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BSEF comments on the draft Management Evaluation for c- Pentabromodiphenyl ether

The Bromine Science and Environmental Forum (BSEF, www.bsef.com) is submitting the following comments on the draft Risk Management Evaluation for Pentabromodiphenyl ether (PeBDE) (CAS No. 32534–81–9).

BSEF represents three major global suppliers of bromine and brominated chemicals. One or more of these companies have made and/or distributed the two brominated products which are currently being evaluated as candidates for possible addition as POP substances to the Stockholm Convention. These substances are "legacy" products and none of these substances have been made under the direction of any BSEF member company after December 31, 2004.

Proposal for listing brominated diphenyl ethers with 4 or 5 bromines instead of c-PentaBDE ("TetraBDEs" and "PentaBDEs")

The Chemical Abstract Service number 32534-81-9 corresponds to the CAS name "benzene, 1,1'-oxybis-, pentabromo", which generically describes all 46 possible isomers of a diphenyl ether structure having 5 bromine atoms attached at any possible combination of locations on the 2 benzene ring structures. In reality, when "commercial PeBDE" was made and distributed it was actually a complex reaction product containing several congener families (predominately TetraBDEs, PentaBDEs and >1% of HexaBDEs).

The draft Risk Management Evaluation that has been submitted by the European Community under the guidance of Annex F of the Convention recommends to the POP RC3 to list as POPs in Annex A all brominated diphenyl ethers (BDEs) having 4 or 5 bromines. Substances having 4 bromine atoms on the diphenyl ether structure are members of the TetraBDE family. There are 42 individual TetraBDE isomers that make up the whole TetraBDE family. As mentioned previously the PentaBDE family consists of 46 isomers. This proposal then actually will add 88 individual chemical substances to Annex A.

We acknowledge that certain of these PBDE isomers within the Tetra-BDE and Penta-BDE congener families (e.g. BDE-47 and BDE-99) appear to meet the POPs criteria. However, there are no analytical standards for most of the 88 isomers that comprise the members of the Tetra and Penta-BDE congener family and we are not aware of any effort to examine and make a POP determination for all members of the Tetra-BDE & Penta-BDE's congener families in any international POP venue.

Therefore, BSEF believes that the recommendation put forth in the Risk Management Evaluation is not appropriate because it would cause a large number of substances (88 individual substances in total) to be identified as POPs under the Stockholm Convention even though the vast majority of these 88 substances were never the subject of nomination, risk profile or risk management evaluation.

It is important on the basis of transparency and consistent treatment that all substances go through the same process as other candidates for addition to Annex A of the Stockholm Convention. The lack of analytical standards for all 88 of the individual isomers will also make it difficult for countries to assure compliance, which is actually the rationale provided in the draft Risk Management Evaluation for not listing "commercial PentaBDE."

POP RC2 after having evaluated the Risk Profile for c-PentaBDE, decided that "commercial PentaBDE" (c-PentaBDE) met the criteria of being a POP primarily due to the presence of several TetraBDE and PentaBDE isomers having POP characteristics. The specific isomers identified in the Risk Profile and serving as the basis for this determination were BDE-47 (a TetraBDE isomer) and BDE-99 (a PentaBDE isomer).

Consequently, it seems more appropriate to add the specific isomers that had been identified in the risk profile and which were accepted at the POPRC 2 as exhibiting POP characteristics (e.g. BDE-47 & BDE-99), than to expand the listing to include all 88 Tetra and PentaBDE isomers.

Non-consideration of HexaBDE

BSEF also questions why BDE-153 (a HexaBDE isomer) was not recommended for action in the Risk Management Evaluation of c-PentaBDE. On the basis of information presented at POPRC 2 regarding BDE-153 (as part of the PentaBDE Risk Profile and the OctaBDE nomination), it was agreed that this isomer has POP characteristics. This substance was a significant component in c-PentaBDE and therefore BSEF believes that it should be included in the Risk Management Evaluation of c-PentaBDE.

Please find in the table below our detailed comments for the draft Risk Management Evaluation for c-PentaBDE:

Page no	Quote	Comment
5	***Background***	General Comment: This section contains too much generic information on BFRs and flame retardants in general. This document is supposed to be on the management of c-PentaBDE and not the whole world of flame retardants.
5	*"Until now, brominated flame retardants have been…PUR and electronics"*	Brominated flame retardants are not the cheapest flame retardant, in fact they are typically much more expensive on a weight to weight comparison against all other common types of flame retardants in use today including inorganic minerals, chlorinated and phosphorus based FR. It is however correct to say that they are very efficient.
8	*At the 4th North Sea Conference, it was decided to phase out the use of brominated flame retardants by 2020*	The North Sea Conference is not a body operated under the OSPAR Commission and therefore does not fit under this section heading. OSPAR does not seek to phase out chemicals; it is geared at eliminating releases. The reference to the 4th North Sea Conference in 1995 was not a decision to phase out BFR's. This body does not have that authority. Rather the ministers attending agreed to "take concerted action within the framework of the competent international forums to substitute the use of the following hazardous substances by less hazardous or preferably non-hazardous substances where these alternatives are available.."
10	*The US EPA (2007) estimates that US production and import were between 4,500 and 23,000 tons in 2002.*	The volumes are reported in ranges by the EPA when the specific production volume is claimed confidential by the manufacturers/importers. Looking at the historical EPA reports from from 1994, 1998 and 2002it is apparent that the production volume was towards the lower end of the range (~10,000,000 pounds; 4500 tonnes). See http://www.epa.gov/oppt/iur/tools/data/index.htm for more information.
11-12	*According to a market analyst consultant company, global demand for flame retardants is expected to grow by 4.4 percent per year to 2.1 million metric tons in 2009 … in Western Europe, Japan and to a lesser extent North America, such restrictions will especially limit growth of chlorinated compounds which might be considered as in-kind replacements for PBDEs. The ban on some brominated flame retardants in Western Europe is not expected to spread substantially to other regions (Freedonia Group 2005), but it drives the development of electrical and electronic equipment without the banned substances for sale on the world market.*	While the market growth for families of flame retardants is interesting, it doesn't seem relevant to the issue of risk management of c-PentaBDE which is the subject of the document. This section should focus on the changing needs for c-PentaBDE and not of flame retardants in general.

<table>
<tr><th>Page no</th><th>Quote</th><th>Comment</th></tr>
<tr><td>12</td><td>Dozens of Asian, European, and US companies announced in 2005 that they have developed or are developing electrical and electronic equipment that does not contain C-PeBDE. In Asia more than 90% of electronic manufacturers already make products compliant with the EU ban on PeBDE. Officials from electronics companies and industry consultants consider that most electric and electronic equipment sold on the world market were in compliance with the ban in EU in 2005, due to the difficulties of keeping product streams separate ((Environmental International reporter 2006).</td><td>This information should be in Section 2.2</td></tr>
<tr><td>12</td><td><table><tr><th>Production of PUR-foam</th><th>Use of C-PeBDE to PUR-foam production</th></tr><tr><td>150,000 tons/year</td><td>15,000 – 27,000 tons/year</td></tr></table></td><td>Is this metric tonnes (1000kg) or actually tons (2000 pounds)? There is not indication provided. We assume you meant metric tonnes.</td></tr>
<tr><td>13</td><td><table><tr><th>Production of PUR-foam</th><th>Content of C-PeBDE in PUR-foam</th><th>Releases of PeBDE during the lifetime of the products</th></tr><tr><td>150,000</td><td>15,000 – 27,000</td><td>585 – 1,053</td></tr></table></td><td>Again is this tonnes or tons? Tables 2.2 and 2.3 need to be consistent in expression of mass.</td></tr>
<tr><td>14</td><td>This can apply to the following outdoor applications of PVC (RPA, 2000):
• Car undercoating,
• Roofing material,
• Coil coating,
• Fabric coating,
• Cables and wires, and profiles,
• Shoe soles.</td><td>It is not clear how this PVC information is relevant to the Risk Management of c-PeBDE. Most of c-PentaBDE uses are for furniture or other articles that are inside and not subject to outdoor environmental conditions.</td></tr>
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16	*Thermoplastic sheeting used to be treated with BFRs at concentrations between 1.3 and 5% by weight. According to a study for Denmark, 10 – 20 % of the plastic sheeting used in bridges and underground structures are possibly treated with flame retardants (Danish EPA 1999).*	Unless there is information that the BFR was c-PentaBDE in these applications, it should not be included since it is not relevant.
18	*… and that the ultimate long term goal is to phase out the global production and use of C-PeBDE and emissions of its components*	The long term goal for the Stockholm Convention the sound management of risks from POP's. Stating that the "ultimate goal is to phase out the global production and use" pre-supposes a decision that is to be made by the COP and the EB.
18	*Since the ultimate goal is to phase out C-PeBDE, other measures seem more likely to be effective at this stage.*	See previous comment. This statement indicates that the conclusion for the method of management has been already decided. However so far the document has not even presented why this is the best choice among all the various options.
19	*It seems that in the current situation a global ban on production and use of C-PeBDE by listing the substance under the Stockholm Convention would be the most appropriate measure.*	This statement is not appropriate to make at this point in the document. Nothing has been said about why other options are not appropriate (i.e. e.g. a global ban just on production).
21	*Section 3.3 Information on Alternatives*	There is a general lack of environmental and human health information in this section. If alternatives will be used in place of c-PentaBDE, there needs to be some information presented to show that these present less risk to human health and the environment.
22	*They are used effectively in Europe in high-density flexible polyurethane foams but require 30 to 40 percent melamine per weight of the polyol.*	It should be mentioned that these materials are not well suited to low density foam.
23	*While the colour of the foam, however, is not a determinant of its flame retardancy, manufactures seem to be reluctant to use discoloured/scorched foam for many applications because this is an indication of thermal stress on the foam which may lead to premature failure of the foam during its service life. Greater acceptance of discolored foams would allow manufacturers to choose from a wider variety of alternative flame retardants.*	Even a slight to moderate scorch can change the foam's technical properties and the ignition resistance enough to make it unusable as "prime quality" product and must be used in lower value, less demanding applications. Some furniture and foam companies try to say that scorch is simply a matter of aesthetics, but their aim may be to reduce the cost of having to use more costly FR's for foam used in furniture.
23	*Greater acceptance of discolored foams would allow manufacturers to choose from a wider variety of alternative flame retardants. Barrier fabrics are allowing mattress manufacturers to mask the colour.*	It should be noted that the use of barrier fabrics is effective for only one major fire ignition scenario but not all significant scenarios. Non-flame retarded foam in a barrier fabric can still be a fuel source and contribute to the severity of a fire.

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23	*But there is considerable interest in future applications of these technologies for the furniture industry as well.*	See previous comment. The use of barriers cannot by themselves be adequate to meet the more rigorous home furniture flammability standards, such as those used in California and elsewhere.
23-24	*In addition to the following technologies, it should be noted that some furniture designs exclude the use of filling materials, and even fabric altogether. Design therefore, should be considered when evaluating alternative means for achieving flame retardancy in furniture. Flame-retardant barrier materials can be a primary defence in protecting padding for furniture and mattresses. Manufacturers can layer barrier materials to improve the flame retardancy of their products. This layering approach allows a product to maintain its fire resistance even if one layer is compromised. There are many types of barrier materials available, and some layers in the composites may be chemically treated to improve flame retardancy. Fabrics composed of natural fibres such as cotton may be chemically treated with phosphonitrilic chlorides, for example, but any hazards associated with these chemical treatments have not been assessed in this report. Fabrics composed of synthetic fibres that are inherently flame retardant are also flame-retardant barrier materials. Plastic films derived from flame-retardant resins are also flame-retardant barrier materials. These materials are designed and manufactured to meet specific flammability standards. This also explains the large number of flame-retardant barrier materials that are available. Flame-retardant barrier materials can be characterized by cost, resulting in three primary groups. The first group of flame-retardant materials is the chemically treated, primarily boric acid treated, cotton-based materials. These materials are the least expensive flame-retardant barrier materials available. Mattress manufacturers that base their material decisions*	Again see previous comment. Barrier technology is only suitable for a portion of the fire scenarios that may occur. They cannot meet the fire safety standards in jurisdictions with the highest standards for upholstered furniture flammability (at least not at reasonable costs to the consumer).

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	predominantly on cost prefer these flame retardants. Though estimates of exposure assume that use of boric acid-treated cotton will not significantly increase boron intake by the wearers, there is no information available on the release of boron in dust form consumer items (Leisewitz et al. 2000). The second group of flame-retardant materials is a blend of inexpensive natural fibres and expensive synthetic fibres. Synthetic fibres used in these blends include VISIL, Basofil, Polybenzimidazole, KEVLAR, NOMEX and fiberglass. Smaller manufacturers of furniture and mattresses in niche markets use these materials. These blends are commonly used in bus and airplane seating. The third group of flame-retardant materials is composed solely of expensive, high-performance synthetic fibres. They are generally used in industrial or high-performance applications such as firemen's coats and astronaut space suits.	
24	*"Alternatives to C-PeBDE in EE-appliances*	The bulleted applications have nothing to do with the past use of c-PentaBDE in E&E. The document and examples need to focus on the E&E applications where c-PentaBDE is or was used. If the statement is about some alternatives to flame retardants other than C-PentaBDE, it shouldn't be part of the text.
25-26	*However, given the documented harm associated with PeBDE in the environment, its persistence and bioaccumulation, and given that most developed countries have already phased it out, there can be little doubt that the overall benefits are considered positive.*	While there may be in the opinion of the POPRC on a potential for harm (which is taken to mean adverse effects impacting the quality of life) the Risk Profile did not provide any examples of "documented harm". If this is new information, its source should be cited. The phase out of a substance by itself does not necessarily mean that the outcome is necessarily positive. This is a huge assumption and supposes that the developed countries have been looking at the impact & risks presented by the use of the alternatives. Hopefully the overall benefits are positive, but until it is demonstrated, this is speculation, not certainty.
26	*Costs of phasing out C-PeBDE*	This section lacks any real quantitative estimates of the cost of phasing out PeBDE. Additional study may be needed.

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28	*Several countries have reported that they would have problems regulating a commercial mixture of PeBDE. Most national regulations concern compounds. It will therefore be more practical, rather than listing C-PeBDE under the Convention, as was earlier envisaged by the POPRC, to* ***list brominated diphenylethers with 4 or 5 bromines****. All mixtures with one of the isomers of Tetrabromodiphenyl or Pentabromodiphenyl ether will then be covered by the conditions in the Convention, except when they occur as trace. The Convention could set lower limits for these listed substances, so that mixtures containing concentrations below these levels (traces, for example) would not be covered. Complete coverage of the components of the C-PeBDE would require also the listing of Hexabromodiphenyl ether, with the same lower limit, since it can comprise up to 12% of the commercial product. This could be an issue for the listing of commercial Octabromodiphenyl ether, which also contains appreciable amounts of the HeBDE.*	See our comments above on page 1. The EU nominated the product that was commercial PentaBDE and did not nominate the possible isomers of Tetra and PentaBDE. The POPRC only evaluated a small number of specific Tetra, Penta and HexaBDE isomers and determined that these should be considered POPs in the context of the Stockholm Convention. There was no information presented or discussed that showed that all 88 tetra and PentaBDE isomers should be considered POPs as well. Therefore a listing that includes all possible isomers as proposed in this document would in effect by-pass the procedure for listing chemicals as specified in Article 8 of the Convention. We are sympathetic to the possible difficulties that could arise if the term "commercial PentaBDE" is used for listing under the Convention. However this term could be defined for purposes of the Convention to obtain the degree of precision needed to make the listing enforceable. The alternative would be to list the specific isomers that POPRC agreed have POP characteristics.
29	*Waste fractions containing C-PeBDE should be handled as hazardous waste. This is already done in large parts of the UN ECE region. This could impose extra costs on some countries and sectors. Ways to ensure collection of articles containing C-PeBDE, and the setting of targets, should therefore be left to each country.*	"Hazardous waste" has very special meaning in the US and probably is interpreted differently in other regions/nations. While waste containing c-PentaBDE must be handled with care and consideration for the impact of the disposal method, The present information shows that modern municipal waste Incinerators and landfills are capable of safely managing post consumer waste containing substances like the components in c-PentaBDE. Guidelines for POPs waste under the Basel Convention will ultimately determine the most appropriate manner(s) of disposal.

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Concluding statement

Given the above, BSEF believes that:

- The POPRC3 should not accept to list as POPs in Annex A all brominated diphenyl ethers (BDE's) having 4 or 5 bromines but instead list "c-Penta-DBE" and those congeners for which POP characteristics have been clearly identified.

- BDE-153, a HexaBDE isomer and a significant component in c-PentaBDE, should be included in the Risk Management Evaluation of c-PentaBDE since POPRC determined it has POP characteristics.

June 2007