Testimony on S. 2754, The American Innovation and Manufacturing Act
Committee on Environment and Public Works
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The World Resources Institute (WRI) appreciates the opportunity to provide written testimony on S. 2754, the American Innovation and Manufacturing (AIM) Act.

WRI supports the bipartisan AIM Act for the following three reasons, further detailed in the testimony below:

- Passage and implementation of the AIM act stands to be a significant catalyst for economic activity, as it is projected to directly create 33,000 new jobs and generate $12.5 billion of direct economic activity over the next seven years. We describe the conditions under which that growth could be even larger with the agreed upon global phase-down of HFCs.
- As endorsed by leading American businesses, shifting our industry to HFC alternatives is crucial if the country is to take advantage of an opportunity to enhance its competitiveness in a global market expected to grow 4.5x in coming decades, or else lose out to China and others.
- Curbing the release of HFC "super-pollutants" is one of the most impactful measures we can take to slow the rate of climate change, potentially avoid some of its most costly outcomes, and protect the health and safety of the American people.

WRI is a non-profit, non-partisan environmental think tank that goes beyond research to provide practical solutions to the world's most urgent environment and development challenges. We work in partnership with scientists, businesses, governments, and non-governmental organizations across the globe to provide information, tools and analysis to address problems like climate change, the degradation of ecosystems and their capacity to provide for human well-being.

WRI supports this bipartisan legislation sponsored by Senators John Kennedy (R-LA) and Tom Carper (D-DE) to promote U.S. competitiveness in the air conditioning and refrigeration sectors, create thousands of jobs and billions of dollars in revenue, and phase down harmful hydrofluorocarbons (HFCs). This comes at a critical moment when global sales in these sectors are poised to dramatically accelerate, while at the same time the Kigali Amendment to the Montreal Protocol, which phases down emissions from HFCs, is coming into effect, requiring that those sectors transition to alternatives. **In what follows we show that the bipartisan AIM act can boost U.S. competitiveness and create jobs in a rapidly-expanding global market.** At a time when the American economy is on the ropes due to the COVID-19 pandemic, we cannot afford to miss any opportunity to support American workers and businesses, especially when it will help to mitigate other problems which will threaten our safety and security.

HFCs are often referred to as "super-pollutants," because of their high potential to accelerate humanly-caused climate change. Reducing them is one of the most powerful tools we have to slow down the rate of global warming in the next 25 years. Of these, HFCs present a particularly important opportunity. HFCs are commonly used for cooling and air conditioning in appliances or as foam-blowing agents and aerosols. Some HFCs can trap thousands of times more heat than carbon dioxide (CO_2). But because they are much shorter lived than CO_2, removing or avoiding them can achieve a faster return in avoided temperature increase than CO_2.

One of the most important achievements in reduction of HFCs was the successful negotiation by 197 Parties in October 2016 of the Kigali Amendment to the Montreal Protocol, agreeing to lower consumption and production of HFCs with high global warming potential. This measure can avoid as much as 0.5°C warming by the end of the century, a critically important goal to achieve given the demonstrable impact of the difference between stabilization of global temperature increase below 1.5°C versus 2°C as documented in the 2018 report by the Intergovernmental Panel on Climate Change, and given that humans have already warmed the planet just over 1°C with detectable and severe impacts.[1] If such mitigation measures are taken early enough, they can also delay the point at which the world crosses the 1.5°C or 2°C thresholds, avoiding the harm that would unavoidably result.

The measured phasedown of the most harmful HFCs required by the AIM Act and mandated by the Kigali Amendment necessitates a worldwide shift to alternative generation refrigerants, aerosols, and other substitutes. The U.S. business community overwhelmingly supports the United States embracing this policy, as it stands to be a boon to the U.S. refrigerant manufacturing industry and could position the country as a global market leader on refrigerants and heating, ventilation, air-conditioning, and refrigeration (HVACR) systems for decades to come. Conversely, failing to capitalize on this rapidly-growing market could leave the U.S. on the outside looking in, having missed an opportunity to both promote American industry and help to stem climate change.

U.S. Fluorocarbon Industry Footprint

The U.S. fluorocarbon-based manufacturing sector, which encompasses HVACR, insulating foams, aerosols, and other industries, is a considerable contributor to the U.S. economy. According to a recent study from Interindustry Forecasting at the University of Maryland (INFORUM), in 2016 this sector directly supported nearly 600,000 jobs, with a total employment impact of 2.5 million jobs (including indirect and induced). This corresponds to $200 billion of direct economic output, and more than $600 billion of economic output when

[1] https://www.ipcc.ch/sr15/

including manufacturing, distribution, service and installation, and induced demand.[2] These figures include industries dependent on HFCs and the burgeoning industry of next-generation fluorocarbons, such as hydrofluoroolefins (HFOs).

The HFC Market: U.S. and Global

As mentioned above, the existing fluorocarbon-based refrigerant industry in the U.S. is substantial. Refrigerants are used for cooling in stationary and mobile sources, as well as in aerosols, foams, and other applications. China is currently the world's leader in production of HFC-134a, with 50 percent greater output than that of the U.S. HFC-134a, has a global warming potential (GWP) of 1,300 times greater than CO2 and is covered by the Kigali Amendment. For three other high GWP HFCs commonly used in refrigerant blends, Chinese production outweighs U.S. production approximately three- to seven-fold.[3] From 2000 to 2015, there has been a clear downward trend in the proportion of U.S. HFC exports relative to those of China and other Asian countries. This is taking place as U.S. companies have opened facilities abroad to more inexpensively serve those markets.

The regulatory certainty provided by passage of the AIM Act could give rise to enhanced domestic demand, thereby incentivizing U.S. companies to build new next-generation facilities stateside. On a macro scale, moving concertedly toward next-generation refrigerants stands to better position the U.S. to be the dominant market presence in the years ahead as the Kigali Amendment induces the global uptake of HFC substitutes.

The HFO Market: U.S. and Global

There exist a variety of alternatives for high GWP HFCs depending on the end-use, including carbon dioxide, hydrocarbons, ammonia, HFOs, and even some low GWP HFCs. HFOs in

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[2] http://ahrinet.org/App_Content/ahri/files/Resources/Economic_Impacts_of_US_Ratification_of_the_Kigali_Amendment.pdf

[3] https://www.nrel.gov/docs/fy20osti/70207.pdf

particular have a global-warming potential of thousands of times less than the most harmful HFCs, while retaining high effectiveness for many applications.[4]

Today, the largest market for major HFO compounds is the European Union, due to its directive restricting the use of high-GWP refrigerants. Currently, China, the U.S. and Japan are the primary producers and exporters of HFOs.[5] U.S. HFO production has expanded significantly in recent years with the 2017 opening of the Honeywell plant in Geismar, Louisiana, as well as the 2019 opening of the Chemours facility in Corpus Christi, Texas. According to a study by the U.S. Department of Energy National Renewable Energy Laboratory (NREL), Honeywell and Chemours retain the most granted patents for the most common HFO compound, HFO-1234yf, which as of now is used primarily in automobile air conditioning systems.[6] Another HFO, HFO-1234ze, is manufactured by Honeywell at facilities in Buffalo, New York, and Baton Rouge, Louisiana.[7] In 2019, German-based BASF began manufacturing HFO-based polyurethane systems at its Orange, California plant, in compliance with California's HFC phasedown policy.[8]

Both Chemours and Honeywell have expanded operations in recent years, and stronger domestic demand could effectively usher additional U.S.-based companies into the HFO industry, adding jobs along the way. According to Chemours, their investment in the facility has supported hundreds of U.S. jobs.[9] Meanwhile, Honeywell's Geismar plant required nearly 1,400 construction jobs and added 55 permanent jobs.[10]

Projected Global Market Growth

The global refrigerant market is poised to undergo a massive expansion over the coming decades. Much of this is due to increased demand in developing countries, where higher

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[4] https://www.nrel.gov/docs/fy20osti/70207.pdf
[5] Ibid
[6] Ibid
[7] Ibid
[8] http://www.performance-materials.basf.us/news/read/title/basf-introduces-innovative-hfo-based-polyurethane-systems-at-its-orange-ca-site
[9] https://investors.chemours.com/news-releases/news-releases-details/2019/Chemours-Triples-Capacity-of-Opteon-YF-with-Startup-of-New-US-Production-Facility/default.aspx
[10] https://www.theadvocate.com/baton_rouge/news/business/article_ea151018-3a3c-11e7-8a0a-0bb995cdcf8c.html

purchasing power and more widespread electrification allow for hundreds of millions more people to take advantage of cooling technologies in a warming world.

The global HVACR market is projected to double over the next decade.[11] Industry growth is even more impressive when forecast out to 2050, a year by which the International Energy Agency projects a 4.5x increase in air conditioning for non-OECD countries and 1.3x increase for OECD countries, relative to 2010.[12]

Take for example India, a country where there is White House and Congressional support for expansion of trade opportunities, and enhancement of our bilateral relationship. The number of residential air conditioners increased more than ten times over between 2006 and 2017, reaching roughly 30 million units.[13] For the country of 1.3 billion people – projected to reach 1.6 billion by 2050 – this growth shows no sign of stopping.[14] By 2037-2038, the government of India projects an increase in aggregate cooling demand of eight times greater than today, with an associated aggregate refrigerant demand of five-to-eight times greater than today.[15] Under the Kigali Amendment, India must begin phasing down its HFC emissions by 2032, and there are growing signs that Indian businesses are responding to this market.[16] India already has created a policy apparatus in response to these requirements. In 2019 the country announced the "India Cooling Action Plan", the first of its kind in the world. It aims to address the tremendous growth in residential air conditioners and refrigeration.

In the global trade context, it is important to note the impact that recent antidumping rulings may have. A recent NREL report contends that antidumping decisions regarding Chinese imports

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[11] http://ahrinet.org/App_Content/ahri/files/Resources/Economic_Impacts_of_US_Ratification_of_the_Kigali_Amendment.pdf

[12] International Energy Agency (IEA). 2013. "Transition to Sustainable Buildings: Strategies and Opportunities to 2050." OECD/IEA. https://www.iea.org/media/training/presentations/etw2014/publications/Sustainable_Buildings_2013.pdf.

[13] https://www.nrdc.org/experts/anjali-jaiswal/momentum-towards-cooling-less-warming-part-ii

[14] United Nations, Department of Economic and Social Affairs, Population Division (2019). World Population Prospects 2019, custom data acquired via website.

[15] http://ozonecell.in/wp-content/uploads/2019/03/INDIA-COOLING-ACTION-PLAN-e-circulation-version080319.pdf

[16] https://ec.europa.eu/clima/sites/clima/files/faq_kigali_amendment_en.pdf

have largely benefited U.S. companies, setting a precedent that favorably positions the U.S. in any HFO trade disputes that may arise. The antidumping duties apply to HFC blends and HFC-134a after the U.S. ITC determined in two separate cases that the U.S. refrigerant industry was being materially injured by Chinese imports being priced at less than fair market value.[17]

Overall, it is estimated that an additional 3.3 billion residential air conditioning units will be installed by 2050, an increase of 175% over today.[18] Today, China leads the world in residential air conditioning exports.[19] However, as the world moves toward new refrigerants and cooling systems mandated by the Kigali Amendment, there is an immense near- and long-term opportunity for the production and export of American-made next-generation alternatives.

Seizing the Opportunity

The recent INFORUM study models the projected impacts of U.S. implementation of measures consistent with the Kigali Amendment by 2027, which include the direct creation of 33,000 new jobs, a $12.5 billion increase in direct manufacturing output, and a 31% increase in U.S. share of the global HVACR market relative to a non-ratification scenario.

Looking beyond 2027, the U.S. stands to gain an even greater share of the surging global market, with the Kigali Amendment creating certainty regarding the timeline by which countries must begin incorporating next-generation refrigerants. However, the extent to which the U.S. is globally competitive in those opening markets hinges on the development of a robust domestic market as outlined by the AIM Act.

Without domestic regulatory certainty, the U.S. industry producing alternatives to high GWP HFCs is less cost-competitive. Without a national policy and cost-competitive industry, the U.S. risks fumbling a chance to increase global market share in this rapidly-expanding sector. The AIM act would provide that certainty. It would promote the manufacture of next-generation

[17] https://www.nrel.gov/docs/fy20osti/70207.pdf;
[18] https://globalcoolingprize.org/about-the-global-cooling-prize/the-need/
[19] http://www.igsd.org/wp-content/uploads/2018/11/Kigali-Amendment-and-China.pdf

refrigerants, solvents, fire suppressants, foam blowing agents, aerosols and propellants. It would establish an allowance allocation and trading program to enable gradual phase down of HFC production and consumption, and would authorize the EPA to establish new standards to manage HFCs used as refrigerants, as well as for recovery of HFCs. We urge its swift adoption and implementation.