

October 30, 2015

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**RE: Comments by Honeywell International Inc. on the F-Gas Provisions of the September 2015 Draft “Short-Lived Climate Pollutant Reduction Strategy”**

Dear Mr. Tollstrup,

Honeywell International Inc. (“Honeywell”) submits these comments in response to the paper issued by the California Air Resources Board (ARB) titled, “Draft Short-Lived Climate Pollutant Reduction Strategy” (“Draft Strategy”). We appreciate the opportunity to provide additional input into ARB’s process to craft a strategy to move away from high global warming potential (GWP) products toward more environmentally beneficial alternatives and applaud ARB’s efforts in developing a strategy that will pave the way for low-GWP substitutes across the fluorocarbon industry. Honeywell offers the enclosed views as a supplement to our extensive comments on ARB’s May 7, 2015 Concept Paper, which we submitted on June 12, 2015.

General Comment. Honeywell agrees with ARB that California can and should take additional actions to accelerate implementation of cost-effective measures. The current and potential availability of many suitable and high-performing low-GWP alternatives supports our view that ARB should establish aggressive phase-down targets, an incentive program to drive early action, and the phase-out of high-GWP refrigerants. Honeywell also encourages ARB to take a leadership position by limiting the use of high-GWP HFCs in aerosol and foam applications beyond what the U.S. EPA has required. Honeywell supports the North American proposal to add HFCs to the Montreal Protocol, but ARB is in a position to reduce high-GWP HFCs in the near term and therefore should not wait for such an amendment to be adopted.

Energy Efficiency Co-Benefits. Honeywell agrees with ARB that certain appliances and systems can be made more efficient by replacing a high-GWP refrigerant with a low-GWP one, particularly when the equipment being replaced is decades old. This would likely be the case with many older chillers that remain in service for up to 40 years.

Discourage Certain Retrofits. Honeywell strongly agrees with ARB that the phase-out of HCFC-22 presents an opportunity to transition refrigeration equipment using HCFC-22 to refrigerants with a lower GWP. Such equipment could be retrofitted from HCFC-22 (GWP of 1810) to much lower GWP options like R-448A or R-449A (which have GWPs of less than 1400), and are near drop in replacements. As a result, we recommend a GWP limit of 1500 for retrofit refrigerants.

Incentives for Low-GWP Refrigerant Systems. We applaud ARB's leadership on refrigerant management and support extending such efforts to drive adoption of low-GWP refrigerants. A financial incentive program would, as ARB recognizes, help reduce the expense of installing low-GWP refrigeration equipment in new facilities or retrofitting equipment in existing facilities. For example, a program could provide incentives for new supermarkets to use refrigerants R-448A or R-449A (which have GWPs of less than 1400) instead of R-407A (GWP of 2017). In addition to their lower GWPs, R-448A and R-449A would typically use several percent less energy as compared to R-407A. California could further expand its leadership in this area, and further reduce emissions, by adopting a procurement policy that would require adoption of low-GWP technologies, where available, across state government operations.

Technology Neutrality. While so called "natural" refrigerants such as carbon dioxide, ammonia, and hydrocarbons (all of which are manufactured in large chemical plants) are effective replacements for HFCs in certain applications, where flammability risks cannot be adequately managed or high ambient temperatures are present, other solutions, such as hydrofluoroolefins (HFOs) and HFC-HFO blends offer superior performance and benefits. ARB should be technology neutral and consider the overall impacts of all refrigerant options.

Substance-Specific Phase-Out. Honeywell supports a phase-out approach similar to the substance-by-substance phase-out implemented by the U.S. EPA under the Significant New Alternatives Policy (SNAP) Program, in addition to early action and incentives for applications such as supermarket refrigeration and chillers. We believe there are opportunities to go beyond EPA's required phase-out dates by either accelerating certain dates or by adding additional applications. For example the EPA phase-out date for HFC-134 for mobile air conditioning is not until the 2021 model year while the EU ban is effective January 1, 2017. In addition, there are applications such as chillers, transport refrigeration, and domestic refrigerators where low- or reduced-GWP options exist today but are not being widely adopted today due to a lack of regulations to move away from HFCs. While Honeywell would support a phase-down program, we recognize it may be more cumbersome to implement than a substance-by-substance phase-out of the highest GWP refrigerants used in applications where lower-GWP alternatives are available.

We agree with ARB's proposal to prohibit use of HFCs in new commercial, industrial, and residential stationary refrigeration and air-conditioning equipment, since lower-GWP alternatives are available, as we described at length in our June 12 comments, particularly for new and retrofit grocery store refrigeration applications.<sup>1</sup> As ARB notes, in the chiller application equipment exists today that uses refrigerants that have a GWP of 1 or less. These refrigerants are HFO-1233zd(E) and HFO-1234ze(E). With F-Gas regulation as a driver, there are over a dozen new chillers that have been launched by chiller manufacturers using HFO-1234ze(E) and HFO-1233zd(E). Based on the availability of reduced-GWP options we suggest a GWP limit of 1500 for supermarket applications and a limit of 750 for chiller applications.

Aerosol Applications. EPA's final rule listing certain high-GWP HFCs as unacceptable under the Significant New Alternatives Policy Program (SNAP) of the federal Clean Air Act prohibits the use of HFC-134a in a number of consumer and specialty aerosol applications (e.g. tire

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<sup>1</sup> ARB's Draft Strategy states that CO<sub>2</sub> refrigeration systems in retail food stores are "cost neutral compared to HFC refrigeration systems." Draft Strategy at 63. Honeywell disagrees. Carbon dioxide systems cost considerably more to both install and operate.

inflators) and subjects others to use limitations. However, the opportunity exists for ARB to take a leadership position to address the estimated 50% of aerosol applications not impacted by the EPA rule and where low GWP technology alternatives are commercially available and technically proven. This includes HFO-1234ze(E), which has a GWP of less than 1, is nonflammable per ASTM E681 and ISO 10156:2010 testing, has zero ozone depletion potential, and is not a volatile organic compound (VOC), as determined by the U.S. EPA and ARB.

Comprehensive action by ARB would drive reduction of an additional 3 million mtCO<sub>2</sub>e as manufacturers and other states follow California's lead. Honeywell strongly encourages ARB to consider a substance specific prohibition of HFC-134a in aerosol applications. Honeywell offers this view as a supplement to our extensive comments on ARB's May 7, 2015 Concept Paper, which we submitted on June 12, 2015 and again via teleconference on September 2, 2015.

Foam Applications. Honeywell believes that the phase-out of high-GWP HFCs and transition to low-GWP substitutes in foam applications such as polyurethane (PU) and extruded polystyrene (XPS) can be accomplished much faster than prescribed by EPA. While ARB's draft strategy aligns with that of EPA, we would suggest this approach forgoes an opportunity for significant additional GHG emissions reduction. Multiple alternative solutions have been approved by U.S. EPA under the SNAP program and have been commercially available in both PU and XPS applications for several years. Moreover, as we stated in our June 12, 2015 comments to ARB, transition times in these applications are fast (~12-18 months). Honeywell has commercialized two low-GWP products:

- HFO-1233zd(E) (Solstice® LBA) for PU: HFO-1233zd(E) has a GWP of 1, which is about 1000 times lower in GWP compared to the HFCs it replaces. HFO-1233zd(E) is also more energy efficient than the HFCs it replaces, non-flammable, and not a VOC. HFO-1233zd(E) has been sold commercially globally since 2013. A large-scale plant to manufacture HFO- 1233zd(E) commenced operations in May, 2014.
- HFO-1234ze(E) (Solstice® GBA) for XPS: HFO-1234ze(E) has a GWP of less than 1, which is 1300 times lower than the GWP of HFC-134a, which it replaces. It is also equal or higher in energy efficiency than HFC-134a, is non-flammable, and is not a VOC. HFO- 1234ze(E) has been sold commercially in XPS applications since 2010. A large-scale plant to manufacture HFO-1234ze(E) started-up in Baton Rouge, LA, in October, 2014.

Because low-GWP solutions are available, Honeywell supports the following phase-out dates: January 1, 2017 for XPS and January 1, 2018 for all other foam applications, including high-pressure spray foam.

As noted in our previous comment submission, across most applications numerous other customers globally are in various stages of commercial development. Customers have several available options from Honeywell and others that are listed as acceptable under SNAP. According to EPA even more options will become available in the near future. Strong regulatory action will continue to drive conversions away from high-GWP HFCs to products with a much less climate impact. Adoption of Honeywell technologies in the foam sector, which can be driven further by ARB's actions, could have an impact of up to 35 million MtCO<sub>2</sub>e by 2020.

Fire Code Updates. Honeywell notes that while ARB is correct that current fire and appliance codes need updating to accommodate some mildly flammable low-GWP alternatives to HFCs, fire codes do currently allow the use of flammable refrigerants in many commercial and industrial air-conditioning applications, such as chillers. However, work needs to be done to implement code changes to allow properly aligned, reduced equipment re-design and installation changes for the use of ASHRAE designated A2Ls, which are less flammable than A3 refrigerants like hydrocarbons.

Thank you for this opportunity to share our comments on ARB's development of a strategy to reduce high-GWP HFC use. Honeywell strongly supports ARB's efforts. If you have any further questions, please do not hesitate to contact Amy Chiang at [amy.chiang@honeywell.com](mailto:amy.chiang@honeywell.com) or Dave Stirpe at [david.stirpe@honeywell.com](mailto:david.stirpe@honeywell.com).

Sincerely,

A handwritten signature in black ink, appearing to read 'Ken Gayer', written in a cursive style.

Ken Gayer  
Vice President and General Manager  
Honeywell Fluorine Products