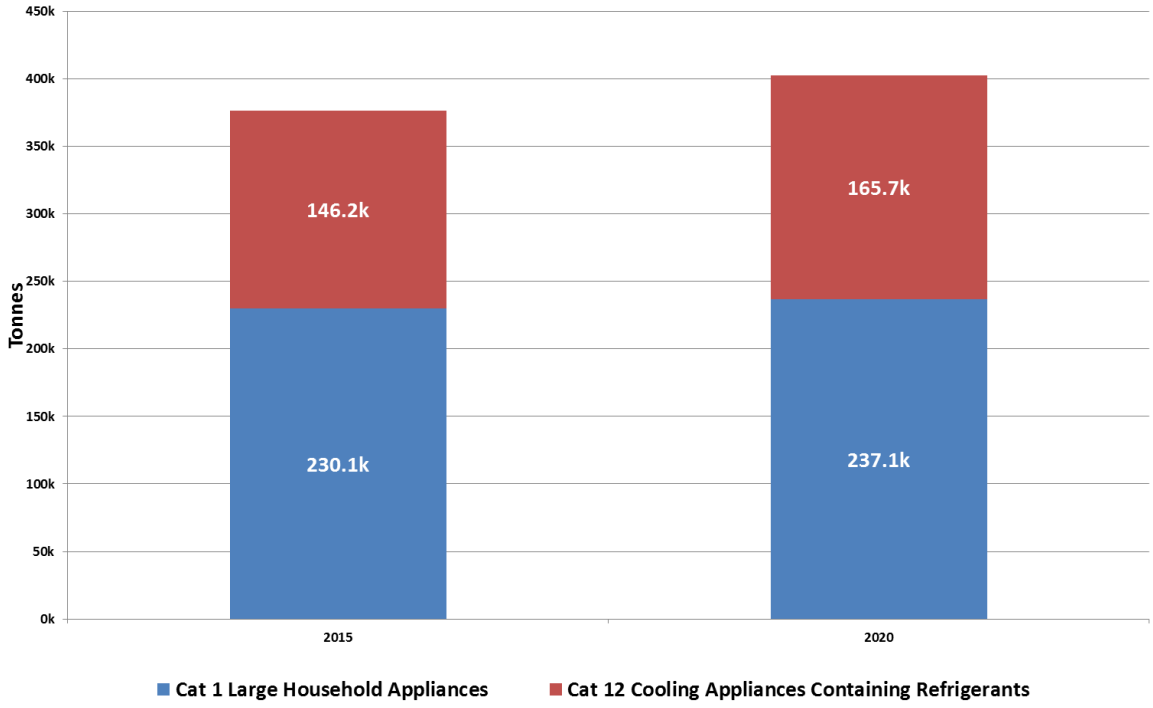
[23] http://ec.europa.eu/environment/waste/weee/pdf/Final_Report_Art7_publication.pdf

Figure 19 Projections results: annual rates of change WEEE

Category	Annual Rate of Change	Source
LDAs	0.6%	House Builds
SDAs	7.27%	Historic AGR
IT and Telecoms	-3.44%	As per POM trend
Cons Equip	6.86%	Historic AGR
Lighting Equipment	12.5%	Recolight - 10-15% pa
Tools	11.17%	Historic AGR
Toys	1.45%	Historic AGR
Med devices	16.84%	Historic AGR
Monitoring and control	0.63%	Historic AGR
Auto dispensers	-19.7%	Historic AGR
Display	Variable	Gradual reduction in rate
Cooling	2.53%	Historic AGR
LEDs and GDLs	-7.8%	Recolight
PV Panels	60.87%	Published report

Figure 20 Projections results: WEEE





Total reported WEEE in 2015 was 679kt. Total reported WEEE in 2020 is projected to be 728kt. This is a projected overall increase of 7% over five years.

Total WEEE generated in 2015 was estimated at 1,528kt. Total WEEE generated in 2020 is projected to be 1,542kt. This is an overall growth projection of 1% over the next five years.

8.3 Compliance assessment

As part of the work we assessed how likely the UK is to meet its national compliance targets. This section details the results of that assessment.

8.3.1 The targets

In 2016 the UK is required to meet a 45% WEEE collection target to comply with the European Directive (based on the average previous three year EEE sales).

In 2019, the UK is required to collect WEEE of at least 65% of averaged previous three year EEE sales, or 85% of WEEE generated in the same year.

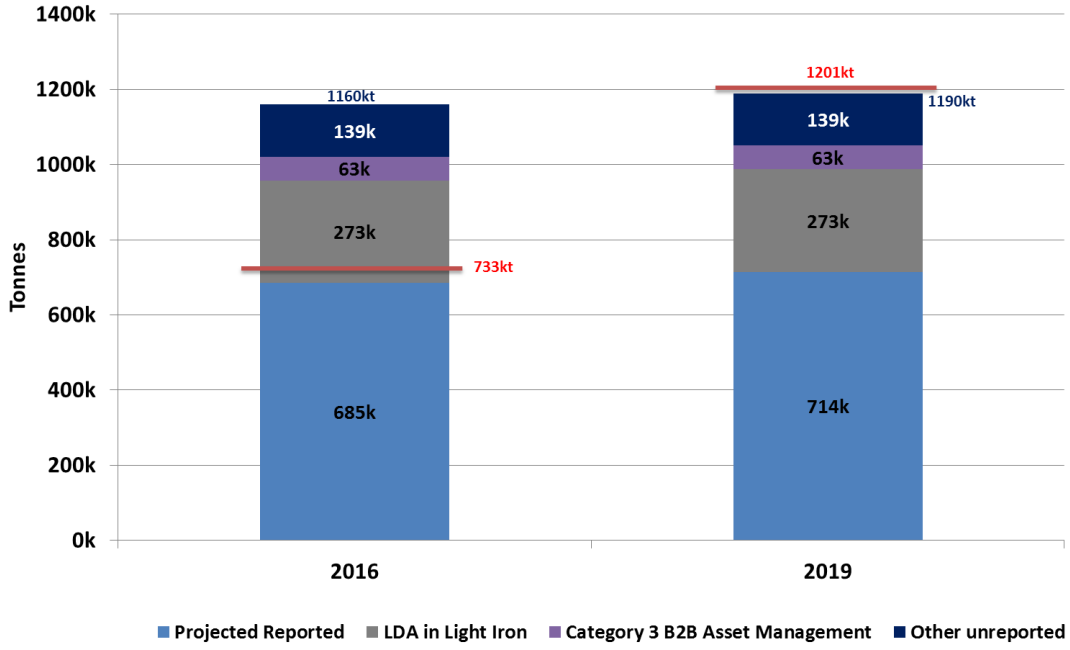
The government can use various data sets to measure the country's performance against those targets. It is not restricted to using reported WEEE data only. Article 16.4 of the Directive states the following:

"Member States shall collect information, including substantiated estimates, on an annual basis, on the quantities and categories of EEE placed on their markets, collected through all routes, prepared for re-use, recycled and recovered within the Member State, and on separately collected WEEE exported, by weight."

It is therefore clear that the UK Government is able to use substantiated estimates for WEEE it knows is collected and treated outside the WEEE system to help count towards target achievement. This section presents the results of the assessment of the projected performance against the targets using all of the data from this study.

Figure 21 illustrates the results of the projections discussed in section 8.2 against where the UK needs to be in order to meet the targets set for 2016 and 2019 based on previous year EEE sales (average previous three years).

Figure 21 Projected compliance performance – target based on POM



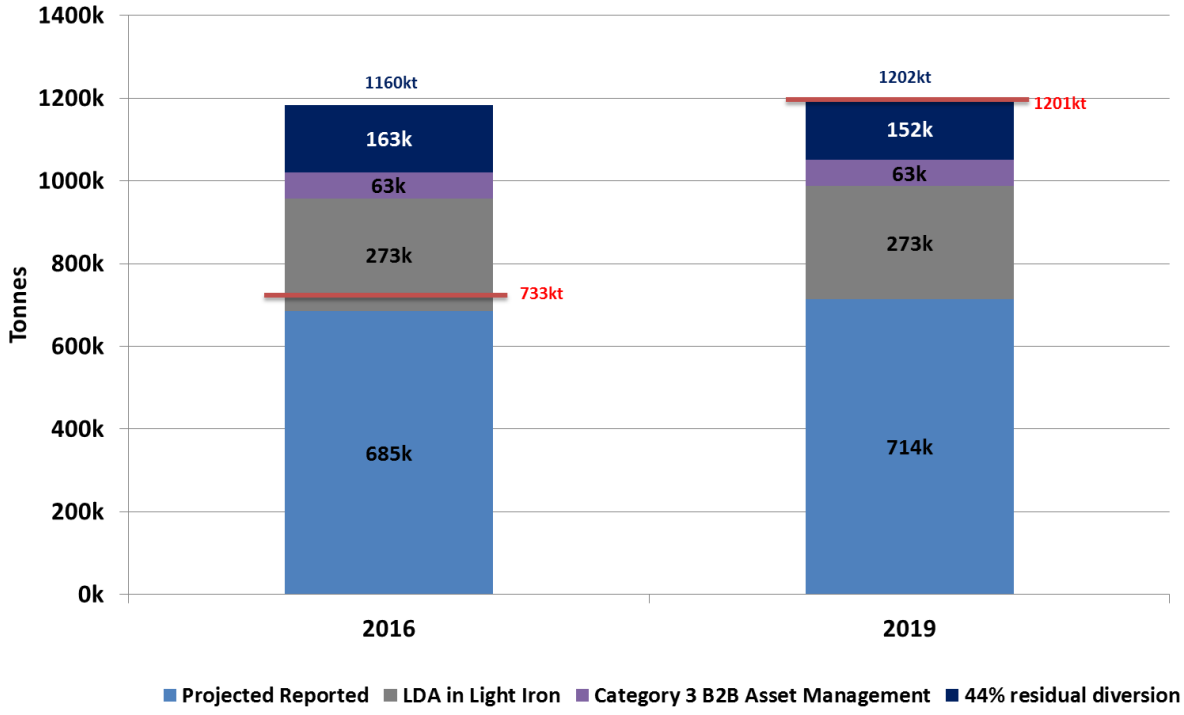
The red line on each stack in Figure 21 sets out the target in tonnes based on the Directive targets as described above. The stacks illustrate how the UK is projected to perform, based on both projected reported data, and also including unreported treated data estimated in this work.

It should be noted we have assumed unreported tonnages remain constant between 2015 and 2020, which is reflected in Figure 21. This is because we do not have sufficient detailed information to estimate whether these are likely to increase or decrease in future. We would encourage that this chart is used in conjunction with Figure 13 of this report, where we set out broad degrees of confidence in the data. In particular, we believe that the reliability of the other unreported data is lower than the other classifications, and are therefore recommending Government should only use other unreported data to count towards national performance if further work is carried out to verify the number or other measures are put in place to ensure other market players accurately report.

In 2016 the estimates suggest we will comfortably comply with the Directive target if LDA in light iron is used as a substantiated estimate. In 2019 the UK is projected to fall short of compliance (unless further action is taken) even if the Government includes all three categories of unreported WEEE within its substantiated estimates, i.e. LDA in light iron, B2B category 3 unreported treatment and other unreported.

In Figure 22, we have used the unreported estimates that we have a higher degree of confidence in (see Figure 13) towards substantiated estimates, and illustrated that even with these substantiated estimates, the rate of diversion of WEEE required from the residual waste stream in order to achieve compliance.

Figure 22 Projected compliance by diverting WEEE from the residual waste stream



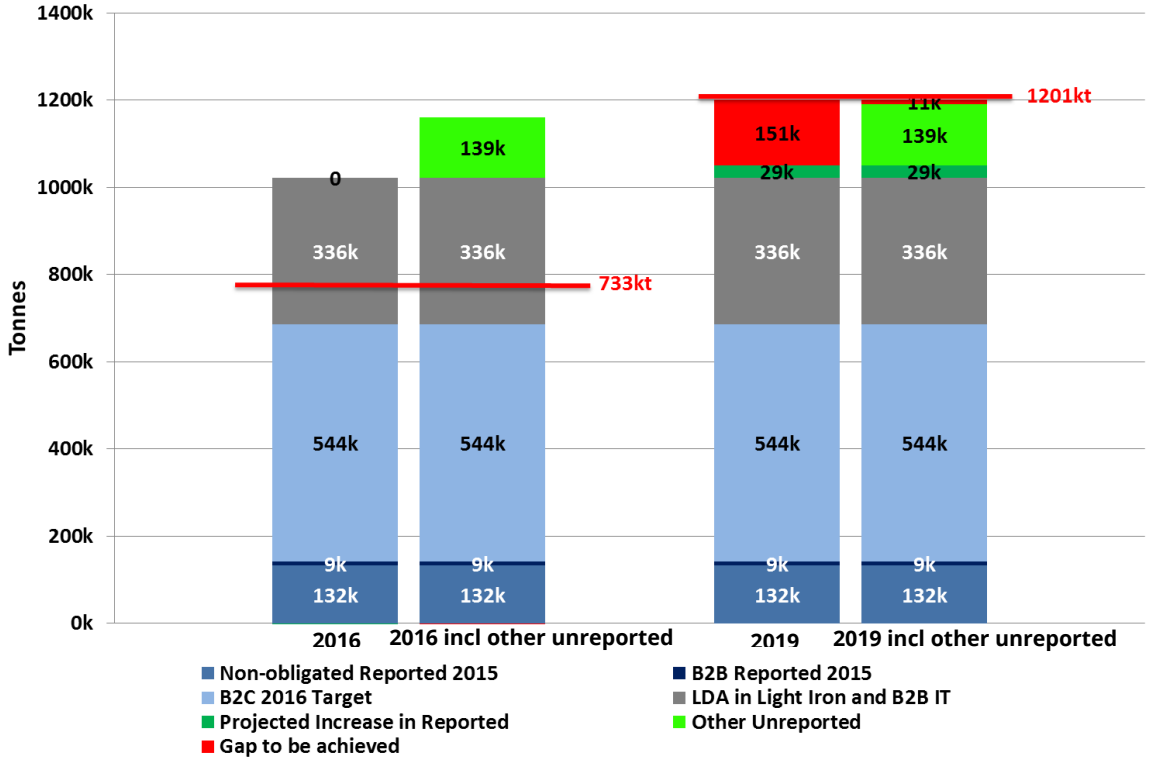
The assessment indicates that 44% of WEEE estimated to be in the residual waste stream would need to be diverted in order to meet the directive targets in 2019, if the only substantiated estimate comes from the two more robustly estimated unreported streams (LDA in light iron and B2B IT unreported treatment).

Figures 23 and 24 have been included to illustrate the gap between projected levels of WEEE reported treatment and required levels to meet compliance targets. In each example, the red block is the tonnage gap. The first graph (Figure 23) is assuming the 2019 target is based on 65% of average EEE sales from the previous three years, Figure 24 assumes Government opt for 85% of WEEE generated as a UK target in 2019.

In both Figures, the B2C tonnage is Government's actual producer target as of 2016 of 544kt. For the purpose of this assessment we have kept all unreported and reported

tonnages flat up to 2019, (as per 2015 tonnages)[24]. However, the projected increase in reported has also been included, but illustrated in a different colour.

Figure 23 Compliance assessment: closing the gap: target based on POM



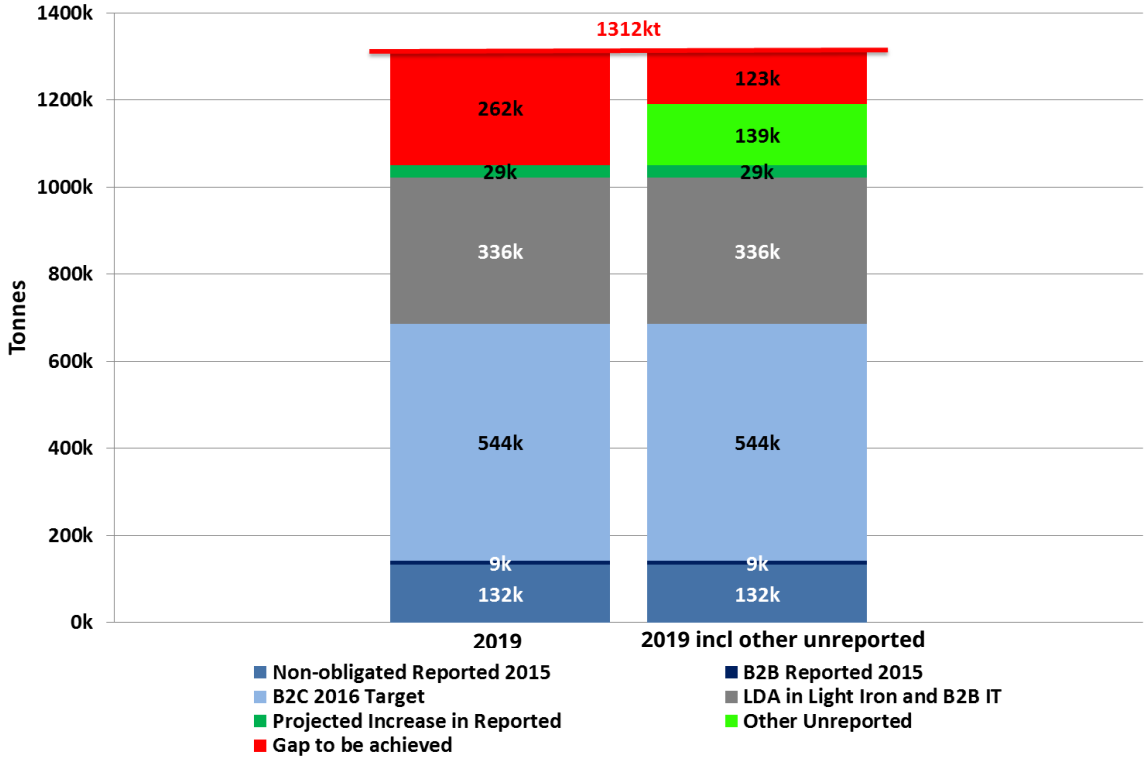
The red block is what is required to close the gap between total required to meet the target, and all projections made.

The green blocks are the less robust data, darker green being the gap between keeping reported flat and this project's projected reported tonnage, and the light green is other unreported, (refer to Figure 13).

In 2019, the UK will need to find an extra 151kt to recycle if it is to meet the Directive target of 65% of EEE sales in 2019, and if other unreported is not used towards substantiated estimates. This is an incremental increase of 50kt each year from 2016. Even if all unreported is used then the UK would still be short by 11kt.

[24] *This may or may not reflect reality.*

Figure 24 Compliance assessment: closing the gap: target based on WG



The red block is what is required to close the gap between total required to meet the target, and projected reported tonnages plus estimated unreported tonnages based on the target to collect 85% of WEEE Generated.

The UK will need to find an extra 262kt of WEEE collections by 2019 if it is to meet a Directive target of 85% of WEEE generated (if Government opt for this option). This reduces to 123kt if all unreported is used. The challenge is greater than if the target is based on 65% of EEE sales (by comparing to Figure 24).

9.0 Project conclusions

This section presents the key conclusions from the work.

9.1 Conclusions POM: 2015 and projections

9.1.1 *Total POM in 2015 is estimated to be 2,001kt*

The total estimated tonnage of EEE POM is estimated to be 2,001kt in 2015. This includes registered producer data, plus estimates of exemptions from the current regulations and products placed on the market by unregistered companies.

9.1.2 *Registered POM accounts for 88% of total POM*

In 2015, EEE POM registered to the Environment Agency accounted for 88% of total POM. This is assumed to be a proportion that is relatively consistent year on year, although is likely to increase in 2019 when some current exempt products are anticipated to come into the scope of the regulations.

9.1.3 *133kt (7%) is estimated to be placed on the market by unregistered companies in 2015*

It is assumed that not all producers register or report their data to the Agency. This could be because they are unaware of the regulations e.g. small companies based abroad selling through market place sites may not be familiar with UK regulatory requirements. We have estimated that 133kt of EEE is placed on the market by unregistered companies. This is 7% of all POM in 2015. The majority of this tonnage is made up by PV panel producers, who, we have assumed, are less aware of the regulations since they have only been obligated for two years.

9.1.4 *99kt (5%) is estimated to be exempt from the scope of the regulations in 2015; this will be lower in 2019*

We estimate that 34kt of household luminaires and halogen lamps are currently exempt, 2kt of toys, and the remainder, 64kt being other equipment. The toys tonnage has not however been counted within the 2019 estimate, nor has the halogen lamps of 6kt (included in the 34kt), as we understand the open scope will not include the introduction of these items, therefore in 2019, we estimate the exempt quantity to be 92kt.

9.1.5 *Total POM and registered POM are both projected to increase to 2020*

Total registered POM in 2020 is projected to be 2,098kt, 19% higher than in 2015 (includes exemptions estimated at 92kt from 2019). Some product categories are projected to decline in tonnage up to 2020, however overall the projection is an increase. The increase in total POM is estimated to be 13% over the next five years[25].

9.2 Conclusions WEEE generated: 2015 and projections

9.2.1 *Total WEEE generated in 2015 is estimated to be 1,528kt*

Using 'The Study on Collection rates of waste electrical and electronic equipment (WEEE)' by the European Commission, October 2014[26] we have been able to estimate that the total UK WEEE generated in 2015 was 1,528kt. The UNU established this tonnage based on historic sales multiplied by product lifespan. This number includes all WEEE off the market including that discarded in the residual waste stream.

9.2.2 *Reported WEEE accounted for 44% of total WEEE generated in 2015*

We used Agency provided data to establish 2015 reported WEEE. A total of 679kt of WEEE was reported in 2015 as received for treatment or reuse by an AATF. This includes B2B, B2C and non-obligated and accounts for 44% of the total WEEE generated in 2015.

9.2.3 *Unreported WEEE accounted for approximately 31% of WEEE generated in 2015, of this 71% has a higher degree of confidence whereas 29% is less reliable*

[25] *Projections were made for each EEE category, depending on availability of data; where possible we used published reports and stakeholder insight, however where this was not available we used annual historic trend*

[26] http://ec.europa.eu/environment/waste/weee/pdf/Final_Report_Art7_publication.pdf

Reported quantities of WEEE treated or reused does not account for the entire market. A lot of activity occurs outside of the producer responsibility WEEE system[27] and we estimate this to be 475kt (31%) of WEEE generated. This includes:

- LDA being treated within the light iron stream, which accounts for 57% (273kt) of the tonnage;
- B2B IT equipment treatment which accounts for 13% (63kt) of the tonnage; and
- Other unreported which is the remaining tonnage after all else is accounted for (including residual and reported), which is 29% (139kt) of the tonnage.

We have a relatively high degree of confidence in the tonnage estimates from the first two classifications being correctly treated, but a significantly lower degree of confidence in the third classification. We recommend further work is undertaken to verify this 139kt as at present it would cover all other activity including B2B unreported recycling, charity reuse, export for reuse, ATF activity, other asset management activity other than B2B IT and non-ferrous metal treatment.

9.2.4 *WEEE in the residual waste stream accounted for 24% in 2015*

We estimated that the quantity of WEEE entering the residual waste stream from businesses and from households placing WEEE in their residual waste bins or in the residual waste stream at DCF sites was 366kt in 2015. The stakeholder group considered this to be too high, particularly compared with collected tonnages i.e. this equates to each household disposing of more than 13kg per annum in their residual waste. No other data is available nor was a more robust methodology proposed with which to contradict this number for the UK.

9.2.5 *6% of WEEE generated is stolen from DCFs. Of this is it believed that 9% is improperly treated*

Theft from DCF sites outside of the Producer Compliance Financed scheme is estimated to account for 96kt (6% of WEEE generated). However much of this tonnage may end up being ultimately correctly treated through legitimate routes. Component parts being taken from cooling appliances at DCF sites however is estimated at 9kt; is considered not to be ultimately properly treated. This is because the removal of the components is highly likely to result in loss of hazardous fluids/gases to atmosphere and therefore prevents the equipment from being properly treated. This makes up 9% of the 95kt and only 0.6% of total WEEE generated. However due to the value of WEEE items and components (which fluctuates depending on market conditions), theft from the WEEE system is believed to be relatively widespread rather than isolated incidents, therefore it is an issue which is experienced by most local authorities in the UK.

9.2.6 *WEEE generated and reported WEEE are both projected to increase through to 2020.*

WEEE generated is projected to increase by 1% and reported WEEE by 7% by 2020[28].

[27] *This activity is legal*

9.3 Conclusions compliance: 2016 and 2019

These conclusions are based on the compliance assessment discussed in section 8.3 of this report.

9.3.1 *Including the substantiated estimate for LDA in light iron will enable the UK to comfortably comply in 2016 with the Directive WEEE collection target of 45% (based on % of average weight of EEE placed on the market in the three preceding years in the UK)*

If projected reported data was used alone, then the estimates suggest the UK would not comply in 2016. However, by including the substantiated estimate[29] for LDA in light iron, the projected collection target achieved would be 59%.

9.3.2 *In 2019 the UK is projected to fall short of compliance even if all unreported estimates are included*

In order to achieve a 65% of EEE sales target (based on average of the previous three year EEE sales), the UK will need to collect 1,201kt of WEEE in 2019 for treatment or reuse. However only including projected reported tonnage together with estimates of additional tonnage in which we have a high degree of confidence, namely LDA in light iron and B2B IT unreported treatment will see the UK achieve a collection tonnage of only 1,050kt collected (57%). If other unreported tonnage in which we have a lower degree of confidence is also included, then the UK will still not comply (short by 11kt).

9.3.3 *It is recommended that further work is undertaken to substantiate the 'other unreported' tonnage (139kt) estimated in this piece of work*

If Government wishes to use the other unreported element of the unreported estimate, which accounts for 29% of total unreported estimate (139kt), then it needs to conduct further work to substantiate this estimate. Further details are provided in section 9.4 of this report.

9.3.4 *Even if our estimate of 'other unreported' WEEE tonnage is verified, the Government may wish to consider what other steps may be necessary in order to ensure the UK meets the 2019 collection target*

Even if all 139kt of 'other unreported' WEEE is verified as being correct and correctly treated there is likely to still be a shortfall of 11kt for the UK to meet its 2019 collection target. Therefore the Government may wish to consider additional measures to increase WEEE collection rates between now and 2019.

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[28] *Projections for reported WEEE were made for each WEEE category, depending on availability of data; where possible we used published reports and stakeholder insight, however where this was not available we used annual historic trend. WEEE generated was taken from The Study on Collection rates of waste electrical and electronic equipment (WEEE)' by the European Commission, October 2014: http://ec.europa.eu/environment/waste/weee/pdf/Final_Report_Art7_publication.pdf*

[29] *See section 9.3 for detail of substantiated estimates*

9.3.5 *UK compliance could be more achievable in 2019 if the UK target is based on 65% of EEE POM*

If Government were to adopt a collection target deriving method in 2019 based on 85% of WEEE generated, then the UK would be likely to be further away from complying than if Government adopts a target based on the 65% POM data method. The shortage in 2019 based on WEEE Generated, and using all higher confidence unreported data is 262kt. This is larger than the equivalent gap if the target was based on EEE sales, which is 151kt. The gap only reduces to 123kt with the additional unreported counted, compared to 11kt if based on EEE sales.

9.4 Recommendations for further work

This section presents a series of recommendations arising as a result of conducting the work. It includes areas where further data analysis is recommended based on current gaps in data availability, and also suggested follow-on work to make sure the estimates remain up to date and relevant for Government to use in future years.

9.4.1 *Key data gaps*

Work on refining the estimate for WEEE treated but unreported should be carried out. For the purposes of this work, we used a top down approach where we estimated all the other sectors and the remainder was assumed as unreported. However, a specific project could be dedicated to profiling organisations with a license/permit to treat WEEE, so that a database of companies and their activity is held. This could also be extended to better understand equipment being handled by WDAs outside of the PCS financed system, retailer activity, and consumer hoarding trends.

WEEE theft from DCF sites is an area of limited information. The estimates made in this work were the best available, however a recommendation is made for further analysis in this area, perhaps by speaking with police forces and/or conducting face to face interviews with councils.

9.4.2 *Further work*

Based on the findings of this work, the UK could more comfortably achieve compliance in 2019 if steps were taken to divert additional WEEE into the producer responsibility system, for example from residual waste. In 2019, the gap to meet compliance if we use only high confidence unreported estimates towards substantiated estimates is 151kt, this is equivalent to 41% of the residual waste stream measured in 2015[30]. Starting to take action to divert WEEE from the residual stream as soon as possible, e.g. through behavioural or attitudinal work, could help to ensure that the UK comfortably meets compliance in 2019. Follow-up waste composition analysis of residual waste in 2017-18 could also be conducted to identify and verify any diverted tonnage.

[30] *Note our assessment projects a reduction in residual waste tonnages up to 2020, as reported tonnages are projected to increase at a greater rate than total WG, therefore the decline to account for the difference in rates is assumed in residual. This is why Figure 22 shows a diversion rate required of 44%, as it's based on projected residual tonnage in 2019. Here, the 38% is based on the estimated 2015 tonnage.*

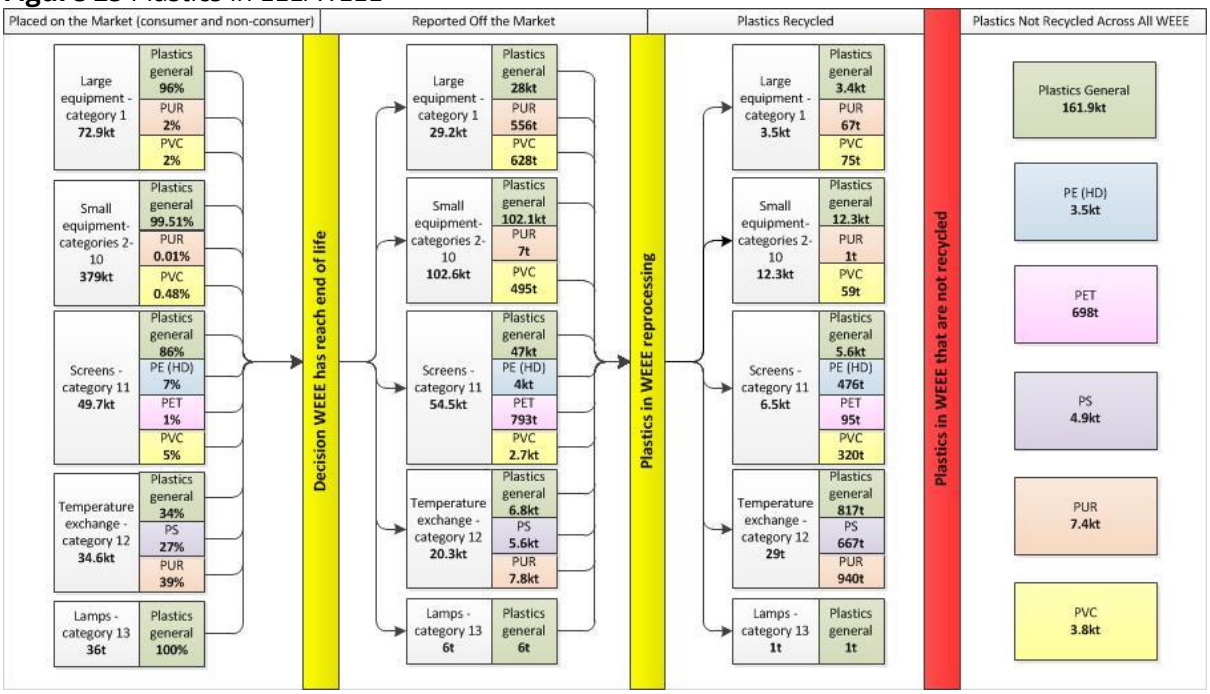
Further work to understand the destination of residual waste could also be conducted to ascertain if some WEEE is extracted for material recovery already and if so, in what quantities.

Appendix 1 Plastics in WEEE

As part of the work we attempted to estimate how much plastic is arising in EEE, how much is therefore in WEEE and where it goes at end of life.

Figure 25 illustrates the results of this work.

Figure 25 Plastics in EEE/WEEE



The map is set out in four key stages, each are discussed in turn below.

Placed on the market

The Study on Collection rates of waste electrical and electronic equipment (WEEE)' by the European Commission, October 2014[31] provides data on the average material composition per collection category. We applied the appropriate percentages for the different plastic polymers to the registered POM numbers which gave the tonnages as seen in Figure 25. The tonnage in the light grey box is total plastic in that category of EEE. The colourful polymer boxes then say of that tonnage the proportion each polymer accounts for.

Reported off the market

The same method has been used for WEEE where the same percentages have been applied to reported EA tonnages including treated by AATFs, reused by AATFs and non-obligated, therefore showing all the plastics that comes off the market within the WEEE. However this does not illustrate the recovery levels of the plastics.

[31] http://ec.europa.eu/environment/waste/weee/pdf/Final_Report_Art7_publication.pdf

Plastics recycled

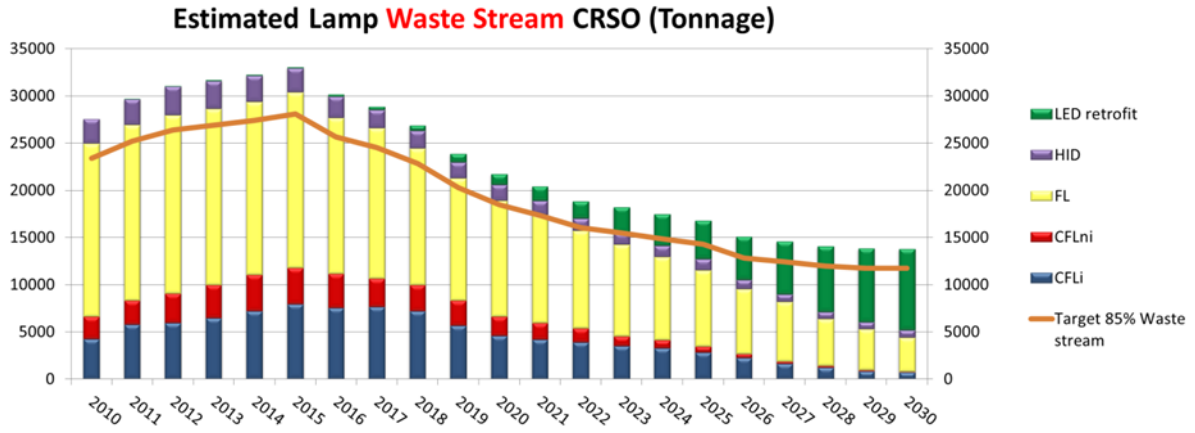
12% of WEEE plastic is actually estimated to be recycled[32]; this is assumed as maximum and covers both ELV and WEEE across the EU not just in the UK. This 12% has been applied to the reported numbers and are reflected in the third column, 'plastics recycled. We did not have this recycling rate by polymer.

Plastics not recovered across all WEEE are the remainder tonnage.

[32] *EFRA 2011*

Appendix 2: Projected reduction in lamp recycling

Source: Third party consultant report prepared for Recolight



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