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Beerse, 28 January 2020

Dear Mr Baron,

RE: Campine Comments on RoHS Annex II Dossier for Diantimony trioxide (flame retardant); Restriction proposal for substances in electrical and electronic equipment under RoHS
Report No. 1, Version 2 (dated 04/12/2019)

With this letter, Campine welcomes the opportunity to participate in the Stakeholder Consultation and provide comments on the second version of the RoHS Annex II Dossier for Diantimony Trioxide (ATO).

Campine appreciates the consultants attempt to get the full picture of ATO, with the conclusion that there is no need to restrict the use of ATO. We agree that there is need for extra information or update of correct figures. We are contributing to this aim with our response, as far as the period and our knowledge reaches.

The various concerns have been described in detail by providing comments on specific parts of the Dossier. **We support and fully agree with the comments given by i2a, but will add some specific information in our comments.**
We were very surprised that while the evidence available on ATO does not meet any of the four RoHS Article 6 criteria, the conclusion did not summarize this criteria and status for ATO. Instead, the consultants recommend to reassess ATO following a group approach, in a next Annex II review exercise. We give you additional arguments to revise these conclusions.

We very much look forward to exchange with you about our concerns and our comments, and remain available for any questions or comments you may have.

Yours respectfully,

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Manager operational excellence Campine

Mark Carpels
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Campine Comments on RoHS Annex II Dossier for Diantimony trioxide (flame retardant)

Specific comments on the RoHS Annex II Dossier for ATO, Report No. 1, Version 2 (dated 04/12/2019)

Page	Section	Paragraph/Content	Comment
15	1.3.2	"Antimony is listed on the 2017 list of Critical Raw Materials of the EU […]"	The study of the critical raw material listing indicates the importance of antimony trioxide in E&E applications. The study reviewed for that reason the potential for substitution. The result of this exercise was the listing as critical both in supply and because of lack of substitution.
18	2.1	"However, the stakeholders […] stress that UL 94 V-0 […] indicates the highest flame-retardant level"	Substitution for the common flame retardancy requirements Please add that stakeholders have also indicated that the ATO+halogen based-formulations offer the highest flame retardancy performance (i.e. UL 94 V-0) with the lowest disruption of the polymer's original and/or desired technical and functional properties. This is important to take into consideration when addressing the substitutability of ATO (and halogens) as flame retardants in EEE
19	2.2	"To conclude, […] there were no backgrounds given for this variation […]"	Could you reconsider this statement.: there is no '1 standard formulation' Stakeholders have previously indicated that there are multiple reasons to use different amounts of ATO in plastics. The primary one is the nature of the polymer and its inherent flame retardancy. Following this, the intended application or use of the component, its potential for exposure to contact/erosion, the compatibility with technical and functional properties of the polymer, including color, weight, flexibility, etc., as well as price (these chemicals are costly and will not be added unless they are necessary).
19	2.2		This statement is not correct for flexible PVC. Whereas for rigid PVC, indeed little or no flame-retardant synergists are needed, for flexible PVC, this is not the case. Indeed, the plasticizers added to soften the PVC decrease its inherent flame retardancy and in such cases, flame retardants need to be added to recover the lost flame retardancy. In the example of KabelWerke Eupen dr. Beyer. With ATH in the composition it is not possible to reach the needed LOI. When some of the ATH is exchanged by half of this amount with ATO, better flame retardant performance is reached, with no significant impact on tensile strength/elongation at break.

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			In some cases (low cost applications e.g.) partial substitution can be done as in this example is the case. Typical PVC-based cable formulation with ATH *Table 2. Typical PVC cable formulations.* Components (and resultant properties) / Quantity (phr) PVC (K value = 70): 100 / 100 Diisononyl phthalate: 55 / 55 Calcium carbonate (e.g., OMYA EX H1SP): 10 / 10 ATH (e.g., MARTINAL OL-104E): 50 / 40 Antimony oxide: – / 5 Lead-based stabilizer: 4 / 4 Lubricant (e.g., A-C 6A): 0.5 / 0.5 Properties LOI (ASTM D 2863-77)(% O_2): 27 / 31 Tensile strength (DIN 53504): 17.5 MPa / 16 MPa Elongation at break (DIN 53504)(%): 220 / 250
19	2.3	"There was no specific nor actual quantities provided by the stakeholders"	I2a involved recently Roskill, recognized in the nonferrous world for his in depth market information research, to provide figures based on evidence. The report is made available as an Annex from i2a. This report is intended to fill the lack of information in the first review. Figure 3 in the report shows that 85000 tonnes of ATO were produced globally for use in flame retardants in 2018. From these, 27000 tonnes are used in PVC, and 43000 tonnes in thermoplastics. Most of the ATO added to PVC ends up in construction applications, whereas around a third of the thermoplastics containing ATO are used in EEE (Figure 6). These figures give a global view on the consumption, so including EEE final products coming into the EU.
20	2.3	"[…] It is understood from this varying information that considerable amounts of ATO are used in EEE applications"	The Roskill report provides you with real information about the consumption of ATO in EEE applications. The presence in EEE does not automatically involve risk. Only exposure to the ATO present in the EEE could entail a risk for producers, consumers or recyclers. The presentation shared as Annex II furthermore shows that the more presence of a chemical in a polymer does not imply it will become available for exposure; the blooming of Sb is generally below detection level, i.e. negligible for consumers of EEE.
23	Table 3-1	Germany: 0.006 mg/m³	Please specify that this one applies to the respirable fraction of the workplace (< 4 µm) rather than to the inhalable one (< 100 µm), so these limits are not to compare with all the other OEL's.
23	Table 3-2	Guidance values for diantimony trioxide	I2a updated REACH dossiers in 2019, with updated DNEL's. see their comments on this subject.

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24	3.2	"As for dermal exposure, the DNEL provided by the registrants will be taken into account"	In section 3.1, the inhalation exposure route is the relevant route of exposure to consider in the assessment.
24	4	"To conclude, potential releases of ATO from EEE manufacturing and use would dissolve in the environment and would be part of dissolved antimony species found in the environment."	The conclusion should rather confirm that ATO does not pose an environmental concern (even if it may be present in the environment, it does not pose a concern; contrary to other chemicals, ATO is not ecotoxic). FYI, the insolubility of Sb prevents it from causing harm to the environment, contrary to more soluble chemicals used in flame retardant formulations, e.g. phosphorous-based ones.
25	4.1	"According to the above mentioned, there is clear evidence that antimony and its compounds have adverse effects on aquatic life, which should be taken into account if exposure to the environment will be looked at."	We totally disagree with this conclusion. None of the authoritative body reports referred to in the introduction to section 1 or in section 4.1 support this statement. To the contrary, they support the fact that ATO is of no concern for the environment, in terms of ecotoxicity and environmental fate. Also, it is not in line with the statement made earlier in section 1.2.2: "the harmonized classification is assumed to have a higher standard of scrutiny […]".
27	5.1	"This fraction is of today's state […]" and following paragraph	In fact, Antimony trioxide is fully recyclable in plastics, and never looses its functionality which is not the case with phosphor based flame retardants. For current combinations of ATO with halogens, mechanical recycling of the plastic is possible and proven by the NLPR project (comment of KULeuven in 2019) and maintains his functionality. Unluckily, antimony trioxide is used in the past in combination with toxic bromine compounds. Unless the fact that antimony trioxide is not the cause of this lack on recyclability, we are taking responsibility to recover the ATO content out of these WEEE. A number of projects are being launched and/or arriving at pilot plant stage to actually make the recycling and recovery of BFR+ATO containing plastics viable. Campine is involved in 2 of these projects : 1. Plast2Bcleaned : chemical recycling of WEEE plastics with removal of Br and ATO https://plast2bcleaned.eu/. – and 2. Lifeplasplus: recycling of high quality secondary thermoplastics and critical raw materials coming from mixed WEEE plastics and ELV – Life 18 ENV/BE/000368. – Website coming soon. There are several other projects running at the moment to solve the recyclability of the plastics containing SVHC Bromine (in WEEE plastics) e.g. CreaTor : removal of the SVHC bromine components during the extrusion

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			process (leaving the ATO in the plastic) : https://www.creatorproject.eu/about/ There are also initiatives to alter the incineration process with energy recovering to optimise recuperation of ATO and Br. E.g. doctorate of Orelie VanGeenhoven KULeuven.
31	5.4	"[…] During shredding processes […] substances like ATO may occur […]"	Most of the shredding of plastics is combined with density separation. Most of the processes are thus wet processes. European set ups are in line with European regulations and foresee dust exhaust. The exposure to dust is a general hazard to be avoided, and not one specific to the shredding of EEE containing ATO. The presence of ATO bound to airborne particles cannot be assessed in isolation from the physical and chemical harms of inhaling an excess of dusts of various particle sizes. Dust exposure should be minimized and control no matter the origin and/or chemical composition of the dust, and cannot be given any specific weight in the assessment of one specific chemical. For more information please visit and review: https://www.who.int/occupational_health/publications/en/oehairbornedust3.pdf.
33	6	Whole section	Please revise and correct this section on the basis of the specific comments formulated by EBRC, expert in exposure assessment of metals and their compounds on the workplace, that are made available by i2a. **In short: ECETOC TRA is not fit to model the exposure to metals and their compounds, and the only one of the three literature references is relevant and reliable, and can be used for the assessment.**
43	8.1.1	"It can be concluded that there are alternative synergists available on the market […]"	Please complete this assessment of alternatives, which is rather poor. It only refers to some applications where ATO can be replaced, and does not take account of the life-cycle impact of the compared chemicals (some of which have their own human health and/or environmental issues!), the technical impact nor of the cost impact of such change In the mean time, it is clear that there is an impact of alternative FR's. A very recent study in Flanders of 'steunpunt milieu en gezondheid' did monitor 428 young people on the presence of 70 environment polluting substances showed the de decrease of harmful Bromine flame retardants. Almost everybody's urine contained traces of the new generation organophosphate fire retardants, of which the effects on health is not yet investigated. Study to be found at : http://www.milieu-en-gezondheid.be/nl/nieuwe-resultaten-steunpunt-milieu-en-gezondheid or http://www.milieu-en-gezondheid.be/sites/default/files/atoms/files/STP%20MG_Rapport%20jongerencampagne%202016-2020_gecomprimeerd.pdf Quote : "Slechts enkele van de verboden gebromeerde vlamvertragers zijn nog meetbaar in de bloedstalen van jongeren. Vrijwel alle jongeren vertoonden in de urinestalen echter sporen van de nieuwe generatie organofosfaatvlamvertragers, waarvan de effecten op de gezondheid dus nog niet kunnen ingeschat worden. "

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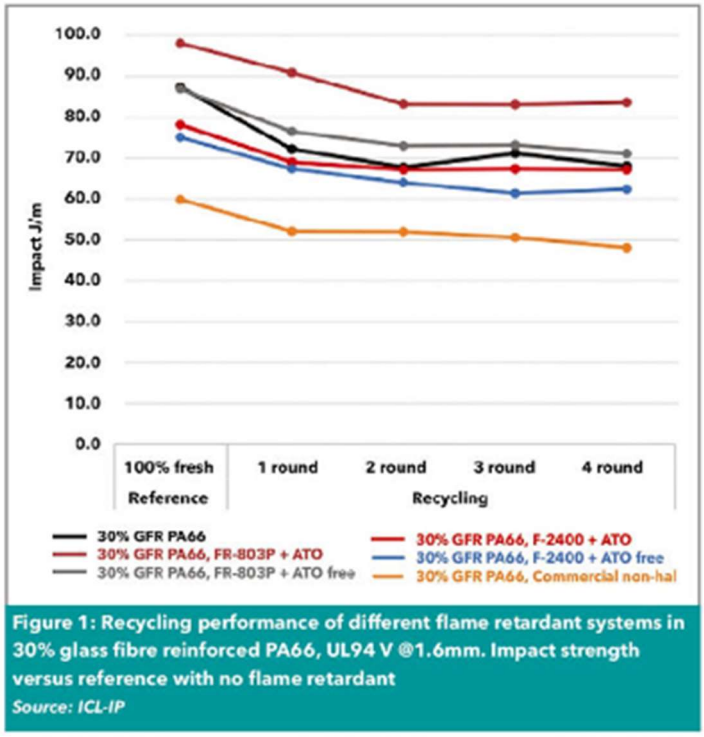
43	8.1.2	"Substituting both, halogenated FR and the synergist ATO, seems the most promising alternative to ATO, entailing a double positive effect through the additional elimination of the halogenated substance."	This note is very subjective and not fit for the level of the rest of your report. There are clear indications one has to look into depth to the performance of the flame retardant system in global. Marc Leifert (ICL, supplier of the different flame retardant systems, and in this regard able to compare the different solutions in detail) did investigate the mechanical performance of the different options.  **Figure 1: Recycling performance of different flame retardant systems in 30% glass fibre reinforced PA66, UL94 V @1.6mm. Impact strength versus reference with no flame retardant** *Source: ICL-IP* Reference :'Reaching for better flame performance' in Compounding World Dec 19 p25-26. He focused on PA66 and PBT, both rated for V-0 aplications. They tested 6 formulations: one without FR, one brominated Polystyrene (FR 803P) with ATO and same without ATO, one with high molecular weight brominated epoxy (F2400) with ATO and one without, and a final one with a commercial non-halogenated FR. The non-halogenated FR showed a 40% decrease in impact strength. Even when the original product would fulfill the mechanical requirements, the reprocessing will decrease the impact strength further so that the plastic cannot be reused. Of course, more investigations have to be done, but it already indicates that Brominated/ATO FR systems are ideal for reusing them in extrusion.
44	8.1.2	"[…] It can be concluded that the voluntary phase-	This is not a scientifically justified conclusion. ATO can be used without brominated flame retardants (in conjunction with other flame retardants and

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		out of ATO by these companies means the simultaneous phase-out of halogenated flame retardants. […]"	synergists) and some brominated flame retardants can also function without ATO.
45	Table 8-1	"Halogen-free (thus ATO-free) flame retardants […]"	Please remove the sentence in parenthesis. Cf. comments given on other pages..
45	8.1.2	"From the table above a trend can be seen towards halogen-free organo-phosphorous compounds (among others) […]"	We do not agree with this statement. It is better to look to real consumption figures taking into account that flame retardancy requirements are going For years, antimony trioxide is on RoHS Listing. Unless the fact that there was never a need for restriction this list triggers some manufacturers to take actions. E.g. change over to aluminum housing as Apple does. It is not the task of RoHS to evaluate best choices, because there is no agreed framework to compare all the alternatives.
45	8.1.2	"The outlined findings allow the conclusion to be drawn that halogen- and ATO-free are available and already being applied. […]"	We do not agree with this statement. The findings do not support that conclusion. The assessment of alternatives should be done on a per application basis, and considering full life-cycle and costs, rather than just market trends and private organizations' findings.
48	8.1.3	"[…] Literature provides these alternatives, but the actual application in products recently placed on the market cannot be confirmed properly, the reason being that the consultants would require concrete confirmation by stakeholders which is still missing."	We cannot agree with this statement. Stakeholders have clearly indicated and repeated that alternatives exist for some applications, but not for most of those requiring a high flame retardancy performance. If one wants really to state there is an alternative, all aspects have to be listed so that a full comparison can be made about FR performance, mechanical and other functional performances, recyclability, environmental and human health (but at the same 'level', not as is the case at the moment where some of the substances are investigated thoroughly and others not),…
50+ 51	Table 8-3	"Human Health and Environmental Concerns"	I2a did give you an update of the human health and environmental concerns of the alternatives, This status has to be added in the overview to give an accurate picture of the status.
51	8.2	"[…] Still, phasing out halogenated flame retardants including ATO as a synergist by using inherent inflammable polymers could be a step forward as	Please complete/correct this statement. Polymers have different degrees of inherent resistance to fire, with the most rigid ones typically having higher resistance than flexible ones. However, not all polymers are fit for all applications in terms of technical performance. The use of inherently resistant polymers is recommended as far as possible, but is not recommended only to avoid the use of certain flame-retardant formulations. Furthermore, a full life-cycle approach should take account of the recycling potential and actual recycling levels applicable to each polymer, hand-in-hand with the other criteria under assessment. This again, goes

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		far as a conclusion on the polymer's suitability is possible."	beyond their supplemental flame-retardant composition (which has been proven to be well established and both effective and efficient as regard halogen+ATO compositions).
52	8.4	"To conclude on possible alternatives for ATO, the analysis of the various information sources indicates two most promising steps forward: […]"	We do not agree with this statement. The steps proposed are not promising, they are in place where the application allows this; where it is has not taken place, this is due to technical, fire safety and cost performances, all very legitimate to the continued use of existing solutions, which have been demonstrated and continue to be demonstrated to be safe. The fact that consultants 'miss concrete confirmations by stakeholders' is due by the fact that the assessment needs to be done per application, and cannot be done in general for EEE covered under RoHS. A better approach would be to first identify the uses of ATO that pose a risk, and then assess alternatives for these specific uses, in which case stakeholders would be in a better position to provide more specific and concrete input.
53	8.4	"The application of substitution is confirmed by waste stream analysis: Halogen-free enclosures […] is assured because phosphorous-based flame retardants in EEE enclosures […] are reported to be found in the waste stream."	On the contrary, we are convinced that the phosphorous-based flame-retardants <u>are not fit for recycling,</u> since they cannot be detected by XRF or density control (the standard techniques in recycling) and thus are diluted in the recycled plastics. The bromine-ATO FR system has the advantage of weight (thanks to ATO!!), which enables all sorting processes no matter in which type of plastics. This view is supported by the recycling federation, which are preparing for the consequences of the RoHS assessment of PFR's.
53	9.1	"In this respect, it is noted that some EEE will already be compliant with the new restriction, seeing that some OEMs already specify ATO as a restricted substance in components and materials purchased from the supply chain […] and have completed the phase-out of ATO. […]"	The phase-out is initiated by some of the users because the continuous uncertainty of the ATO status.
53-54	9.2-9.4	"Impacts on the Industry […]"	It is important to note that a SEA is <u>performed after the risk of a chemical has been demonstrated</u> and the need for a restriction confirmed. The consultants are cordially invited to review the Roskill SEA report provided by i2a, to have a better idea about the size and importance of the Industries depending upon ATO uses as flame-retardant synergist. This would only be a

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			first step in starting to evaluate the actual socio-economic impact on the value chain, would ATO be restricted under RoHS.
55	9.5	"On the other hand, plastics sorted out based on the presence of ATO for the most part are incinerated or declared as hazardous waste and landfilled at appropriate sites, constituting a loss of antimony which is considered a critical raw material. […]"	Even if there would be no other solution in future than incineration (which is the case if none of the projects of recycling would be successful), we know how to separate the WEEE plastics containing ATO. The industry is able to change the incineration processes into pyrolysis (ending up with removable Sb content) or into improved mono-incineration of WEEE plastics maximizing the Sb content in fly ashes (doctorate KULeuven) so that the recuperation is possible. Landfill can be avoided in 2 years.
55	9.6	"[…] Additional costs may be relevant in the longer-term, depending on whether exemptions would be requested and how long such exemptions would remain valid (frequency of revaluations). […]"	Please rephrase this statement. If ATO is restricted, it is very highly likely that exemptions will be requested and necessary, and that these will be necessary over a long period, with several revaluations. This should be clearly reflected in the cost assessment both for authorities, as well as for Industry (section 9.2, 9.3 and 9.4).
57	10	"[…] Substantial information was missing with regard to the question which halogenated flame retardant requires which concentration of ATO. […]"	Please complete this statement. Please note that there is no top-5 formulation recipes and that the formulation recipe is a tailored one, prepared to fit the specifications and quality, technical, fire-performance, safety and price requirements requested by the customer for each application. There is no possibility to provide such a list of formulations because it simply does not exist. Information which cannot be compiled or generated is not missing. The applications are far too complex and numerous.
57	10	"With regard to risks for human health […]"	Please rephrase or remove this whole paragraph. Cf. Specific comments formulated by EBRC, expert in exposure assessment of metals and their compounds on the workplace, are available in Annex V.
57	10	"In light of the precautionary principle, there is some reason for appropriate measures to take due to the fact that ATO is a recognized carcinogen."	Please correct and complete this statement. First, ATO is a suspected carcinogen, and not a demonstrated carcinogen. Second, as any suspected carcinogens, those handling or producing ATO are subject to workplace legislation, which imposes a hierarchy of controls. This is unrelated to RoHS. RoHS should not duplicate existing legislation, as this would go against the principle of better regulation. The need for proper workplace controls can be recommended but is not an argument to justify a RoHS (future) assessment or restriction recommendation.

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57	10	"[…] Voluntary approaches by industry or ecolabel schemes show that substitution rather targets halogenated flame retardants (and thereby ATO as well)."	Cf. comment on page 45: Private organization decision and inspections alone cannot be considered as trend-setters; as such any of their lists should not be used as a source of evidence to compare well-known ATO FR applications with other applications, which require more market visibility and as such, make more active use of such private platforms.
57	10	"[…] In order to avoid this, the consultant proposes not to exclusively restrict ATO, but instead to carry out a joint assessment of the system of halogenated flame retardants and the ATO synergist with high priority."	This proposal is not in line with the general conclusions of the study. First, nothing in the report actually demonstrates that ATO poses a demonstrated risk in light with Articles 6(1) criteria, according to which ATO: **(a) *could have a negative impact during EEE waste management operations, including on the possibilities for preparing for the reuse of waste EEE or for recycling of materials from waste EEE*;** **NO**, Oeko concludes that it actually brings an advantage! **(b) *could give rise, given its uses, to uncontrolled or diffuse release into the environment of the substance, or could give rise to hazardous residues, or transformation or degradation products through the preparation for reuse, recycling or other treatment of materials from waste EEE under current operational conditions*;** **NO**, the evidence put forward in the report is that ATO poses no risk for the environment **(c) *could lead to unacceptable exposure of workers involved in the waste EEE collection or treatment processes*;** **NO**, unless the waste treatment does not fulfill the European standards. **(d) *could be replaced by substitutes or alternative technologies which have less negative impacts*.** **YES, but** Oeko recognizes that there are many exceptions and that cost may be an issue, so Oeko's conclusion should read **NO** (Industry points towards the need to perform a more in-depth alternatives assessment for the uses in EEE which are deemed to pose a risk, which has so far not been demonstrated!) **For these reasons, we cannot agree with the final conclusion that there is a need for further assessement .**