FACT SHEET

Air Quality: Revision to the Regulatory Definition of Volatile Organic Compounds – Exclusion of *cis*-1,1,1,4,4,4-hexafluorobut-2-ene (also known as HFO-1336mzz-Z)

ACTION

- On November 16, 2018, the U.S. Environmental Protection Agency (EPA) issued a final rule revising the regulatory definition of volatile organic compounds (VOC) under the Clean Air Act. This action will add *cis*-1,1,1,4,4,4-hexafluorobut-2-ene (also known as HFO-1336mzz-Z; CAS RN 692-49-9) to the list of compounds excluded from the regulatory definition of volatile organic compound (VOC) because it makes a negligible contribution to ground-level ozone formation.

- Some VOCs contribute significantly to the formation of ground-level ozone. Exposure to ozone can cause serious respiratory illness. Due to its low photochemical reactivity, HFO-1336mzz-Z is considered to be negligibly reactive in the formation of ground-level ozone and is not expected to contribute to violations of the national ambient air quality standards (NAAQS).

- This action is based on consideration of HFO-1336mzz-Z's negligible contribution to ground-level ozone and the low likelihood of risk to human health and the environment associated with its use.

- This final action will allow, but does not require, states to exclude from control emissions of HFO-1336mzz-Z in State Implementation Plans (SIP) designed to meet the ground-level ozone standards. This enables industry to use HFO-1336mzz-Z with fewer restrictions.

- HFO-1336mzz-Z may be used in a variety of applications as a replacement for foam expansion or blowing agents most of which have higher global warming potential (GWP) (>700 GWP) and are used in the production of polyurethane rigid insulating foams. It is also a new developmental refrigerant for use as a potential working fluid for Organic Rankine Cycles (ORC)[1] used to produce energy.

[1] The Organic Rankine Cycle (ORC) is named for its use of an organic, high molecular mass fluid with a liquid-vapor phase change, or boiling point, occurring at a lower temperature than the water-steam phase change. The fluid allows Rankine cycle heat recovery from lower temperature sources such as biomass combustion, industrial waste heat, geothermal heat, solar ponds etc. The low-temperature heat is converted into useful work, that can itself be converted into electricity.

- HFO-1336mzz-Z as a foam blowing agent and a refrigerant has a lower stratospheric ozone depletion potential than other alternatives, and based on the available toxicity data, it is less harmful compared with other chemicals used for the same purpose.

- This final rule will be effective 60 days after publication in the *Federal Register*.

BACKGROUND

- A compound may be excluded as a VOC as a result of public petitions and scientific data that demonstrate its negligible effect on the formation of ground-level ozone. Since 1977, EPA has removed 62 specific compounds or classes of compounds from the list of VOC that contribute to ozone formation.

- DuPont Chemicals & Fluoro-products (DuPont)/Chemours submitted a petition to the EPA on February 4, 2014, requesting that *cis*-1,1,1,4,4,4-hexafluorobut-2-ene (also known as HFO-1336mzz-Z; CAS RN 692-49-9) be exempted from the regulatory definition of VOC. The petition was based on the argument that HFO-1336mzz-Z has low reactivity relative to ethane.

- EPA has carefully reviewed all available scientific data and in response to received comments, continues to find HFO-1336mzz-Z eligible for exclusion from regulation as a VOC.

FOR MORE INFORMATON

- Interested parties can download the action and other materials from EPA's Web site on the Internet under Recent Actions at the following address*: https://www.epa.gov/ozone-pollution/ozone-volatile-organic-compound-voc-exemptions-rules*.
  - To view the final rule and any background information related to the rule (use Docket ID No. EPA-HQ-OAR-2017-0175), go to http://www.regulations.gov.
  - **EPA's electronic public docket and comment system** at https://www.regulations.gov.
  - **The EPA Docket Center's Public Reading Room** (for hard copies).
  - The Public Reading Room is located at EPA Headquarters, Room Number 3334 in EPA WJC West Building, 1301 Constitution Avenue, NW, Washington, DC. Hours of operation are 8:30 a.m. to 4:30 p.m. eastern standard time, Monday through Friday, excluding federal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Air and Radiation Docket is (202) 566-1742.
    - You will have to show photo identification, pass through a metal detector, and sign the EPA visitor log. Any materials you bring with you will be processed

through an X-ray machine as well. You will be provided a badge that must be visible at all times.

- For further information about these actions, contact Dr. Souad Benromdhane of EPA's Office of Air Quality Planning and Standards, at (919) 541-4359 or by email at benromdhane.souad@epa.gov.