July 13, 2022

The Honourable Steven Guilbeault
Minister of the Environment and Climate Change
C/o Christina Paradiso, Executive Director
Chemicals Management, Environmental Protection Branch
Environment and Climate Change Canada
Gatineau, Quebec, K1A 0H3
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Re: Proposed Prohibition of Certain Toxic Substances Regulations, 2022 – Canada Gazette, Part I, Volume 156, Number 20 (May 14, 2022)

Dear Minister Guilbeault:

This letter is being submitted on behalf of the Albemarle Corporation for the purpose of filing a notice of objection requesting that a board of review be established under section 333 of the Canadian Environmental Protection Act ("CEPA") in response to Environment and Climate Change Canada ("ECCC" or "Department") and Health Canada ("HC") publishing the proposed *Prohibition of Certain Toxic Substances Regulations, 2022* ("PCTSR" or "draft Regulation") in the May 14, 2022 Canada Gazette, Part I, Volume 156, Number 20.

Introduction

Albemarle Corporation is a global manufacturer of specialty chemicals, among whose product line includes Decabromodiphenyl ethane (DBDPE) as an important part of our portfolio. As a manufacturer and in conjunction with leading experts and key users of DBDPE, Albemarle Corporation has developed considerable expertise with respect to this important substance, including a comprehensive set of over 50 analytical, toxicological, environmental, and pharmacological studies.

We strongly believe that these studies in conjunction with several independent reviews, as well as several recent new studies, not available at the time of the original screening assessment, clearly demonstrate the safety of DBDPE and do not support a conclusion that would justify adding DBDPE to Schedule 1 of CEPA.

Therefore, ECCC should not seek the virtual elimination of DBDPE in Canada.

The Conclusions of the Final Screening Assessment upon which the Proposed Risk Management Measures for DBDPE Rely is not Supported by the State of the Science

This submission includes a comprehensive list of 50 analytical, toxicological, environmental, and pharmacological studies that have been conducted on DBDPE to evaluate its safety and to register as appropriate in other jurisdictions. Each study has been provided to ECCC through the assessment process or during the comment period to assist in the evaluation of this substance, including in-person collaborative reviews of the most recent data to further partner with ECCC on advancing additional science that demonstrates the stability of DBDPE.

Albemarle asserts that the available science as demonstrated by these 50 studies does not support a conclusion that would justify adding DBDPE to Schedule 1 of CEPA. Therefore, ECCC should not seek the virtual elimination of DBDPE in Canada.

In addition to the studies discussed above, there is new scientific information since the Final Screening Assessment was published in the May 11, 2019, Canada Gazette, Part I, that was not available and therefore not evaluated by ECCC or HC during the Screening Assessment. This additional scientific information provides a sufficient justification for the Minister to reconsider the conclusion reached in the Final Screening Assessment that DBDPE is "toxic" under CEPA.

First, new experimental scientific evidence from a 336-hour study modelling the photolytic degradation of DBDPE within high impact polystyrene (HIPS) in the Canadian environment that was shared with ECCC in May 2021. Conclusions from that study are that DBDPE has a very long half-life (multi-decades to centuries) when modeled to realistic photodegradation conditions, any formation of lower brominated products from DBDPE is negligible, and *the latter are not the species of concern expressed by ECCC*.

A 2,000-hour study extending the modelling of the photolytic degradation of DBDPE within HIPS in the Canadian environment was also shared with ECCC in January 2022. The study followed the ASTM D7869 Standard and employed new high resolution mass spectrometry instrumentation. Conclusions support and extend the initial findings including that DBDPE has an even longer half-life under these more realistic photodegradation conditions, any formation of lower brominated products from DBDPE is negligible, and the latter are not the species of concern expressed by ECCC. Further, lower form brominated products can be prevented with the help of ultraviolet absorbers and light stabilizers. Subsequent to the discussions with ECCC in January 2022, additional studies were conducted to gauge photooxidation. The findings were that, unlike decaBDE (the read-across compound), *DBDPE does not accelerate photooxidation*. Studies were also conducted in polypropylene (PP), where the loading of DBDPE is even higher than in HIPS; *neither photolytic debromination nor photooxidation was observed in PP*.

These studies confirm that as a polymer additive, photolytic degradation of DBDPE is orders of magnitude slower in resins than in dilute matrices under photolysis. In fact, some of photolytic studies cited by ECCC in their assessment, e.g., Nadjia (2014) and Wang (2012), used wavelengths in the UVC region that could impact the results and interpretation; the light sources were an unfiltered xenon (Xe) lamp that went down to 200 nm, and a high-pressure mercury vapor lamp known to go down to 250 nm, respectively. Terrestrial solar irradiation is only in the UVA and

UVB region, down to ca. 295-300 nm. Our studies used RightLight filters on a Xe lamp to best mimic solar irradiation.

More importantly, no lower brominated species of concern are formed. UV stabilizers mitigate the slow degradation of DBDPE even further. There are resin effects, with no photolytic degradation occurring in PP. A draft manuscript of these studies, together with supporting information, is being prepared for publication, and is included with this submission for reference.

Second, in 2020, NAFRA retained Dr. Frank Gobas of Simon Fraser University to conduct an independent third-party review of the available scientific reports, as well as the draft and final screening assessments, for the purpose of providing an opinion on the validity of the approach taken and conclusions reached by ECCC with respect to the Final Screening Assessment for DBDPE. Dr. Gobas is a recognized and respected toxicologist, and his opinion is invaluable for the purposes of making a final determination on whether or not DBDPE is “toxic” under CEPA and subsequently the appropriateness of the proposed risk management measure.

Below are several of the conclusions from Dr. Gobas’ independent review:

- DecaBDE is not a good read-across substance for the purpose of estimating the rate of potential debromination of DBDPE;
- Guidelines and recommendations for applying a read-across approach exist but were not adequately followed by ECCC in the Final Screening Assessment; and,
- The Final Screening Assessment does not include evidence to substantiate that lower-form DBDPE products enter the environment in a quantity or concentration that have or may have an immediate or long-term harmful effect.

Dr. Gobas emphasizes that DBDPE cannot form the same transformation products as decaBDE. He notes that while DBDPE can theoretically form lower brominated products, these lower brominated products are different from those formed by decaBDE and do not include brominated dibenzo-p-dioxins, dibenzofurans, or diphenyl ethers. The inherent toxicity of lower brominated products from DBDPE has not been demonstrated. Furthermore, Dr. Gobas opines that degradation rates of DBDPE are very slow. Thus, it is unlikely that transformation products of DBDPE are formed in quantities or concentrations that can have an immediate or long-term harmful effect on the environment or its biological diversity.

Third, a new relevant study by the National Academy of Sciences, Engineering, and Medicine ("NAS") published a study report[1] in May 2019 to determine if organohalogen flame retardants ("OFRs") – which includes DBDPE – could be divided into subgroups based on similar chemical structures or physicochemical properties for the purposes of further assessment. NAS recommended dividing 161 OFRs into 14 subclasses. It is noteworthy that in the study, NAS grouped DBDPE and decaBDE into separate subclasses with DBDPE in the polyhalogenated benzene aliphatics and functionalized subclass and decaBDE in the polyhalogenated diphenyl ethers subclass. This finding further supports the position that it is not appropriate to use decaBDE as a surrogate for DBDPE to draw any conclusion regarding potential breakdown products in the absence of supporting studies.

Fourth, a GreenScreen Risk Assessment for DBDPE was conducted in December 2021 with the compound assigned a Benchmark-2 score.[2] By comparison, decaBDE has a List Translator 1 score (equivalent to a Benchmark-1 score) meaning the hazard classification meets one or more of the GreenScreen Benchmark-1 criteria and would most likely be a Benchmark-1 chemical if given a full GreenScreen Risk Assessment. In the GreenScreen Risk Assessment for DBDPE it notes that, "while both DBDPE and Deca have the same degree of bromine substitution, one is an unsaturated alkane (*i.e.*, ethane) and the other is an ether. The potential for biological/metabolic differences may be significant, as indicated by differing GreenScreen scores obtained for certain endpoints." Again, this further indicates that decaBDE has limited value as a structural analogue for DBDPE

Fifth, in the ECCC report on *Polybrominated Diphenylethers in Fish and Sediment* published in January 2020, it states that "sediment sampling in many drainage regions of Canada does not go back far enough to establish long-term trends." This lack of data establishing long-term trends for decaBDE further reinforces the fact that DBDPE does not meet the criteria for listing under Schedule 1 and therefore does not require risk management measures. If DBDPE were truly degrading in the environment, relevant monitoring data for the compounds analyzed would be expected to demonstrate the increasing presence of substances of concern in the environment. Though the use of the substance (decaBDE) used in the degradation models by ECCC is no longer permitted in commerce, if DBDPE were degrading in the same manner, we would also expect a continued increase in the monitored by-products. However, this is not the case, and the real-world monitoring data directly contradicts the modelling and assumptions that were the basis for the Schedule 1 listing and provides an additional rationale for withdrawing the listing and the proposed risk management measures.

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[1] National Academies of Sciences, Engineering, and Medicine. 2019. A Class Approach to Hazard Assessment of Organohalogen Flame Retardants. Washington, DC: The National Academies Press. doi: https://doi.org/10.17226/25412.

[2] Gradient. GreenScreen® Assessment for [Decabromodiphenyl ethane; DBDPE (CAS # 84852-53- 9)]; Prepared for: American Chemistry Council: December 2021.

Final Screening Assessment for DBDPE Ignores the "Weight of the Evidence"

Section 76.1 of CEPA requires equal weight in the application of both the weight of evidence and the precautionary principle in conducting the evaluation of the scientific evidence relating to any particular substance. Section 76.1 does not give precedence to either of these two principles. The application of the precautionary principle is not stated or intended to govern decision-making.

The conclusion reached in the Final Screening Assessment that DBDPE has the potential to transform into lower brominated products that could pose a risk to aquatic organisms conflicts with the proper application of the weight of evidence approach and has not been substantiated. ECCC reached its conclusion regarding the potential for breakdown of DBDPE based on a theory that the DBDPE would behave in the same way as decaBDE. That conclusion is inconsistent with the available evidence on DBDPE.

In the Final Screening Assessment, it was noted that DBDPE itself was not a concern, but raised concerns about the potential formation of persistent lower brominated BDPE's, particularly tetra-, penta- and hexa- congeners, and therefore was concluded toxic. It was also referenced in the Final Screening Assessment that photolysis in natural waters, soils and bio-solids is expected to be limited because of DBDPE's low water solubility, particle adsorption behavior as well as light attenuation by humic materials. These references by the ECCC screening assessment question the suitability of photodegradation concerns and is inconsistent with the proposed ban.

The approach taken by ECCC is contrary to the statutory requirement to apply the weight of evidence approach. DBDPE is very different scientifically and structurally than decaBDE. Thus, the use of decaBDE as a proxy for DBDPE in computer modelling to draw this conclusion of potential breakdown products in the absence of any supporting studies is not appropriate and based on faulty assumptions given their different molecular structures.

Proposed Risk Management Measures May Lead to Severe Risk to Public Health and Safety

DBDPE performs a valuable function by reducing the flammability of the products where it is used. Those products include not just consumer devices and appliances, but also include airplanes and motor vehicles. In the absence of alternatives, the prohibition poses a genuine risk of increasing flammability and impact shock risk for products therefore creating a severe risk to public health and safety.

Product manufacturers must balance the need to meet consumer demand for overall performance with the need to ensure that those products meet relevant safety standards. Plastics have revolutionized product designs for electronic and electrical equipment. Manufacturers use plastics to ensure performance goals, and plastic is used in casings and enclosures to protect from fire and shock risk. If left untreated, these plastics are flammable, so flame retardants serve as a critical line of defense.

There are hundreds of end-product standards for electrical and electronic equipment. For example, Underwriters Laboratories (UL) 746C[3] can require electrical and electronic products with larger enclosures to undergo a specific test that assumes a flame threat occurs outside of the enclosure. In addition, product standards can contain additional or stricter requirements than UL 746C, such as an enclosure needing a minimum rating of UL 94 V-1 or V-0 for flammability.[4]

The removal of the use of flame retardants in many applications (DBDPE in this instance) has a disproportionate effect on at-risk or underserved populations, including children, the elderly, and low-income Populations. Children are more susceptible to injury or death from fire than the average person, where fire and burns have been found to be the 3rd leading cause of unintentional death among children 14 and under. [5]For the Elderly, the relative risk of 65 or over dying in a fire is 2.7 times greater than that of the general population.[6] Socioeconomic studies show an inverse relationship between fire risk and income, where low-income populations are prone to fire injury or death due to substandard housing that may lack fire-safety measures such as working smoke alarms and fire extinguishers.[7] Finally, the changing nature of consumer products with the use of more flammable materials has increased the risk of fire safety and the removal of this key substance may worsen these effect.[8]

Fire safety standards should be viewed as minimum requirements for flammability and products can go beyond those standards. Product manufacturers use flame retardants such as DBDPE to meet or exceed minimum flammability requirements based on their own needs for safety and performance. For instance, product manufacturers may conclude that an external fire threat is a risk for their product (from a candle or other flame source) and want their product to exceed minimum requirements for horizontal burning or may determine that an internal risk may warrant higher flammability requirements than the minimum flame rating allowed in a standard.

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[3] UL 746C specifies standards for parts made of polymeric materials that are used in electrical equipment and describe the various test procedures and their use in the testing of such parts and equipment.

[4] UL 94 is a plastics flammability standard that classifies plastics according to how they burn in various orientations and part thicknesses from the lowest flame-retardant to most flame-retardant in six different classifications.

[5] Source: https://www.flameretardantfacts.com/fire-safety/

[6] Source: https://www.flameretardantfacts.com/fire-safety/

[7] Source: https://www.flameretardantfacts.com/fire-safety/

[8] Source: https://www.flameretardantfacts.com/fire-safety/

Conclusion

The Final Screening Assessment determination for DBDPE upon which the proposed risk management measures rely is not supported by the state of the science, and did not appropriately consider and apply the weight of evidence. Furthermore, new evidence which has been developed since the final screening assessment, including the photolytic degradation and NAS studies, do not support either the finding that DBDPE is "toxic" under CEPA or the proposed risk management measures.

Finally, the proposed risk management measures for DBDPE as presented in the draft Regulation have the potential to cause significant risk to public health and safety by reducing the use of a critical fire retardant.

Based upon the facts and arguments set out above we ask the Minister to appoint a Board of Review to "inquire into the nature and extent of danger" posed by DBDPE.

Albemarle appreciates the opportunity to provide these comments and looks forward to continuing to work with Environment and Climate Change Canada and Health Canada on this matter. If you have questions or if we can provide any additional information for review or discussion, please contact me at bob.miller@albemarle.com or 980.299.5628.

Sincerely,
ALBEMARLE CORPORATION

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