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Indianapolis, IN 46231

John Gibbons
Director
Regulatory Affairs



26 May 2016

Mr. Richard Corey
Executive Officer
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Comments on April 2016 proposed Short-Lived Climate Pollutant (SLCP) Reduction Strategy

Dear Mr. Corey,

UTC Climate Controls & Security (UTC CCS), a business unit of United Technologies Corporation (UTC), welcomes this opportunity to submit comments to the California Air Resources Board (ARB) on the Proposed Short-Lived Climate Pollutant Reduction Strategy (“Proposed Strategy”) released in April 2016.

UTC CCS provides fire safety, security, building automation, heating, ventilation, air conditioning and refrigeration systems and services to promote integrated, high performance buildings that are safer, smarter and sustainable. The combination of our businesses makes us uniquely qualified to comment on issues associated with environmental impacts and the tradeoffs with energy efficiency and safety, such as flammability risks.

UTC CCS submits comments on behalf of Carrier Corporation (Carrier). Carrier is the founder of the modern HVAC industry and operates across the globe. Our range of products includes unitary residential and commercial products and services, air and water cooled chillers, as well as commercial and transport refrigeration products.

Global Action

We commend ARB for supporting robust national and international actions to reduce hydrofluorocarbon (HFC) emissions, a potent greenhouse gas (GHG). We also support your willingness to await the outcome of the current Montreal Protocol amendment negotiations before finalizing the Proposed Strategy.

While we are supportive of a global phase-down in HFCs, we do not believe that sector-specific bans are the correct or appropriate approach to reduce GHG emissions. An efficient and expedient HFC phase-down allows the industry flexibility in how best to reduce the impact of

refrigerant emissions while maintaining or increasing energy efficiency to further reduce GHG emissions from power plants.

Consideration of Direct vs. Indirect Emissions

It is critically important to consider the total impact of HVAC&R products due to the direct emissions from the refrigerants, but also to consider the indirect emissions resulting from energy generation which dominate the total contribution. The vast majority of GHG emissions from HVAC&R, measured on a CO₂-equivalent basis, result from the burning of fossil fuels which generate the electricity needed to run the equipment. Today's HVAC&R products have very low leak rates so that the direct contribution to anthropogenic climate change from refrigerant emissions is very low. Simply requiring manufacturers to switch to refrigerants with a lower global warming potential (GWP) without more is short-sighted and counterproductive. Most current refrigerants with lower GWP reduce the energy efficiency of the chiller (causing increased energy consumption requirements). From a climate change policy and abatement perspective, a transition to lower GWP refrigerants should be directly correlated to achievement of net GHG abatement and lifecycle benefits.

In short, the choice of refrigerant must not be made without consideration of the energy efficiency of the system in which it will be used. The lowest GWP refrigerant may not be the optimal or best choice. In the support documents for your Proposed Strategy, it was noted that in all cases the lower GWP refrigerants improve efficiency. That assertion is not borne out by the evidence. Our internal tests have shown that some of the shorter term solutions likely to be used with an accelerated phase-out will decrease efficiency due to refrigerant cycle losses, capacity losses and heat transfer losses. This is more of an issue with "drop-in" replacements where the GWP may be lower, but resulting negative impact on efficiency offsets the GWP reductions and can result in increases in total emissions.

Current Regulatory Efforts and New Safety Risks

ARB should also take into consideration the DOE and ASHRAE 90.1 energy efficiency requirements that go into effect in 2023 for products like residential and commercial unitary equipment. A refrigerant transition in 2021 will force an additional temporary transition for the industry. Harmonization of the dates for increased energy efficiency and for a refrigerant transition will allow for a smoother, more cost effective transition. Two major equipment design changes in such a short time will be extremely cumbersome for equipment manufacturers and will negatively impact the building industry. It could also force changes to less than optimal refrigerant selections due to limitations on fully optimized designs to handle more optimized refrigerant options.

In addition to the design changes that will be required before the industry can utilize the new lower GWP refrigerants, many of the options will likely be flammable and semi-flammable refrigerants. This will require the safety standards and building and fire codes to be updated and adopted to allow the use of mildly flammable refrigerants. Changes to ASHRAE Standard 15,

Safety Standard for Mechanical Refrigeration, and UL 60335-2-40, *Safety of Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers*, as well as the development of new safety standards like ASHRAE 15.2 for residential, must be modified to include requirements for mildly flammable refrigerants. When these standards are published, the requirements will have to be included in the codes throughout California.

Additionally, these new refrigerants, due to the flammability, create new risks for installation and service. The service industry is accustomed to working with non-flammable refrigerants and extensive training will be required to ensure their safe use. We also caution policymakers on programs to retrofit refrigerants especially for flammable refrigerants in products and applications that were not designed for the use of flammable refrigerants.

Conclusion

UTC CCS supports a concerted global effort to avoid significant future growth in GHG emissions associated with the use of HFCs, but the company believes and respectfully recommends that all policies and standards structuring the rational GHG abatement transition must be made in a manner that allows the industry to select the best refrigerant available that has the lowest GWP achievable for particular HVAC&R product technologies on a net GHG lifecycle basis, while maintaining the ability of those products to supply essential, energy efficient air-conditioning and refrigeration equipment to the residents of California.

We support the concept of incentives to help in the transition as outlined in the Proposed Strategy. In the past this has been effective to help in efficiency changes. We would encourage you to go beyond just a focus on GWP reductions and consider the total GHG emissions lifecycle. For example, trying to replace refrigerants in existing equipment may reduce some emissions but it may result in capacity and efficiency losses as well as issues with product reliability and safety. A better approach might be to develop incentives to replace old equipment with new equipment with lower GWP refrigerants. That also could be considerably more efficient due to all the technology progress that has occurred since 2000 in the improvement of energy efficiency.

We also support the efforts of California in reducing the leaks of existing equipment and more effort in this area can result in further reductions in GWP. This could also include incentives and programs to reclaim and recycle refrigerants.

We appreciate the work that was done to look at cost justification. Carrier has completed considerable research, testing and risk analysis and we believe that the semi-flammable refrigerants can be used, but equipment design changes, application changes, and training are critical to the safe application. Your cost analysis should reflect the cost of these additional mitigation requirements that are now being defined by the safety standards.

We at UTC-CCS and Carrier wish to thank the California Air Resources Board for the opportunity to provide these comments.

Sincerely,

A handwritten signature in black ink, appearing to read "John Gibbons". The signature is written in a cursive, flowing style.

John J. Gibbons
Executive Director, Regulatory Affairs
HVAC Americas
UTC-CCS

Cc: The Honorable Mary Nichols, Chair
Members of the Air Resources Board
Ryan McCarthy, Chair's Office
Emily Wimberger, Chief Economist
Dave Mehl, Manager, Energy Section
Marcelle Surovik, Staff Air Pollution Specialist
Glenn Gallagher, Staff Air Pollution Specialist