



The impacts of European proposals to limit the permissible levels of decabromodiphenyl ether in plastics on the UK end-of-life vehicle and waste electrical and electronic equipment recycling industry

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Executive Summary

In the UK around 1.7 million end-of-life vehicles (ELV) (1.92million tonnes) and 1.60 million tonnes of waste electrical and electronic (WEEE) products enter the waste stream annually. Between them, they comprise around 665,000 tonnes of plastic, much of which is suitable for recycling and remanufacturing, with only a relatively low percentage containing persistent organic pollutant brominated flame retardants.

Over the past 10 years there has been considerable investment in new technologies to separate and recover the valuable plastics found in ELV and WEEE waste products. The successful recycling of plastics from these industrial plants has made a vital contribution to the UK's ability to meet Extended Producer Responsibility targets in those markets. Significant volumes of high-quality polymer resins are now being supplied back into manufacturers of component parts for use in new durable goods as a leading example of the Circular Economy in practice.

Due to the long working lifetime of automotive and electrical goods (15 to 25 years), some of the plastics being collected for recycling may contain additives chemicals used in their original formulation. Some of these legacy additives are being banned from their further use in new products. Recyclers therefore face the challenge of achieving the overall recycling targets for ELV and WEEE, whilst also having to separate and remove those plastics containing banned additives.

This report details how a European Commission proposal (based on a UN Stockholm Convention decision), to set a very low limit value for a formerly widely-used chemical flame-retardant additive for plastics, decabromodiphenyl ether ('decaBDE'), could threaten the very existence of the UK and European plastics recycling industry.

It provides an estimate of:

- the tonnage of current plastics recycling that would be affected;
- the loss of associated revenue and jobs; the loss of CO₂ savings compared to virgin polymer production;
- the tonnage of plastics that would be destined for landfill or high-temperature incineration; and,
- how these impacts could undermine the UK and EU ambitions for a Circular Economy and achievement of European recycling targets for ELV and WEEE.

ELV and WEEE recycling in the UK

The UK metal recycling sector provides highly effective collection, treatment and recovery of metal waste. Each year, it processes over 12million tonnes of metal into secondary raw material, and comprises an estimated 2,500 businesses in the UK, employing some 17,000 people. Recovered metals are traded on global commodities markets and supply valuable resources to metal manufacturers. It is also establishing itself as a leader in the innovation and development of a thriving UK plastics recycling industry.

The sector is responsible for the processing of a wide range of materials, including end-of-life vehicles (ELV); waste electrical and electronic equipment (WEEE); and packaging wastes, as well as household, business and industrial waste arisings. As such, the industry is a substantial contributor to the delivery of European and domestic targets on recycling and the sustainable use of resources.

The European Commission is currently considering introducing changes that would dramatically limit the permissible amount of a common, formerly-used flame retardant, decabromodiphenyl ether ('decaBDE') in plastics and products made from them. If approved, the consequences could include an end to the future growth of the UK and European plastics recycling industry and bring into doubt the achievability of those above-mentioned recycling targets.

This report focuses on the metal recycling sector's two main waste streams that may contain decaBDE, namely ELV and WEEE. The treatment and recycling of both waste streams is regulated and controlled under European Union Directives on extended producer responsibility, and the associated domestic regulations that implement them:

- End-of-Life Vehicles (ELV) – The UK 'car pool' of registered in-use vehicles is estimated to be around 32 million cars, vans and commercial units. Cars have an average working life of 12 – 13 years, with around 1.7 million units reaching end-of-life annually. Typically, these enter the UK's ELV collection and recovery system.

Since 2015, the ELV Directive has required all producers of motor vehicles to demonstrate that 95% by mass of ELVs are recycled or recovered¹. Materials recycling can be 85% of this figure with 10% coming from energy recovery. A typical ELV weighs about 1.130 tonnes and is made-up of c.75% metals. Plastics account for 20% (or around 365,000 tonnes) of the vehicle weight in the form of moulded-parts, textiles, foams and elastomers.

Producer recycling targets can only be met if at least half of these plastics are separated and re-processed to make recycled polymers.

- Waste Electrical and Electronic Equipment (WEEE) – In 2017, 1.6 million tonnes of new electrical and electronic equipment were placed on the market in the UK. It is estimated that c.1.2 million tonnes of end-of-life electrical equipment (comprising

¹ <https://www.gov.uk/guidance/elv> UK Producer Responsibility for ELVs

around 300,000 tonnes of plastics) enter the waste stream every year and that around half of this (541,000 tonnes) is collected for recycling in the approved authorised UK WEEE system².

Under the requirements of the WEEE Directive, all obligated producers and distributors of these electrical products must acquire evidence for the treatment and recycling of their own share of the collected tonnage across the different categories of product types sold.

Authorised Treatment Facilities (ATFs) operate to carry out safe treatment and materials recycling on the collected WEEE, and to deliver the relevant recycling targets across 14 product categories³. Metals and plastics are separated and sent on for further recycling in the UK and overseas.

Large-scale metals recycling plants and ATFs are primarily focussed upon the following categories of WEEE:

- Large Domestic Appliances (LDA)
- Small Mixed WEEE (SMW)/Small Domestic Appliances (SDA)
- Cooling equipment – refrigerators.

Combined these make up c.478,000 tonnes of waste materials sent for recycling, or >85% of the reported collected total.

Plastics from ELV and WEEE

The separation and recycling of sorted plastics from ELV and WEEE is a vital part of reaching the producer responsibility recovery and recycling targets. To ensure these targets are met, the metals recycling industry has, in the past 15 years, invested heavily in the sorting, separating and recycling of materials from the huge tonnages of waste products being collected. Major investment has been made to build highly innovative process plants to carry out the complex identification and sorting of plastics and other materials in the waste stream after the primary metals have been removed. Broadly-speaking, there are three different types of plant used at different stages of the recycling process:

- i. Primary Materials Separation at Authorised Treatment Facilities (ATFs) – large-scale metal shredding sites where a range of non-hazardous infeed materials (including fully depolluted ELV and large domestic appliances) are shredded to liberate individual material fractions. Ferrous and non-ferrous metals are removed and the resulting plastic-rich, non-metallic shredder residue is passed on for further processing;
- ii. Advanced Sorting Plants / Post-Shredder Treatment PSTs –material separating processes where complex waste infeed mixtures, including shredder residue, are sorted into individual material types to add-value and increase recovery and recycling rates. Output streams such as aggregates and solid recovered fuels are

² <http://www.legislation.gov.uk/ukxi/2013/3113/made#> WEEE regulations 2014 UK.

³ https://www.360environmental.co.uk/legislation/producer_responsibility/weee_regulations/#Summary UK WEEE system and category targets

then sold-on to contribute to the delivery of recovery and recycling targets. Typically, a shredded, mixed plastic stream is sent to plastics recycling plants to produce a range of high quality polymers.

- iii. Plastics Recycling Plants - Innovative mechanical processing technologies have been developed to enable sorting of individual polymer types from the infeed mixed plastic shred. Once a high purity of each type of plastic has been achieved, the process uses extrusion compounding in the melt-phase to generate high-quality recycled polymer pellets: a fully recycled, 'end-of-waste' PRODUCT.

When these three stages are combined into a complete process chain, the result is a fully integrated, advanced material sorting system (see Figure 1):

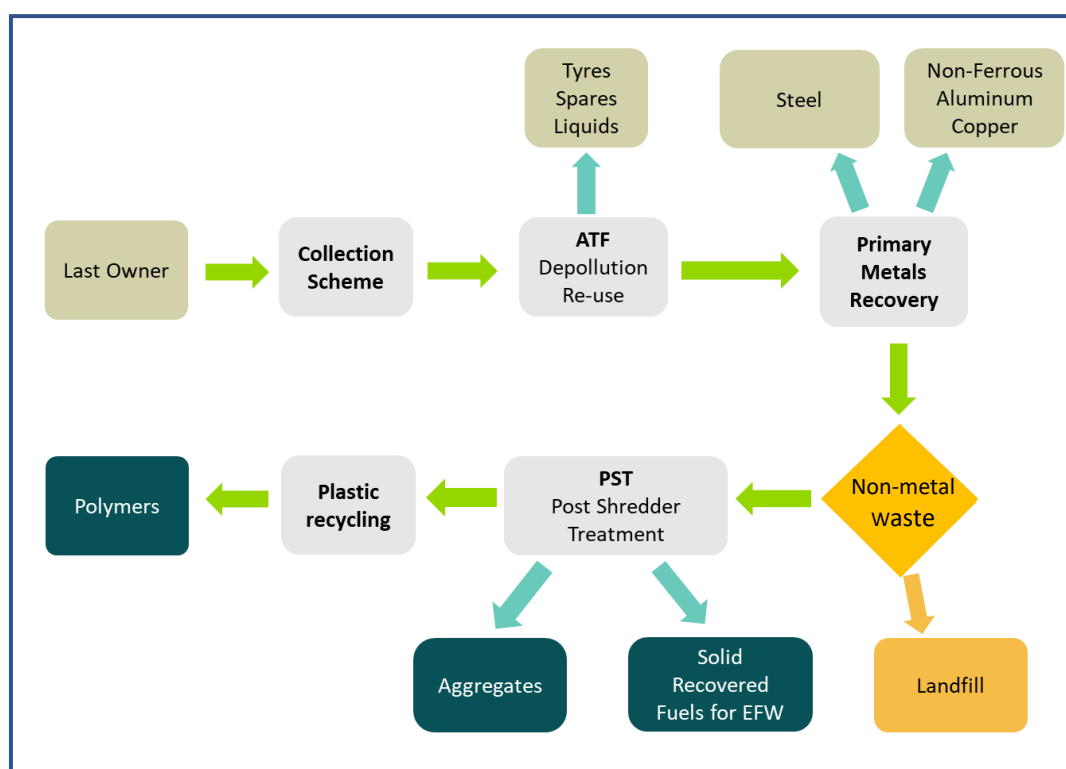


Figure 1 – Integrated materials recycling system for ELVs.

These material re-processing chains are delivering a growing tonnage of high-quality recycled plastics and metals back into the UK's manufacturing economy. In a period when there has been much political debate about creating a European circular economy, the metals recycling sector has been quietly creating the necessary infrastructure and skills to deliver it.

A summary of the UK's annual ELV & WEEE Plastics volumes is shown in Table 1:-

	ELV	WEEE	Units
Waste Arisings Tonnage	1.92	1.2	M. Tonne
Average Plastics Content	19%	20-25%	
Tonnes of Plastics	365,000	300,000	Tonne

Table 1 – Summary of UK ELV and WEEE plastics volumes (annual)

ELV and WEEE Plastics Recycling Sector in the UK

There are currently three main players in the UK who have made the necessary investments to create these advanced process plants that deliver closed-loop recycling of plastics:

1. **Axion Polymers, Manchester** – with close shareholding links to the S Norton & Co metals recycling business, Axion have designed, built and now operate advanced plants in Trafford Park and Salford for the recycling of shredder residue from the metal recycler's shredding sites. A range of Axpoly® polypropylene, polystyrene and ABS pellet compounds are made under ISO 9001 quality procedures and sold to injection moulders of parts in construction, automotive, household and electrical markets. www.axiongroup.co.uk
2. **Blue Sky Plastics, Bourne Lincs.** - developed by former owners of the Riddle metals company, BSP was recently acquired by the ENVA group⁴. With a primary focus on recycling of plastic compounds from WEEE waste, Blue Sky have continued to invest in the technology and equipment needed to drive growth. <http://www.bspcompounds.com/>
3. **MBA Polymers, Worksop** – Now wholly owned by European Metals Recycling in the UK, the process technology employed at this large-scale site was originally developed in the USA from 1996 to 2008. With an integrated flow of materials from EMR's extensive PST plants across the UK, the Worksop site produces high-quality polymer compounds for use in manufactured products. <https://mbapolymers.com/company/locations/#united-kingdom>

An indication of the combined impact of just these three firms on the UK economy is given in Table 2:

Item	unit	Combined total
Max. Plant Capacity	Tonne/yr	135,000
Current Waste Inputs :-		
Shredded Plastic ex ELV	T/yr	45,000
Shredded Plastic ex. WEEE	T/yr	41,000
Total waste plastic infeed	T/yr	86,000
Output Polymer Product	T/yr	40,500
Sales turnover	£ Million	31
Staff numbers	FTE's	204
Growth next 3 years	x volume	approx. double

[Note – There is some new capacity coming on stream from GAP Recycling Ltd, Newcastle at end of 2018 – estimates 20,000 Tpa SDA plastics; recycling plant under construction Q3 2018
www.gapgroupuk.com]

Table 2 – Summary of UK's ELV and WEEE recycled polymer manufacturers

⁴ <https://enva.com/enva-group-announces-acquisition-blue-sky-plastic-recycling/> - Enva acquires BSP Jan 2018

These companies represent the vanguard of businesses across the complete collection, processing and recycling system.

Additionally, there is a large number of companies involved in widespread regional collection operations; primary sorting and de-pollution of products in accordance with the appropriate Government guidance; logistics and administration effort involved in transporting, monitoring and reporting all of the above. These various actors, including ATFs, approved ATFs (AATFs) and Producer Compliance Schemes (PCSs) have grown into a significant industry to meet the demands of the legislation and to deliver evidence of recycling being carried out to the required standards.

As an indicator of the size and scope of the sector, for WEEE there are 34 PCSs for WEEE and over 140 registered AATF sites in the UK. For ELVs, it is estimated that there are over 250 primary metal recycling companies, operating around 450 sites that together with several hundred smaller ATF and metal recycling facilities employing some 17,000 people.

Legacy Additives in Recycled Plastics

Plastics recycled from ELV and WEEE are much older than plastics recycled from the consumer packaging markets. Plastics from motor vehicles can be up to 25 years old and from electrical equipment can last 20 – 30 years in the use-phase. By comparison, a packaging product such as a UK plastic milk bottle can have a working life of as little as six days spanning production, filling, consumption and disposal.

This means that all the different plastics used to make components in these long-life durable goods will contain any number of additives, fillers, colours, stabilizers and flame-retardants used in polymer compounding recipes during that long period. Plastic products have been developed to meet the demands of a wide range of market applications and in each case, a series of design choices were taken to select which plastic compound could deliver the required performance and lifetime durability. The plastic may have been treated for resistance to weathering, UV-light degradation, anti-oxidant properties, physical strength improvement, anti-static and resistance to ignition by fire.

When these plastic-rich products reach end-of-life, then the chemical additives used in the original item will also come back to the recycling point as part of the sorted rigid plastic fraction. The recycler has to be able to sort the plastics by individual polymer type and also take account of the mix and type of additive that may be contained within each batch of processed polymer.

Legislation Related to Plastics Chemical additives

In recent years the control of certain chemical substances found in plastics from the ELV and WEEE has fallen under two broad areas of regulatory control:

- A. United Nations – Stockholm and Basel conventions – for the gradual elimination (or strict control) of Persistent Organic Polluting substances – POPs ⁵
- B. ECHA - European chemical controls – known as REACH ⁶

[NOTE - There are also specific chemical controls related to WEEE plastics under the RoHS regulations in Europe, for a few heavy metals and 2 flame retardant, but these are similar to the REACH rules in terms of impact on plastic recycling] ⁷.

Summary of Chemicals Legislative Process

Signatories to the UN Stockholm & Basel conventions have a greater power to regulate than any individual state or group of states (e.g. the EU28 members). Therefore, in normal circumstances, the UN takes the lead and then all individual member countries and regions are 'duty bound' to implement similar measures to those agreed at the higher UN level.

The European legislative process appears to take the lead from the UN Conference of the Parties (CoP) to reach its conclusions, with EU delegates attempting to steer those debates and rulings to create something that is consistent with the EU region's own strategies and policies.

Until recently this appeared to be the case with the development of regulations concerning persistent organic pollutants (POPs) in relation to decaBDE. However, a rushed recasting of a piece of European regulation on POPs in 2018 has changed that (see section titled 'EU Regulations Re-cast', below).

Summary of the decaBDE Debate

The full history of decaBDE legislation under POPs and REACH is very long and detailed, but in summary:

- The plastic additive decaBDE was used as the 'workhorse' flame retardant across many product sectors for the past 20 years. It is widely found in furnishings, automotive, aerospace, electricals and construction products. Huge tonnages of longer life plastic products exist which contain high percentages of decaBDE (e.g. up to 15% by mass – 150,000 ppm in the plastic casings of TVs and CRT monitors)

⁵ <http://chm.pops.int/TheConvention/Overview/tabid/3351/Default.aspx> - Overview U.N. POPs Regulations – Stockholm & Basel conventions

⁶ <https://echa.europa.eu/regulations/reach/understanding-reach> REACH overview on ECHA website

⁷ www.gov.uk/guidance/rohs-compliance-and-guidance - UK guidance to RoHS regulations for EE goods

- There are a large number of polybrominated diphenyl ethers (PBDE) brominated flame retardants used for flame retardant performance in plastic parts and products. Nearly 80 similar brominated chemical types exist and only six of these have been banned. Therefore, if x-ray fluorescence is used to detect 'total bromine content', that will only indicate the combined presence of any of these bromine containing molecules. A much more detailed chemical analysis is needed to identify all the individual chemical species (called 'congeners') by exact type to see which ones are banned PBDEs within the mix.
- Over the period 2012 to 2017 there was a long debate about the potential status of decaBDE as a substance of very high concern (SVHC) under REACH. In March 2017, decaBDE was listed as a SVHC under European REACH regulations⁸ coming into force in 2019. This public exposure marked the demise of the use of that chemical in new products, although many major brands had foreseen the eventual ruling and had begun to de-list the use of decaBDE from circa 2008 onwards.

Under REACH, the safe threshold for products containing traces of decaBDE was set at 0.1% or **1000 ppm**.

Generally, the use of decaBDE in 'branded' goods for electrical and automotive sectors has been reducing in the past 5 – 10 years, but it was still widely used in 'grey brand' generic imported items. Figure 2 shows the decline in the number of parts data sheets containing decaBDE for motor vehicles from 2008 to 2015.

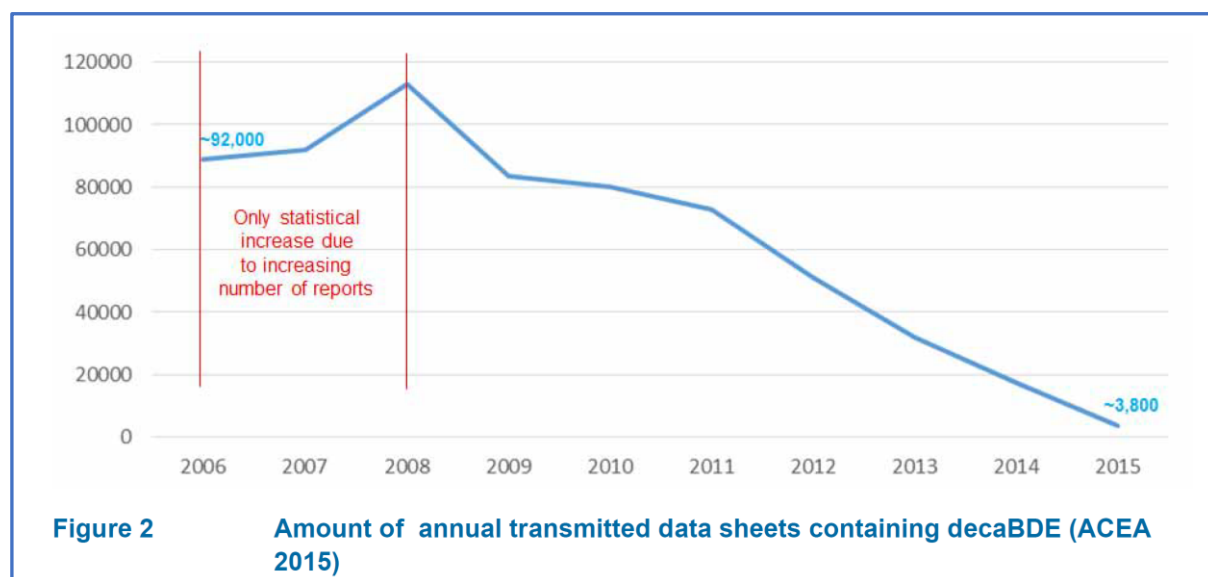


Figure 2 – (extract Oeko institute Report – Effect of decaBDE on ELV industry – ACEA 9/2018)

- From 2010 to 2016 the UN Stockholm convention was slowly progressing with making decaBDE a POP substance to follow the status of other partially

⁸ <https://www.tuv-sud.com/home-com/resource-centre/publications/e-ssentials-newsletter/consumer-products-e-ssentials/e-ssentials-4-2017/eu-reach-restriction-on-decabde-published> deca-BDE published as SVHC REACH March 2017

brominated BDE FR additives (e.g. tetra-, penta- and octa-BDE). Then in May 2017, at the Geneva CoP, the Stockholm convention finally agreed to add decaBDE to the POPs 'A-list'. This means that they intend to take measures to 'eradicate' that chemical in the world.

- This ruling triggered the formation of a technical working group – under BASEL convention (i.e. primarily for the control of waste shipments and treatment), called the 'Small Interessional Working Group' - **SIWG**. This group has met three times already during 2018. They are tasked with preparing a set of guidelines to publish alongside the final UN Declarations, so that organisations and players in the impacted markets have a technical definition about how they should measure, control and eventually destroy plastic materials that fail the set limit threshold values. BASEL will set an LPL [Lower Pops Limit] for WASTE material shipments to enforce much stricter controls on the movement both as 'EXPORTS from' and as 'IMPORTS into' the receiving country for the waste. This LPL threshold could be set anywhere between circa 10,000 and 1000 ppm or lower of the identified POP chemical in the plastic waste stream ⁹.
- In the 2017 Stockholm ruling for decaBDE, there was no derogation clause to allow for the continued recycling of plastics containing the substance. Moreover, no limit was set for recycled plastics to contain traces of the chemical additive. (Unlike earlier rulings for similar BDE flame retardant chemicals, such as tetra-, penta- and octa-BDE where 1000ppm level was agreed for the sum of all the individual banned congeners).
- To compound matters, a limit has also been proposed for the 'unintentional trace contamination' of decaBDE that will be allowed in new '*substances, mixtures or articles*' (i.e. polymer pellets, compounds and component parts made from plastics). This limit, called the UTC, is written in the draft regs. at **10 ppm**. This is 100 times lower than the existing REACH SVHC limit of 1000ppm (0.1%). It will be near impossible for advanced recyclers to hit this extremely low limit in extruded compounds from ELV, small domestic appliances (SDA) and flat-panel display (FPD) infed plastics streams.

Essentially there are three major questions that have still to be answered through the U.N. Basel and Stockholm processes:

- I. What LPL will be set for controlled international waste material movements under Basel?
- II. What UTC will be fixed in products and/or will a derogation be proposed for continued recycling of decaBDE plastics?

⁹ SIWG working group technical guidelines for Basel / Stockholm - <http://www.basel.int/Implementation/POPsWastes/TechnicalGuidelines/tabid/5052/Default.aspx>

- III. What agreed methods of destruction will be specified in the guidelines to eradicate the residual decaBDE POP in wastes above the LPL threshold?

Technical guidelines are due to be published (by the Small Intersessional Working Group (SIWG)) for consideration by the end of 2018. These may be voted for acceptance in the May 2019 CoP, although a delay to these proceedings may occur if there are multiple and widespread calls for changes.

Recasting of EU Regulations (June to October 2018)

To further complicate the matter, there was a surprise ‘re-cast’ amendment tabled at the EU Parliament in June 2018. This ‘blanket’ EU regulation (EC 850 / 2004)¹⁰, which has been used to transfer many previous POPs rulings from Stockholm convention into EU law by a series of amendments is handled by a UK MEP, Julie Girling, as Rapporteur¹¹. The new amendment was tabled to transpose the Stockholm POPs ruling on decaBDE into the EU’s regulatory instrument. It stated the same UTC level of 10 ppm for ‘substances, mixtures and articles’ – this would effectively prevent recycling of plastics wastes containing traces of decaBDE.

Following some urgent and high-level lobbying effort from the European Confederation of Recycling Industries (EuRIC)¹² and members of other trade associations, including the British Metals Recycling Association (BMRA) during September and October 2018, there has been a new amendment tabled by Julie Girling MEP that would allow for the continued recycling of plastics from ELV and WEEE into ‘*mixtures and articles*’ at up to 1000 ppm decaBDE by way of a derogation. In this proposed re-wording of the text, the level of 10ppm for the UTC is maintained for ‘*substances*’ because these are defined as polymers made from single pure monomers (i.e. virgin plastics). The processes for recycling plastics used by the leading companies in Europe actually create ‘**mixtures**’ due to them being blends of similar plastic chips created during the mechanical separation plants. Hence this important definition allows for the continued placing on the market of recycled plastic ‘mixtures’ and for their use back into products (i.e. ‘articles’).

At the time of writing, the amendment was NOT voted for acceptance at the Committee stage (11th October) and is now being tabled for discussion in a full plenary session of the European Parliament. In this case all 751 MEPs are eligible to vote on the proposed amendments. Hence there is still uncertainty on the exact outcome of this important legislative instrument for recyclers in the WEEE & ELV sector.

¹⁰ EU Regulation 850/2004 – Re-cast of amendments 13 – 56 -

<http://www.europarl.europa.eu/committees/en/envi/subject-files.html?id=20180531CDT02421>

¹¹ <https://www.eumonitor.eu/9353000/1/j9vvik7m1c3gyxp/vhcmdex0ovsn> Task of the Rapporteur in preparation of EU regulations

¹² Joint position on Recast POPs Regulation (EC 850/2004) – EuRIC, BSEF - <https://www.euric-aisbl.eu/position-papers/item/222-joint-position-on-the-recast-of-the-persistent-organic-pollutants-05-09-2018>

Potential Impact of Low UTC and LPL on UK Plastics Recycling

The key outcomes from both the UN Stockholm & Basel Convention rulings and the EU's implementation of similar POPs regulations for decaBDE will have far-reaching impacts upon the ELV and WEEE recycling industry across the UK and the European Union. There are three primary questions that remain of concern:

1. If a UTC remains at 10 ppm for 'substances, mixtures and articles', will advanced re-processors of ELV and WEEE plastic be able to continue to make and sell recycled polymer pellets for use in the Circular Economy for plastics?
2. What Lower POPs Limit will be set under BASEL to determine the strict controlled global movements of shredded waste ELV and WEEE plastics?
3. If very limited choices are given in the SIWG guidelines for 'safe methods of disposal' for high-POPs plastic waste streams, then how will ATFs and primary materials recyclers dispose of their separated or identified high-POPs plastic streams?

The answers to these questions are:

1. UTC of 10 ppm for recycled plastic substances – An extremely low level of permissible decaBDE in high-quality plastics compounds will make it impossible for the UK to continue recycling in its current format. This is also true for those comparable facilities located in other European countries, all of whom have implemented similar 'waste-to-product' processes, fully-compliant with the requirements set out in REACH, to help deliver the EU's Circular Economy ambitions.

The accepted standard for proving REACH (and RoHS) compliance on the output polymer pellets has been the 1000 ppm or 0.1% level of the banned flame retardant additive deca-BDE. The UN POPs ruling and the proposed EU Re-cast both propose the extremely low 10 ppm UTC level – this is 100 times lower than the accepted REACH value that has been applied since 2008 for most chemicals and since 2017 for decaBDE.

The use of in-house XRF measurements to control the 'total bromine' content at levels in the range 100 to 500 ppm has been the de-facto method of ensuring that fully compliant polymer materials are being placed back onto the material market. It is simply not possible to control at below 10 ppm of decaBDE using this methodology on the current embodiment of the best-available technology in the sector.

IMPACT 1 – The UK's three leading recyclers of ELV and WEEE-derived plastics will cease the production of PP, ABS and PS polymer compounds. Further investment from other companies will cease.

Table 3 estimates the lost volume and revenue impact of this on UK polymer re-processors:-

Plastic sold as Polymer Pellet				
Material	Tonne sold 2018	Avg. Sales Price	Revenue	Future 3 years
PP, PS , ABS pellet	40,500	£765	£30,982,500	£61,965,000

Table 3 – Estimated lost volume and revenue impact of UTC 10ppm decaBDE

In the scenario where these firms cease production due to having no viable market for the output polymer pellets, then UK would see a loss in current annual sales revenues of c.£31 million and predicted future growth of the sector estimated to be c.£62million in the next three years.

Employment of >200 staff associated with these activities would be expected to drop significantly or even see a total loss as the primary market output would be lost.

These recycled plastics are replacing virgin oil-derived plastics in the growing circular economy. Using an estimated split between PP, PS and ABS polymer types, the total carbon impact of this has been estimated in Table 4:

Carbon Impact Estimate		Virgin Polymer	CO2 eq.	Carbon Saving
Polymer Type	production split	CO2eq. / T.	Saving %	Tonne CO2 eq
PP	40%	1.6	73%	18,922
ABS	30%	3.7	89%	40,010
PS	30%	2.4	83%	24,203
Total Tonnage	40,500			83,134

Table 4 – CO₂ equivalent savings through ELV and WEEE derived plastics production

The result of losing this carbon-benefit value of the recycled plastics replacing virgin polymer gives a total CO₂ saving of 83,134 tonnes of CO₂ equivalent. This represents 1,200 articulated lorries each driving around 50,000 miles per year being taken off the roads.

2. Lower POPs Limit for shredded waste plastics – The majority of ATFs and AATFs produce a part-processed output fraction of shredded, mixed plastic particles for onward sale into the UK, European or overseas recycling markets. These output streams contain different levels of brominated flame retardants depending upon the source of the plastic being handled. Setting an LPL that is too-low will drive a large tonnage of currently shipped plastic shred to be designated as hazardous under BASEL shipment rules. That will severely restrict the export shipment of these materials and add significant cost for administration, transport and eventual point of disposal. In fact, there is almost certainly insufficient capacity available to handle the combined tonnage of this material, should the LPL be set too low.

IMPACT 2 – A large proportion of the output plastic shred material that is currently sent for onward recycling will become classified as a ‘hazardous waste’ and would have to be sent to appropriately classified landfill or for high-temperature destruction.

Two possible scenarios are used to estimate the impact of this change on UK primary AATF processors of WEEE plastics:-

Scenario 1 – Shredded output plastic stream can no longer be sold to export or UK downstream re-processors; this material has to be sent to controlled hazardous landfill sites with allocated cells for storage of rigid waste plastics. Cost for disposal - £110 per tonne.

Scenario 2 – All shredded WEEE and ELV plastic ex. primary processing sites has to be sent for hazardous waste incineration as the only approved disposal route for decaBDE POPs plastics. Cost for disposal - £300 per tonne.

This estimate is presented in Table 5:

Plastic Impact Table		Current Situation		Scenario 1		Scenario 2	
sold as Shredded Plastic		Mid range Value	revenue £	Landfill impact	value swing	Haz Waste incin.	value swing
WEEE Plastic Type	AATF processed	2018		£		£	
LDA	21,955	£ 10	£ 219,549	-£ 120	-£ 2,634,585	-£ 310	-£ 6,806,012
SDA / SMW	49,714	£ 30	£ 1,491,416	-£ 140	-£ 6,959,941	-£ 330	-£ 16,405,575
Fridge / cooling	20,763	£ 120	£ 2,491,557	-£ 230	-£ 4,775,485	-£ 420	-£ 8,720,451
Display Screens	6,510	£ 100	£ 651,042	-£ 210	-£ 1,367,188	-£ 400	-£ 2,604,168
Total WEEE	98,942		£ 4,853,564		-£ 15,737,199		-£ 34,536,206
ELV plastic shred	355,300	-£ 40	-£ 14,212,000	-£ 70	-£ 24,871,000	-£ 260	-£ 92,378,000
Total WEEE + ELV	454,242		-£ 9,358,436		-£ 40,608,199		-£ 126,914,206

Table 5 – Estimated monetary Impact on ELV and WEEE plastics recyclers

Under Scenario 1, impact on the UK WEEE & ELV sector is a total value swing of - £40.6 Million p.a.

Scenario 2 give a total negative cost impact of £127 Million p.a.

Using industry-supplied estimates of the number of tonnes of each WEEE category that can be processed per employee, an estimated 700 direct jobs would be impacted by the significant shifts in costs on the sector. Although one can argue that these extra costs would have to be passed back onto the obligated producers and retailers as part of the UK compliance system.

3. Limited choices on Disposal route – The currently preferred route for disposal of separated plastics with higher levels of brominated flame retardant additives (i.e. above circa 2000 ppm total bromine) is to high-temperature energy from waste plants, such as into direct-fired cement kilns. If the SIWG guidelines only approve, for example, advanced chemical destruction in a pressurized reactor, then there will be a huge capacity shortage and a massive increase in costs for disposal.

IMPACT 3 – Very limited access to approved specialist disposal routes with associated high cost increase.

Impact Summary:

The reported estimates provide the main quantifiable impacts on the UK's ELV and WEEE recycling sector, namely:

- Over 450,000 tonnes of ELV and WEEE-derived part-processed plastic would be diverted away from the recycling sector and sent for disposal as waste.
- Loss of 40,500 tonnes of recycled polymer product output as replacement for virgin plastics. A current revenue loss of £31million and in three years, an estimated £62million (81,000 tonnes of polymer)
- Carbon Impact savings loss of 83,000 tonnes CO₂ eq. annually. This equates to 1,200 large lorries' annual operating impact;
- Over 200 full time jobs in these advance technology polymer recycling plants would be under severe threat.
- For the primary processor of ELV and WEEE materials, the loss of revenue from onward sales of shredded plastics would be around £8million per annum. However the ACTUAL impact would be a swing from positive value sales to large additional disposal costs:
 - Disposal to controlled landfill sites estimated at £ 41million cost impact
 - Disposal to high temperature incineration units an additional £127million.

The proposed legislative changes will also significantly impact upon the UK's delivery of the 25 year Environmental Plan and Waste Strategy in the following areas:

- UK would fail to achieve 2015 ELV Directive 95% recycling target;
- UK would fail to achieve the individual category recycling targets set for WEEE;
- Increase in cost to WEEE obligated companies (i.e. OEM Brands, manufacturers, retailers) to meet the large cost increases for hazardous waste disposal;

- Blocking the important transition to a material resource efficient UK economy by halting the innovative technology developments in the recycling operators;
- Creating a huge barrier to future investment in capacity and technology development based upon the past 10 years of early-stage growth in the sector.

It is for all of the above reasons that a workable, pragmatic solution must be found urgently for dealing with decaBDE in plastics.

Glossary of Terms

AATF – Approved Authorised Treatment Facility (WEEE only)

ABS – Acrylonitrile butadiene styrene

ATF – Authorised Treatment Facility (ELV and WEEE)

BDE - Brominated diphenyl ether

CoPs – Conference of Parties (under U.N.)

decaBDE - deca-diphenyl ether

ECHA – European Chemical Controls Agency

ELV – End of Life Vehicle

EuRIC – European Recycling Industries' Confederation

FPD – Flat Panel Display

LDA – Large Domestic Appliance

LPL – Lower POPs Limit

OEM – Original Equipment Manufacturer

P. R. – Producer Responsibility

PDBE – Polybrominated diphenyl ether

POPs – Persistent Organic Pollutant substances

PP – Polypropylene

PS – Polystyrene

PST – Post Shredder Treatments

SIWG – Small Intersessional Working Group

SMW – Small Mixed WEEE

WEEE – Waste Electrical and Electronic Equipment