The POP separation process in the recycling of WEEE.

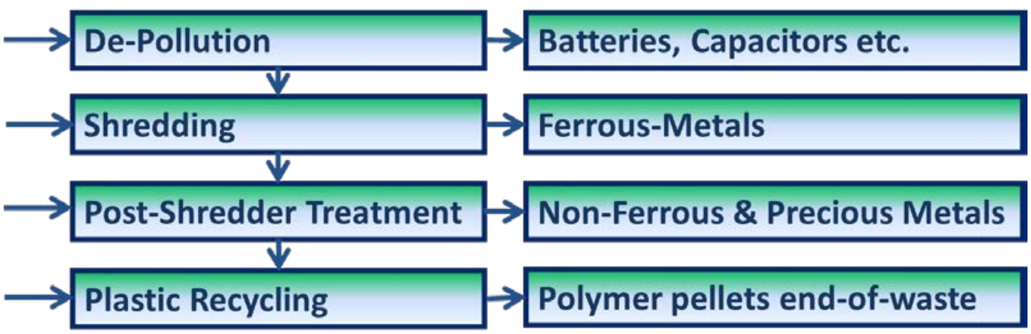
Support notes from EERA to the proposed Guidance document for POPs

The recycling process of E-Waste.

The recycling process of Waste from Electrical and Electronic Equipment (WEEE) is developed on the basis of this definition by the European Union:

“Substances, preparations and components may be removed manually, mechanically or chemically, metallurgically with the result that hazardous substances, preparations, and components and those mentioned in Annex II are contained as an identifiable stream or identifiable part of a stream at the end of the treatment process. A substance, preparation or component is identifiable if it can be (is) monitored to prove environmentally safe treatment.”

This has resulted in a recycling process with the following steps:



The plastic recycling process takes place at the end of the recycling processes of WEEE. The result of these recycling processes is on the one hand REACH and/or RoHS compliant Post-Consumer Recycled plastics that have reached End-of-Waste status and a fraction of non-recycled plastics, which include the plastics with brominated flame retardants containing both brominated flame retardants (BFRs) that can still be used and those containing restricted BFRs. In Europe the latter fraction is incinerated and by this incineration process the POP content is destructed.

This implies that the plastics from E-Waste might contain POPs over and above POP LPC levels, as long as these are delivered to recycling plants separating these POP containing plastics.

It is after this plastic recycling process that the plastic waste fraction with a “high” POP content (i.e. above the LPC) is *“disposed of in such a way that the POP content is destroyed or irreversibly transformed so that they do not exhibit the characteristics of POPs or otherwise disposed of in an environmentally sound manner when destruction or irreversible transformation does not represent the environmentally preferable option or the POP content is low.*

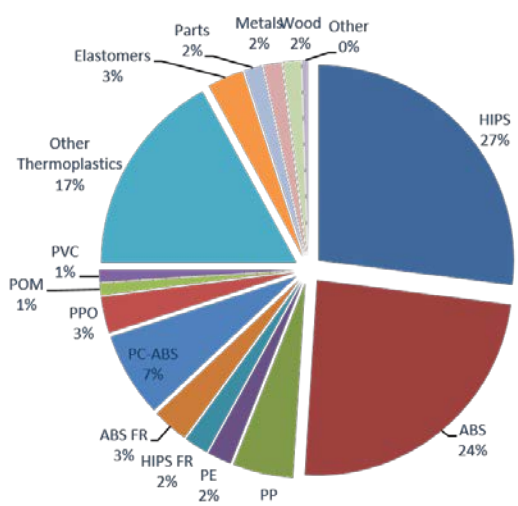
During the last COP 2017 EERA has been present with a stand to show the COP participants how the recycling processes of WEEE and ELV's take place.

Plastics from WEEE and the content of POP's.

The mix of plastics in WEEE and ELV's is highly complex. In order not to complicate this paper too much, we will concentrate on the mix of plastics from WEEE and particularly on the solid plastic waste fraction.

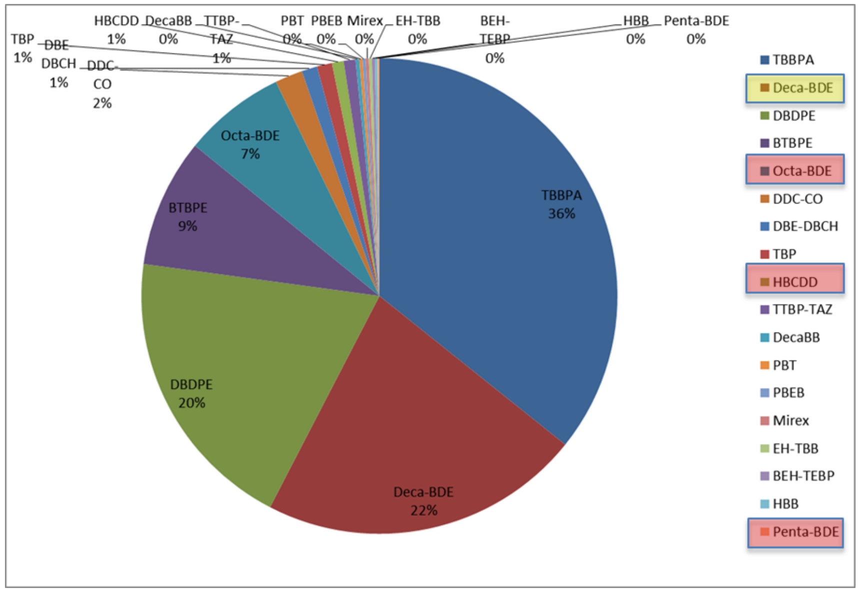
The composition of this mix consists of some 65 % of recyclable content, mainly Styrenics (ABS and HIPS, Polyolefin (mainly PP) and PC and PC-ABS. The remainder of this solid plastic waste fraction consists of a wide variety of plastics that to date are not recycled. These plastics include the solid plastics with brominated flame retardants. In the average mix of solid plastics wastes coming out of the WEEE recycling processes, typically 5 – 10 % consist of plastics with flame retardants (see Graph below).

ABS	24%
HIPS	27%
Polyolefines	7%
PC and PC-ABS	7%
Solid Plastics with BFR's	5%
Other plastics	24%
Parts and metals	4%
Other (mainly wood)	2%



Source: MGG Polymers

Of the fraction that contains BFRs, the POPs with defined LPC levels (octa- and penta-BDE and HBCDD) represent not even 10% of the plastics containing flame retardants and this can be explained by the fact that these have been phased out since deca-BDE replaced these substances. Deca-BDE in turn has been phased out in electronic appliances with the introduction of the RoHS directive in 2004, which explains that we have seen large reductions over the last couple of years. Deca-BDE represented some 22% of the BFRs in WEEE plastics in 2011 still decreasing (see also study "Stoffflüsse im Schweitzer Elektronikschrott". www.bafu.admin.ch/uz-1717-d



The environmental Aspects of Recycling of WEEE plastics.

The environmental benefits of the recycling of solid plastics wastes from durable products such as WEEE are impressive. This is a logic consequence of the production chain of virgin plastics, which starts with the extraction of crude oil, which subsequently is transported to refineries and these refineries produce monomers, which are subsequently "knitted" together in long polymer chains by large plastic manufacturers.

The recycling of plastics keeps all this energy input in the polymer chains, which are basically re-used after the separation and recycling processes. EMPA has performed two Life-Cycle Analyses comparing the recycling process of MBA Polymers Austria (now MGG Polymers) to the production of virgin plastics and one other one comparing the recycling process to the incineration of this plastics mix.

The result of this Life Cycle Analysis is that the recycling process is that the MGG Polymers process is clearly superior to the alternatives considered in this study from an environmental perspective, both with regard to the performance of post-consumer recycled plastics and the performance of the recovery and disposal routes for plastics-rich shredder residues originating from dismantling / mechanical processing of WEEE. Large amounts of CO2 emissions are prevented and energy savings are the result of plastic recycling.

Discussion and conclusion:

The total amount of plastics used in Electronic applications in Europe amounts to some 3 Mio MT's per annum. Only a very small percentage of these plastics contain POP BFRs, which are embedded in a structure of solid plastics. This clearly results in a completely different risk profile compared to POP substances that are not embedded in a solid structure.

The recycling technology of these complex EEE products has developed over the last 15 years into becoming a mechanical recycling treatment, whereby the plastics with substances of concern such as BFRs are separated into an identifiable fraction that is monitored to prove environmentally safe treatment. These plastics are incinerated to destruct the embedded BFRs.

The Stockholm Convention quite rightly makes the distinction between the use of POPs in new products and materials and as legacy substance in used material. Priority is to stop the production of materials and products with POPs, which RoHS and REACH provided for. The stockpile of the new POP BFRs has been largely reduced over the last 10-15 years, as studies show.

What we expect is a recognition that the advantages of recycling E-Waste plastics into Post-Consumer Recycled (PCR) materials, that are fulfilling the current levels of REACH and RoHS compliant plastics, outweigh by far the risks of recycling.

We therefore call for POP LPC levels that:

1. Keep the recycling option open, allowing these recyclable plastics to be transported across borders in order to transport these recyclable materials to appropriate recycling plants and
2. Not be lowered beyond those that are in place today for the recycled materials i.e. current REACH and RoHS values, i.e. 1000 ppm for each octa-BDE, penta-BDE.
3. A Deca-BDE LPC will be defined at the next COP 2019 and EERA also calls for a 1000 ppm LPC value as absolute minimum in order to make sure that the recycling option for WEEE plastics remains open. The further development of a WEEE plastic recycling industry requires this legal clarity in this matter.
4. With regards to HBCDD EERA calls for an alignment of the thresholds with the other POP BFRs, i.e. a 1000 ppm LPC value.

It would be an environmental disaster if the recycling option for plastics from WEEE would cease to exist as a consequence of thresholds set too low. It would jeopardize the recycling targets set for WEEE and it would not be in line with the objectives of a circular economy and it would result in a further increase of CO_2 emissions.