



The Dow Chemical Company
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June 12, 2015

Mr. Bart Croes
Division Chief
Research Division
California Air Resources Board
1001 I Street
Sacramento, CA 95814

RE: CalEPA ARB "Short-Lived Climate Pollutant Reduction Strategy Concept Paper"
(SLCP Concept Paper), issued May 7, 2015

Dear Mr. Croes,

The Dow Chemical Company appreciates the opportunity to provide comments on the referenced concept paper. Dow is a major producer of highly efficient building insulation and air sealing products, such as extruded polystyrene foam insulation (XPS), two component spray polyurethane foam insulation (SPF) and sealants, and, is a supplier of formulated polyurethane systems, which all encapsulate HFC blowing agents to provide the R-value associated with these products. As a leader in energy efficient residential and commercial construction, California relies upon these products not only to reduce energy costs for California consumers and business owners, but also to help California reach its aggressive reduction goals in greenhouse gas (GHG) emissions from the buildings sector.

Dow's comments on the SLCP Concept Paper present our general views on the proposed strategy and then are focused on the F-Gas Emission Reduction Concepts, and specifically on the section titled, "Removing High Global Warming Potential Gases from Foams, Aerosols and Transportation".

Dow strongly urges California ARB to postpone any considered HFC regulation in the foam insulation sector pending the EPA decision regarding its Significant New Alternatives Program (SNAP), which is expected in the next few months. Dow encourages California to follow the decisions of the U.S. EPA SNAP ruling in order to reduce the patchwork of costly and burdensome regulatory requirements state by state.



General Comments on the SLCP Concept Paper Strategy:

- Priority should be based on first reducing emissions from the largest GHG sector. For example, Figure 1 (page 11) illustrates the differences in sector GHG emissions between a 100 GWP vs the 20 year GWP. Based on this analysis, the projected reductions of short-lived climate pollutants should place a priority on reducing emissions of black carbon, then methane, and lastly, F-gases (HFCs).
 - Black Carbon increases from 7% to 19%
 - Methane increases from 8% to 17%
 - F-gases increase from 4% to only 6%
- Because many foam insulation types utilize HFCs, the SLCP Strategy must closely align with the goals of the California Energy Commission (CEC). On June 10, 2015, the CEC approved the latest 15 day language for the 2016 California Energy Code. Two important features include “high performance attics (HPA) and high performance walls (HPW)”, both of which rely heavily on foam insulation. Alignment with this current California Energy Code development process will insure that unintended consequences, such as a regulation of HFC emissions from foam, in the SLCP strategy does not increase GHG emissions by weakening energy efficiency in the building sector, or significantly increase the cost of energy efficient buildings. XPS and SPF are used extensively in the residential and commercial construction markets to improve building energy efficiency. DOE estimates that 42% of total U.S. energy is consumed within the commercial and residential building sectors.
- As stated by a CARB presenter at the May 27 Workshop, a robust cost-benefit analysis must underpin the SLCP Strategy, especially in regard to F-gas reduction
- Furthermore, even with the HFC blowing agents, the use of XPS has a net positive contribution to reductions of GHG emissions. Based on published Life Cycle information, XPS insulation will avoid at least 28 times more GHG emissions relative to its own carbon footprint over 50 years. (*Life Cycle Greenhouse Gas Emissions Reduction From Rigid Thermal Insulation Use in Buildings* M.H. Mazor, J.D. Mutton, D.A.M. Russell, G.A. Keoleian, J. Ind. Ecology, 15, 2, pp 284–299, April 2011.)

F-Gas Emission Reduction Concepts

The SLCP Concept Paper correctly notes that there are several international and national approaches to reduce F-Gas emissions from foam insulation and other uses.



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- The adopted European Union F-gas regulation based on a phase down in production and import of HFCs
- The proposed Montreal Protocol phase down on the production and consumption of HFCs
- The proposed US EPA Rule on HFCs in specific applications under the Significant New Alternatives Policy (SNAP)
- The proposed Canadian regulation on production and consumption of HFCs.

Generally, Dow supports a global approach to regulate HFCs, based on scientifically proven and cost-effective technologies. Any new technologies should be built upon success with attainable time-lines that allow the industry to innovate, develop, and commercialize alternative technologies for our stakeholders. It is critical that BA transition be to products based on lower GWP blowing agents &/or co-blowing agents and not based on specifically named allowable chemistries per sector.

With respect to the F-gas emissions reduction scheme, Dow recommends that California should address highly emissive HFC sources as a first priority as it is consistent with the proposed relatively short term 2020-2030 timeframe. HFC emissions from foam insulation are long term, since these products rely on the encapsulation of HFC gases for high long-term R-value (i.e., thermal energy efficiency). This scheme is further supported by Figure 4 (page 26) of the SLCP Concept Paper "California 2013 F-gas (Hydrofluorocarbons) Emission Sources". In this figure, HFCs from foams account for only 6% of total HFC emissions.

Dow has actively engaged with the US EPA regarding the proposed SNAP HFC regulations. Several of the EPA-listed substitutes are hydrocarbon-based (HC) and therefore flammable. This characteristic has the potential to require significant and costly plant modifications by XPS and rigid polyurethane manufacturers, will add to plant VOC emissions, and cannot be safely used for field-applied spray polyurethane foam insulation and sealants. Flammability concerns are also addressed in the *UNEP (United Nations Environment Programme) "REPORT OF THE TECHNOLOGY AND ECONOMIC ASSESSMENT PANEL" MAY 2014 VOLUME 4 DECISION XXV/5 TASK FORCE REPORT*. When the EPA published its 2007 SNAP ruling list of acceptable alternatives, the XPS, SPF and rigid polyurethane manufacturers chose HFCs, understanding at that time that HC blowing agents (BAs) were an issue for the reasons cited above, and therefore more costly and not functionally appropriate for XPS and SPF products. In cases where HC's could be used safely, such as Polyisocyanurate (PIR) foams, the industry has proactively moved to these alternatives in lieu of HFCs. Additionally, we do not consider HFOs as a viable and cost-effective alternative for near term conversions.



HFO-1234ze has not been fully commercialized in any geography, is currently only offered by a single supplier, and is not viewed as a viable option for use in foam manufacture, in part due to the current lack of broader markets for the material which limits the supply infrastructure.

Dow believes that Product Specific Controls such as those set out in the EPA's HFC SNAP rule should not be adopted in any regulation. Instead, the phase down approach be used for all HFC's. Foam types & uses are a complicated arena with widely varying federal and state codes and regulations that must be met. Foam segmentation is a critical factor in any HFC regulation that requires delineation of the various types. This would require significant coordination with industry.

This chart represents our comments to EPA on the proposed SNAP ruling:

EPA SNAP Insulation Type	Current Blowing Agent	EPA 2014 SNAP Proposal	EPA 2014 SNAP Rationale	Dow Response	Dow Recommendation
Polystyrene Extruded Boardstock & Billet	134a	Unacceptable after 1/1/2017	Low GWP alternatives exist that can replace 134a	All broadly available alternatives reduce the overall GHG savings from in use applications	Acceptable subject to narrowed use limits allowing time to find better alternatives Projected timing 2021
Rigid Polyurethane Spray	134a	Unacceptable after 1/12017	Low GWP alternatives exist that can replace 134a	No safe alternatives currently exist. The GWP of HFC 134a is 1.39x higher than 245fa which is "acceptable" for spray foams	Acceptable subject to narrowed use limits Projected timing 2021
Rigid Polyurethane used in commercial refrigeration and sandwich panels	134a and 245fa	Unacceptable after 1/1/2017	Low GWP alternatives exist that can replace 134a and 245fa	More time is needed to move to alternatives allowing these specific end use markets time to identify and convert	Conversion timeline extension from 2017 to 2020

The Dow position is based on these facts:

- At present, there is no viable, non-flammable, commercially available cost-effective alternative blowing agent for HFCs used in XPS and field-applied SPF insulation products for building and construction;
- While proposed HFC alternative blowing agents are being evaluated, at this time there are no data suggesting the alternative blowing agents will provide the same long-term thermal performance, physical properties and compliance with building code requirements that the current blowing agent provide.
- All insulations that use blowing agents are manufactured with complicated chemistries and all end products require extensive building code testing and registrations prior to commercialization.



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- An orderly transition, as in the 2021 timeframe for XPS, will allow the foam industry to determine the best alternative blowing agent that will minimize market disruption, and ensure best performance at the lowest cost.
- Both the US EPA and Environment Canada have acknowledged the numerous difficulties in finding suitable alternatives for field-applied SPF blowing agents. They further acknowledge some SPF technologies require two types of blowing agents.

Finally, the SLCP Concept Paper also alluded to recovery and destruction of HFCs as a viable mechanism to reduce HFCs or control in some way emissions from land-filled foam insulation waste. An earlier CARB proposal included recovery and destruction of CFCs and HCFCs from foam insulation in the case where these products are part of building demolition or construction waste. The technical evaluation at that time concluded this process is expensive and the cost of destruction was excessive since the waste, or the recovered gases would have to be shipped out of state for high temperature incineration. In other words, the net benefit to California GHG reduction was negative. Therefore, this concept should not be included based on the results of the evaluation.

Dow intends to participate fully in this process as this SLCP program is developed. For further information or discussion, please contact me at 989-638-4248 or LMMassaro@dow.com.

Sincerely,

Lisa Massaro
Product Stewardship Manager
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