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**REPORT ON FEDERAL LEGISLATION & STATE-LEVEL ACTION
BY THE INTERNATIONAL ENVIRONMENTAL LAW COMMITTEE¹**

S.2448

Sen. Kennedy

A BILL to provide for the issuance of a rule to advance next-generation technologies to provide alternatives to hydrofluorocarbons, and for other purposes.

The American Innovation and Manufacturing Act of 2018

THIS LEGISLATION IS SUPPORTED.

IN THE ALTERNATIVE, NEW YORK STATE LEGISLATION IS SUPPORTED

On February 15, 2018, Senator John Kennedy (R-LA) introduced and Senators Thomas Carper (D-DE), Bill Cassidy (R-LA), Christopher Coons (D-DE), Susan Collins (R-ME), and Jeff Merkley (D-OR) co-sponsored Senate bill S. 2448, the American Innovation and Manufacturing Act of 2018 (the “AIM Act”), which would require the Administrator of the United States Environmental Protection Agency (“EPA”) to promulgate a rule to phase down hydrofluorocarbons (“HFCs”), consistent with the United States’ commitments under the Kigali Amendment to the Montreal Protocol on Substances That Deplete the Ozone Layer (the “Montreal Protocol”). Senator Lindsey Graham (R-SC) subsequently joined as co-sponsor. The AIM Act would codify a sensible, viable pathway to removing HFCs from our industrial economy. HFCs, which were introduced into various products in order to eliminate ozone-depleting substances, have proven to cause a different kind of harm in that they are greenhouse gases with a high global warming potential.

We write on behalf of the Committee on International Environmental Law of the New York City Bar Association (the “Committee”) to register our strong support for passage of the AIM Act. As an alternative, and in addition, we support New York State legislation that addresses the same issue in a similar, or identical, way. Our committee is comprised of lawyers and other professionals who practice in law firms, corporations, government agencies, non-governmental organizations, and academic institutions and who have a special interest in matters pertaining to international environmental law. Our committee’s interest is the protection of human health and welfare, the maintenance of high levels of environmental quality, and the conservation and preservation of natural resources. Because the proposed legislation would make a significant contribution to domestic efforts to combat climate change, we urge New York State’s congressional

¹ Co-sponsored by the Environmental Law Committee

delegation to support S.2448 and passage of the AIM Act. While we hope the bill proceeds quickly, we recognize that federal action may not materialize. Accordingly, as an alternative, we urge Governor Cuomo and the New York State Legislature to support enactment of state-level legislation that provides for the phaseout of HFCs in New York.

I. International Law Background: The Montreal Protocol and the Kigali Amendment

The Montreal Protocol, which entered into force on January 1, 1989, is an international agreement that requires the phase out of production and consumption of substances that deplete the ozone layer, including chlorofluorocarbons (“CFCs”) and hydrochlorofluorocarbons (“HCFCs”).² One hundred and ninety-seven countries, including all members of the United Nations, have ratified the Montreal Protocol. The Protocol and its subsequent revisions and amendments have contributed to a significant decline in emissions from ozone-depleting substances.

On October 15, 2016, parties to the Protocol adopted the Kigali Amendment, which aims to phase down the production and consumption of HFCs.³ HFCs are potent greenhouse gases that came into widespread use after the Montreal Protocol required countries to phase out CFCs and HCFCs. The Kigali Amendment will enter into force on January 1, 2019, provided that it is ratified by at least twenty parties to the Montreal Protocol, or 90 days after ratification by the twentieth party, whichever is later. The United States has not yet ratified the Amendment.

II. Domestic Law Background: EPA’s Regulation of HFCs under the Clean Air Act

In 1990, Congress implemented the United States’ obligations under the Montreal Protocol by amending the Clean Air Act to include Title VI.⁴ Title VI requires EPA to develop and implement regulations for managing ozone-depleting substances. Title VI requires manufacturers to phase out use of some ozone-depleting substances by 2000, and others by 2015.

Section 602 of Title VI requires EPA to publish a list of ozone-depleting substances.⁵ Section 612 requires manufacturers to replace those identified ozone-depleting substances with safer alternatives.⁶ To identify safer alternatives, Section 612 directs EPA to evaluate the risks to human health and the environment of potential

² Montreal Protocol on Substances That Deplete the Ozone Layer, *opened for signature* Sept. 16, 1987, S. Treaty Doc. No. 100-10, 1522 U.N.T.S. 29.

³ Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, Kigali, Oct. 15, 2016, C.N.872.2016.TREATIES-XXVII.2.f (adoption of amendment).

⁴ 42 U.S.C. § 7671.

⁵ *Id.* § 7671a.

⁶ *Id.* § 7671k.

alternatives. EPA undertakes this review through the Significant New Alternatives Policy (“SNAP”) program. EPA then develops a list of approved and prohibited alternatives. Manufacturers must replace the identified ozone-depleting substances with approved alternatives. EPA has the authority to revise the lists of acceptable and prohibited alternatives at any time.

EPA had previously designated certain HFCs as acceptable alternatives to certain CFCs and HCFCs.⁷ However, as scientific knowledge about the global warming potential of HFCs grew, EPA reevaluated that designation. In 2015, EPA issued a new SNAP rule, moving certain HFCs from the list of acceptable alternatives to the list of prohibited alternatives.⁸ As a result, certain HFCs that had previously been approved by the EPA were now prohibited or restricted in certain end-uses.

Subsequently, two foreign manufacturers of HFCs filed a suit challenging EPA’s 2015 SNAP rule. EPA—along with New York and a number of other states, industry leaders Honeywell and Chemours, and environmental groups such as the Natural Resources Defense Council—defended the agency’s approach. In *Mexichem Fluor, Inc. v. EPA*, 866 F.3d 451 (D.C. Cir. 2017), the U.S. Court of Appeals for the D.C. Circuit vacated and remanded in part the rule, holding that Section 612 of the Clean Air Act does not grant EPA the authority to require manufacturers to replace HFCs with approved alternatives. The court acknowledged that EPA had the authority to move HFCs from the list of acceptable alternatives to the list of prohibited alternatives, but held that, because HFCs are not ozone-depleting substances, EPA could not require manufacturers to replace HFCs with approved alternatives. This decision constrains EPA’s ability to regulate HFCs through its existing Clean Air Act authority. Three intervener-respondents filed petitions for rehearing and rehearing en banc, but on January 26, 2018, the Court of Appeals for the D.C. Circuit denied those petitions.⁹ On March 8, 2018, Chief Justice Roberts granted an application for an extension of time for filing a petition for writ of certiorari filed by Honeywell and Chemours.

Although the *Mexichem Fluor* decision constrains EPA’s ability to regulate HFCs through Title VI of the Clean Air Act, there are other provisions of the Clean Air Act that EPA could potentially invoke to restrict the use of HFCs:

- Section 614(b) of the Clean Air Act provides that “[i]n the case of conflict between any provision of this subchapter and any provision of the Montreal Protocol, the more stringent provision shall govern.”¹⁰ If the

⁷ See, e.g., Protection of Stratospheric Ozone, 59 Fed. Reg. 13,044, 13,122-46 (Mar. 18, 1994); Protection of Stratospheric Ozone; Listing of Substitutes for Ozone-Depleting Substances, 64 Fed. Reg. 22,982, 22,984 (Apr. 28, 1999); Protection of Stratospheric Ozone: Listing of Substitutes for Ozone-Depleting Substances, 68 Fed. Reg. 4004, 4005 (Jan. 27, 2003).

⁸ Protection of Stratospheric Ozone: Change of Listing Status for Certain Substitutes Under the Significant New Alternatives Policy Program, 89 Fed. Reg. 42,870 (July 20, 2015).

⁹ See *Mexichem Fluor, Inc. v. EPA*, 2018 U.S. App. LEXIS 2105 (D.C. Cir., Jan. 26, 2018) (denying rehearing en banc).

¹⁰ 42 U.S.C. § 7671m.

United States ratifies the Kigali Amendment restricting the use of HFCs, EPA could potentially invoke section 614 to regulate the use of HFCs.

- EPA could regulate HFCs under section 115 of the Clean Air Act.¹¹ Section 115 authorizes the United States to work with other countries to reduce transboundary air pollution. To regulate HFCs under section 115, EPA must, first, find that U.S. emissions of HFCs endanger the public health or welfare of other countries, and second, determine that if the United States acts to reduce its HFC emissions, other countries will reciprocate. EPA then must give notice to the governors of the states where the HFC emissions originate; the governors would be obligated to amend their State Implementation Plans to reduce HFC emissions.¹²
- EPA could designate HFCs as Class II substances under section 602 of Title VI of the Clean Air Act. Section 602(b) identifies a Class II substance as one which “is known or may reasonably be anticipated to cause or contribute to harmful effects on the stratospheric ozone layer.”¹³ Although the D.C. Circuit in *Mexichem Fluor* noted that HFCs are not ozone-depleting substances, a 2015 NASA study found that HFCs do contribute to ozone depletion by a small but measurable amount.¹⁴ If EPA determines that HFCs may cause harmful effects on the ozone layer, and HFCs are designated as Class II substances, EPA could promulgate regulations to phase out their production and consumption.

The majority in *Mexichem Fluor* cited a number of other Clean Air Act provisions under which EPA could potentially regulate non-ozone depleting substances, but none of these provisions offer a clear path toward comprehensive regulation. EPA could potentially regulate HFCs under Section 109 of the Clean Air Act; however, this would require EPA to implement a National Ambient Air Quality Standard for greenhouse gases, which may pose significant difficulties.¹⁵ EPA could also regulate HFCs under Section 202 of the Clean Air Act, but those regulations would only apply to HFCs used in moving vehicles.¹⁶ Finally, EPA could attempt to regulate HFCs under the Hazardous Air Pollutants Program, but that program is designed to regulate hazardous pollution from stationary sources, not products.

¹¹ *Id.* § 7415.

¹² See generally Michael Burger et al., *Legal Pathways to Reducing Greenhouse Gas Emissions under Section 115 of the Clean Air Act*, 28 Geo. Envtl. L. Rev. 359 (2016).

¹³ 42 U.S.C. § 7671a(b).

¹⁴ *NASA Study Shows That Common Coolants Contribute to Ozone Depletion*, NASA (Oct. 22, 2015), <https://www.nasa.gov/press-release/goddard/nasa-study-shows-that-common-coolants-contribute-to-ozone-depletion>.

¹⁵ 42 U.S.C. § 7409.

¹⁶ *Id.* § 7521 et seq.

The majority in *Mexichem* also noted the possibility of regulating HFCs as toxic substances under the Toxic Substances Control Act (“TSCA”). Under TSCA, EPA can regulate chemical substances and mixtures that pose an unreasonable risk of injury to human health or the environment.¹⁷ However, because of the evidentiary risk assessments required for EPA to initiate TSCA regulation, it has been historically difficult for EPA to regulate existing chemicals under TSCA.

As is evident from the above, EPA does have other options available to pursue a phaseout of HFCs; however, a clear directive from Congress would resolve any uncertainties around the agency’s legal authority to do so. Accordingly, in the absence of Senate ratification of the Kigali Amendment, enactment of new legislation would be the most efficient and effective way to pursue this important goal.

III. Federal and State Legislative Efforts to Implement the Kigali Amendment Should be Supported

But for the *Mexichem Fluor, Inc. v. EPA* decision, EPA’s SNAP Program would have required compliance with the Kigali Amendment’s phased reductions of HFC production and consumption.¹⁸ In efforts to correct for the uncertainty around EPA’s proposed approach, several U.S. Senators and politicians and regulators in California are moving ahead with alternative approaches to implementing phasedowns consistent with the Kigali Amendment. The following discussion summarizes those initiatives, the processes required to give them effect, and key features of their political circumstances. Ultimately, this Committee supports federal legislation as the best overall solution. In the absence of federal legislation, New York State can join California in demonstrating leadership by enacting state legislation to phase out HFCs.

a. S. 2448 Takes a Common Sense Approach and Directly Addresses the Issue at the National Level

S. 2448, the American Innovation and Manufacturing (“AIM”) Act of 2018,¹⁹ was introduced in February 2018. If enacted, it would instruct EPA to issue “one or more rules to phasedown hydrofluorocarbons” by the end of 2018 in conformity with the schedule embodied in the Kigali Amendment.²⁰ Those rules would, at a minimum, establish “an allowance allocation and trading program.”²¹ The AIM Act would also authorize EPA to further support the “advancement of environmentally friendly technologies, including new compounds, blends, and other substances . . .” with programs

¹⁷ 15 U.S.C. § 2601 et seq.

¹⁸ See EPA, Final Rule 20 - Protection of Stratospheric Ozone: Change of Listing Status for Certain Substitutes under the Significant New Alternatives Policy Program (Dec. 21, 2016), <https://perma.cc/P2Q8-5R3S>.

¹⁹ <https://www.congress.gov/115/bills/s2448/BILLS-115s2448is.pdf>.

²⁰ AIM Act §§ 2(a) & (b)(2).

²¹ *Id.* § 2(a).

additional to the trading program.²² While the AIM Act would provide the legal authority for these rules, it would borrow procedures from Title VI of the Clean Air Act to govern their issuance, review, and enforcement²³— an approach that would minimize regulatory novelty and complexity.

Notably, S. 2448 invites EPA to develop the phasedown rule or rules using the process described by the Negotiated Rulemaking Act of 1990 (the “Reg-Neg” Act).²⁴ This approach would engage stakeholders in the rulemaking process from the outset rather than just inviting their responses to a proposed rule drafted by EPA.²⁵ Including a provision expressly suggesting use of the “Reg-Neg” approach reflects the understanding of the bill’s bipartisan sponsors of the consensus view among U.S. industry leaders that HFC substitutes are commercially viable and regulations to restrict HFCs are welcome.

The language of S. 2448 focuses on the economic and health benefits of HFC substitution. It lists a suite of goals—“promote and support economic development,” “minimize costs” and “maximize flexibility for [HFC] producers, reclaimers, and user entities,” and “minimize any additional costs to consumers”—that balance its instruction to “maximize protections for human health and the environment.”²⁶ Similarly, the press release that accompanied introduction of the bill in the Senate noted the size (in terms of capitalization and employment) of the U.S. “hydrofluorocarbon industry” and explained that, “[b]ecause of changing global policy, countries are moving away from using hydrofluorocarbons.”²⁷ In short, the bill treats HFCs’ contribution to climate change and the related imperative to replace them as a background issue, and addresses itself to the foreground issues of how U.S. policy and businesses are positioned to respond. Thus the bill also does not mention the D.C. Circuit’s *Mexichem Fluor, Inc. v. EPA* decision.²⁸

These tactical measures appear to be prudent, given the profound lack of overt federal political support for what implementing the Kigali Amendment would require, namely (i) federal regulatory intervention (ii) for the purpose of mitigating adverse impacts on the global climate (iii) informed by parameters prescribed by international agreement.²⁹

²² *Id.*

²³ *Id.* § 2(b)(1).

²⁴ *Id.* § 2(c).

²⁵ *See* 5 U.S.C. §§ 561–570a.

²⁶ AIM Act § 2(b)(4).

²⁷ Press Release, Cassidy, Kennedy, Colleagues Introduce Bipartisan Bill to Support Next Generation Coolant Manufacturers (February 16, 2018), <https://www.cassidy.senate.gov/newsroom/press-releases/cassidy-kennedy-colleagues-introduce-bipartisan-bill-to-support-next-generation-coolant-manufacturers>.

²⁸ 866 F.3d 451 (D.C. Cir. 2017), *mot. for re-hearing en banc denied*, Case No. 15-1328 (Jan. 26, 2018).

²⁹ The Administration has worked to shut down responses to—and even the study of—climate change by federal agencies, and has sought to undo any and all Obama-era EPA regulations dealing with climate issues. *See* Sabin Center for Climate Change Law at Columbia Law School, Climate Deregulation Tracker,

As of this writing, S. 2448 has been read twice and referred to the Senate Committee on Environment and Public Works.³⁰ Its passage would require the support of that committee, of majorities of the full Senate and House, as well as signature by the President.³¹ The New York State congressional delegation should fully support these measures.

b. California Has Provided a Useful, Replicable Model for State-Level Action

California and New York were both among the 11 states that supported EPA’s 2015 regulation before the D.C. Circuit in the *Mexichem Fluor* case with an amicus brief.³² California, however, has moved to regulate HFCs ahead of federal action. In 2016, it enacted legislation to address HFCs and other “short-term climate pollutants.”³³ That legislation set a statewide 40% HFC emissions reduction target by 2030 from a 2013 baseline and authorized the California Air Resources Board (“CARB”) to issue regulations to meet that target.³⁴ Analysis of compliance pathways conducted for CARB in 2017 found that this would mean adopting a more ambitious program than the one required of developed countries by the Kigali Amendment.

CARB was planning to pursue much of this HFC phasedown by following Rules 20 and 21 of EPA’s SNAP Program—until Rule 20 was suspended and Rule 21’s legal foundation incidentally called into question by the *Mexichem Fluor* decision.³⁵ Now, to fill the gap created by that decision, CARB has adopted a rule that largely copies Rule 20 and other aspects of SNAP.³⁶ Backed by a rule grounded in California law rather than the

<http://columbiaclimatelaw.com/resources/climate-deregulation-tracker/> (accessed Mar. 19, 2018). Congress has similarly eschewed concerns about climate change.

³⁰ Congress.gov, S.2448 - American Innovation and Manufacturing Act of 2018: All Actions 115th Congress (2017-2018), <https://perma.cc/3PE8-KVR7> (accessed Mar. 8, 2018).

³¹ AIM Act § 2(a).

³² See Brief of California and 10 others as Amici Curiae in Support of Intervenor-Respondents' Petitions for Rehearing or Rehearing En Banc, *Mexichem Fluor, Inc. v. EPA*, 2017 WL 4297640 (D. C. Cir. Sept. 17, 2017).

³³ Short-lived climate pollutants: methane emissions: dairy and livestock: organic waste: landfills, 2016 Cal. Stat. ch. 395, <https://perma.cc/7RGJ-5GE7>.

³⁴ *Id.* § (1).

³⁵ CARB, Public Workshop on Rulemaking Proposal: High-Global Warming Potential Refrigerant Emissions Reductions 9 (Oct. 24, 2017), <https://perma.cc/SQA9-RFRG>; see also Elise Herron, California agency seeks input for adopting EPA SNAP’s HFC delisting rules and SLCP strategy’s HFC phasedown plans, R744.com, Oct. 25, 2017 (noting that California will rely on California regulations rather than SNAP for HFCs used in mobile refrigeration or air conditioning, nor for those used in foam-blowing agents).

³⁶ Proposed Prohibitions on Use of Certain Hydrofluorocarbons in Stationary Refrigeration and Foam End-Uses 17 Cal. Code Regs. §§ 95371–77 (2018); Debra Kahn, *State passes HFC rules to fill federal gap*, Climate Wire, Mar. 26, 2018, <https://bit.ly/2GwXEW0> (“The California Air Resources Board (ARB) voted Friday to approve regulations enforcing in-state bans on certain hydrofluorocarbons that the Obama administration had banned in 2015 but that a federal court vacated last year.”).

federal Clean Air Act,³⁷ California will impose incrementally tightening restrictions—and eventually prohibitions—on the production, import, sales, distribution, or entry into commerce of HFCs with high global warming potential (“GWP”) ratings.³⁸ CARB’s pre-existing Refrigerant Management Program, which was initially established to deal with CFCs, will facilitate administration of and compliance with the phasedown.

Unlike some other aspects of California’s climate policy, the HFC phasedown is not especially controversial. Use of HFCs is highly concentrated in particular sectors and products,³⁹ and CARB expects that their replacement with effective substitutes is economically feasible and will not be exceedingly burdensome to stakeholders, particularly if regulatory approaches provide certainty and opportunities for longer-term planning.⁴⁰ Furthermore, because the EU’s HFC phasedown schedule is even more ambitious than California’s,⁴¹ stakeholders affected by California regulations will be able to “free ride” somewhat on investments in new HFC alternatives prompted by the need to comply with European standards.⁴²

It is possible to imagine a legal challenge alleging that the federal Clean Air Act preempts California’s approach, and/or that it violates the U.S. Constitution’s Dormant Commerce Clause, but neither of these presents a significant legal risk to California’s plans. Because the Clean Air Act—as interpreted by the *Mexichem Fluor* decision—does not address HFCs directly, it neither crowds out nor conflicts with California’s program. And because the program in no way discriminates in favor of California businesses or against out-of-state ones, it steers well clear of what the Dormant Commerce Clause prohibits.

In short, California’s approach presents a useful, and replicable, model for New York and other states.

³⁷ See 17 Cal. Code Regs. §§ 95371–77 (2018) (citing Cal. Health & Safety Code §§ 38510, 38598, 38560, 38562, 38566, 38580, 39600, 39601, 39730.5, 41511); see also CARB, Short-Lived Climate Pollutant (SLCP) Reduction Strategy (Mar. 2017), <https://perma.cc/U8JQ-WWFZ>.

³⁸ A chemical’s GWP rating is derived from two factors: how much that chemical absorbs infrared radiation (i.e., how much it heats up in sunlight), and how persistent it is in the atmosphere. HFCs have extremely high GWPs because they absorb solar radiation very efficiently and are extremely stable, such that little in the atmosphere causes them to break down. See G. Myhre et al., *Anthropogenic and Natural Radiative Forcing*, in *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change 711–14* (T.F. Stocker et al. eds. 2013) (suggesting that “relative cumulative forcing index” would be a more accurate term than GWP).

³⁹ CARB, SLCP Reduction Strategy, *supra* note 37, at 90.

⁴⁰ CARB, Potential Impact of the Kigali Amendment on California HFC Emissions 26–27 (Dec. 15, 2017), <https://perma.cc/39JX-WW7K>.

⁴¹ CARB, SLCP Reduction Strategy, *supra* note 37, at 96 (“In order to comply with the EU F-gas regulation that went into effect January 1, 2015, manufacturers are already developing air-conditioning systems that use refrigerants with a 100-year GWP of less than 750.”).

⁴² This is substantially captured by the portion of compliance that CARB ascribes to the Kigali Amendment’s requirements for HFC phasedown. See CARB, Public Workshop presentation, *supra* note 35, at 14.

c. New York and Other States Should Support S.2448 and Pursue State-Level Action Until Congress Takes Action

To date, other states, including New York, have tracked HFC emissions in their greenhouse gas emissions inventories pursuant to domestic or federal law, and generally using federal guidance.⁴³ (Some cities do so as well, including New York City, pursuant to local laws.⁴⁴) Given the *Mexichem Fluor* decision, the Trump Administration’s general aversions to climate policy and international agreements, and burgeoning efforts by states and others to fill the gap left by dormant or rescinded federal efforts, New York (and other states) should follow California’s lead. New York’s Governor Cuomo indicated in his 2018 State of the State speech that he would direct state agencies to implement the Kigali Amendment in New York through a suite of regulations and programs.⁴⁵

We fully support Governor Cuomo’s directive. What is more, we encourage the New York State legislature to initiate consideration of legislation that would expressly authorize the phaseout of HFCs. In pursuing state-level action, New York should also seek to coordinate with California—and perhaps the other nine states that also joined the amicus brief in *Mexichem Fluor*. A coordinated, multi-state approach would provide greater regulatory certainty and coherence, and ultimately prove more effective.

IV. The Economic Case for an HFC Phasedown and Regulation to Support It

⁴³ See, 9 N.Y. Code Rules & Regs. § 7.2(3)(i) (calling for inventory of statewide greenhouse gases); New York State Energy Research & Development Authority, New York State Greenhouse Gas Inventory: 1990-2014, at 17 (Dec. 2016; revised Feb. 2017) (“Historical emissions from [ozone-depleting substances] substitutes are calculated . . . by scaling national emissions from the EPA’s GHG inventory based on the ratio of state to national population.”); see also, e.g., Alaska Department of Environmental Conservation, Alaska Greenhouse Gas Emissions Inventory 1990–2015, at 13 (Jan. 30, 2018), <https://perma.cc/3B32-CGGT>; Alaska Department of Environmental Conservation, Alaska State Greenhouse Gas Emissions Inventory 1990–2010, at 6 (Mar. 12, 2015), <https://perma.cc/G4MH-GSX2> (indicating that report complies with Clean Air Act Title V permit requirements and “the federal Greenhouse Gas Reporting Rule”), *id.* at 9 (indicating that methodology is borrowed from 2013 version of EPA State Inventory Tool).

⁴⁴ New York City, Local Law 22 of 2008; New York City, Inventory of New York City Greenhouse Gas Emissions in 2015, at 52 (Apr. 2017), <https://perma.cc/9SPM-V5C2>; see also City of Chicago, Greenhouse Gas Inventory Report Calendar Year 2015, at 6 (Aug. 2017).

⁴⁵ Gov. Andrew M. Cuomo, Excelsior – Ever Upward: 2018 State of the State, 307–08 (Jan. 2018) (“This year, Governor Cuomo will direct the Department of Environmental Conservation, [NYSERDA] and the Department of State, to develop a comprehensive strategy to reduce HFC emissions by incentivizing the use of climate-friendly alternatives. This effort will provide rebates to municipalities It will also develop new building codes New York State will also work with fellow U.S. Climate Alliance member states to explore options for phasing out HFCs in alignment with the Paris Agreement and the Montreal Protocol.”).

Firms based in the United States have led their industry in the development and manufacture of HFC replacements that neither deplete the ozone layer nor contribute to global warming as much as HFCs do. It is in the U.S. national interest that those firms succeed in continuing to lead the way toward a robust national and global market for HFC replacements, both because of what success would mean for American workers and prosperity as well as what it would mean for the global climate. However, the economic success of those firms' strategic investments in HFC replacements depends on regulations barring HFCs—which are currently cheaper than environmentally friendly replacements—from the marketplace in the foreseeable future.

a. What HFC Phasedown Would Involve, in Brief

As the term is used in relation to HFCs, “phasing down” means excising HFCs from the markets for refrigerants, aerosols, foams, solvents, and flame retardants in a way that provides adequate time to change the designs of affected machinery and systems; to update safety codes that will govern the transport, use, and disposal of HFC replacements; and, of course, to physically replace HFCs currently in use.⁴⁶ Replacements include carbon dioxide, hydrocarbons (such as propane), ammonia, hydrofluoroolefins (“HFOs”), and HFC-HFO blends.⁴⁷ These chemicals behave more or less like HFCs and CFCs: in some instances but not in others replacement can occur with little or no redesign.⁴⁸ In general, HFC replacements do not persist for as long in the atmosphere because they are less stable.⁴⁹ While this instability gives them a lower GWP rating, it can also cause them to require different forms of containment and/or makes them more flammable.⁵⁰

⁴⁶ See generally IFC International, Market Characterization of the U.S. Motor Vehicle Air Conditioning Industry, U.S. Foams Industry, U.S. Aerosols Industry, and U.S. Commercial Refrigeration Industry (July 2015) (listing active firms, device and use categories, and HFCs and HFC-alternatives currently used and identified as candidates for future use).

⁴⁷ W. Goetzler et al., U.S. Dep’t of Energy, Research & Development Roadmap for Next-Generation Low Global Warming Potential Refrigerants 18–23 (2014); see also European Commission, *Climate Action: Climate-friendly alternatives to HFCs and HCFCs* (last visited Apr. 1, 2018), <https://bit.ly/2GnHdN4>; Significant New Alternatives Policy (SNAP), Reducing Hydrofluorocarbon (HFC) Use and Emissions in the Federal Sector through SNAP, <https://bit.ly/2iOp5AS> (last updated Oct. 9, 2017) (“The SNAP program has reviewed over 400 substitutes . . . for various industrial sectors.”).

⁴⁸ See, e.g., Nihar Shah et al., Lawrence Berkeley Nat’l Lab., Opportunities for Simultaneous Efficiency Improvement and Refrigerant Transition in Air Conditioning (July 2017), <https://escholarship.org/uc/item/2r19r76z> (“CO₂ typically introduces additional design complexities due to its high operating pressure, lower cooling capacity, and lower thermodynamic cycle efficiency at high ambient temperatures, and is more suitable for applications such as supermarket refrigeration where a secondary loop prevents the refrigerant from leaking into occupied spaces.”).

⁴⁹ HFOs are the most chemically similar to HFCs. The others listed include Not-In-Kind substitutes, meaning that they can perform similar functions but are chemically distinct in ways that have potentially significant engineering implications. See generally Steve Seidel et al., Ctr. for Climate & Energy Solutions, Not-In-Kind Alternatives to High Global Warming HFCs (Oct. 2016), <https://bit.ly/2q73xjk>.

⁵⁰ Goetzler et al., *supra* note 47, at 18–19; Shah et al., *supra* note 48, at 73 (“The principal barrier to wider deployment of low-GWP alternatives for [ductless mini-split room air conditioning units] is safety (i.e., flammability.”); Danfoss, Refrigerant options now and in the future 11, fig. 7 (Sept. 2014),

In economic terms, phasedown will involve transitioning from markets dominated by relatively cheap HFCs to markets in which the currently high costs of manufacturing and distributing HFC replacements have fallen far enough to make those replacements price-competitive.⁵¹ Notably, although the cost of HFCs generally accounts for only a small percentage of the total costs of the devices and processes that employ them,⁵² price differentials still matter greatly to sales.⁵³ This pattern of transition is well understood thanks to experience with the global phasedown of CFCs that followed adoption of the 1987 Montreal Protocol. Many firms initially balked at the capital and R&D costs involved in CFC replacement,⁵⁴ but that phasedown ultimately proceeded faster and more cheaply than firms and regulators alike had anticipated.⁵⁵ As was the case with the replacement of CFCs, current cost differentials between HFCs and their replacements owe to some or all of the following factors: the 20-year life of patents on all HFCs have run, but not yet those of replacements, raising both costs and barriers to entry; replacements' production processes continue to be refined, adding costs relative to well-established processes of HFC production; replacement production runs are currently small relative to those of HFCs, which enjoy economies of scale in distribution as well as production; and some equipment must be redesigned to use HFC replacements instead of HFCs.⁵⁶ Accomplishing this transition will likely be aided by the fact that HFC manufacturers, such as Arkema, Chemours, Daikin Chemical, Honeywell, and Mexichem, are well-positioned to also manufacture HFC replacements.⁵⁷

b. HFC Phasedown Would Yield Net Benefits for U.S. Stakeholders

<https://bit.ly/2HOEJUv> (depicting relationship between GWP, pressurization required for storage and/or use, and flammability).

⁵¹ See, e.g., David Sherry, Maria Nolan, et al., HFO-1234yf: An Examination of Projected Long-Term Costs of Production (Apr. 2017), <https://bit.ly/2q0dz5E> (discussing replacement for HFC used in motor vehicle air conditioning systems).

⁵² U.S. International Trade Commission, Hydrofluorocarbon Blends and Components from China, Investigation No. 731-TA-1279 (Final), at II-9 (Aug. 2016) [hereinafter "ITC 2016"] (noting that HFCs account for between 2% and 5% of the costs of air conditioning and refrigeration).

⁵³ *Id.* at II-10 (noting that sales of HFC blends versus R-22, an HCFC scheduled for incremental phaseout, were highly sensitive to a 5-fold price difference).

⁵⁴ UN Environment Programme, *The Montreal Protocol and the Green Economy, Assessing the contributions and co-benefits of a Multilateral Environmental Agreement* 26 (2012); Elizabeth Cook, *Lessons from the CFC Phase-Out in the United States*, in *Protecting the Ozone Layer* 179 (P.G. Presort et al. eds. 1998) ("Not that long ago, reaching this ambitious goal [of CFC phase-out] without devastating the economy was considered to be virtually impossible.").

⁵⁵ Cook, *supra* note 54, at 179–89; see also R. Vanner, *Ex-post estimates of costs to business of EU environmental policies: A case study looking at Ozone Depleting Substances*, report commissioned by European Commission, DG Environment (2006), <https://bit.ly/2uBvDs8>.

⁵⁶ *Id.* at 2; see also Won Young Park et al., Lawrence Berkeley Nat'l Lab'y, *Assessment of commercially available energy-efficient room air conditioners including models with low global warming potential (GWP) refrigerants* 3, 54 (Oct. 2017) (noting role of scale economies in reducing the costs and thus prices of products designed to rely on HFC-replacements).

⁵⁷ Bitzer, *REFRIGERANT REPORT 19* (2016), <https://bit.ly/2ijwt6u>.

U.S. compliance with the timetable prescribed for developed countries by the Kigali Amendment would mean cutting HFC use 85% by 2036 from a 2019 baseline. Given that HFC manufacturers—to say nothing of end-users or companies whose equipment currently relies on HFCs to operate—employ almost 600,000 workers in the U.S. and make annual sales in excess of \$2 billion,⁵⁸ phasedown at this pace would be a monumental task. Nonetheless, because coordinated international efforts to phase down HFCs are well underway and show no signs of slowing or reversal, U.S. stakeholders have much more to gain than lose from continuing to keep up with the leads in this segment of the chemical industry.

Due partly to the challenges of accessing and/or publishing proprietary information about particular companies' operations and production costs, no comprehensive, publicly available study describes with precision the expected costs *and* benefits of phasedown in the U.S.⁵⁹ However, several national governments, including the U.S. federal government, have published estimates showing that they expect stakeholders in their respective countries to glean net benefits from compliance with the Kigali timetable.⁶⁰ The EPA examined the question in its decision to apply SNAP to HFCs—the action that the *Mexichem Fluor* decision struck down. Building on several earlier analyses,⁶¹ EPA found that the benefits of applying SNAP to HFCs in compliance

⁵⁸ AIM Act Press Release, *supra* note 27. Aldis Clarke, *United States Refrigerant Market 2017 By Key Manufacturers – Chemours, Mexichem, Daikin and Honeywell*, Registrar Daily Daily News (March 19, 2018), <http://registrardaily.com/2017/07/25/united-states-refrigerant-market/>. Internationally, the leading firms include Honeywell International Inc. (U.S.), Daikin Industries Ltd. (Japan), SRF Ltd. (India), and Arkema S.A. (France). *Refrigerant Market by Type (HCFC, HFC, HFO, Isobutane, Propane, Ammonia, and CO2), Application (Refrigerators, Large-scale Refrigerators, Chillers, Air Conditioners, and Heat Pumps), Region - Global Forecast to 2022*, MarketsandMarkets (May 2017), <https://bit.ly/2uLFwDX>.

⁵⁹ Zack Colman, *Pact's Future Uncertain as White House Champion Exits*, E&E News (February 19, 2018), <https://bit.ly/2IyW1VX> (reporting that the U.S. refrigerant trade association has yet to generate an economic analysis of failure to regulate HFCs in line with Kigali Amendment). For a description of the U.S. and Chinese markets from which most numeric data has been redacted, see ITC 2016, *supra* note 52. For an estimate of the global, aggregated social costs and benefits of phasedown in compliance with the Kigali timetable, see Lena Höglund-Isaksson et al., *Cost estimates of the Kigali Amendment to phase-down hydrofluorocarbons*, 75 *Env'tl. Sci. & Pol'y* 138 (2017).

⁶⁰ *See, e.g.*, Canadian Departments of Environment and Health, Regulatory Impact Analysis Statement for Regulations Amending the Ozone-depleting Substances and Halocarbon Alternatives Regulations (Nov. 26, 2016) (estimating net benefit of \$6 billion for HFC phasedown from 2018 to 2040), <https://bit.ly/2Gydygm>; National Interest Analysis [Australia]: Category 1 Treaty: Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, at para. 30 [2017] ATNIA 14; [2017] ATNIF 15 (noting that, partly because Australian law already requires HFC phasedown, “[t]he cost benefit analysis concluded that the overall benefit to cost ratio for the HFC phasedown [required by the Kigali Amendment] was around 1.1 – 1.2, taking into account the carbon and energy savings.”).

⁶¹ *See, e.g.*, EPA, Benefits of Addressing HFCs under the Montreal Protocol (July 2016), <https://bit.ly/2GSsOb9> (listing national efforts already underway and estimating environmental benefits of phasedown); ICF International, Economic Impact Screening Analysis for Regulatory Changes to the Listing Status of High-GWP Alternatives – Revised 34 (July 2015); EPA, Global Mitigation of Non-CO2 Greenhouse Gases: 2010-2030, IV-19 to IV-43 (Sept. 2013), <https://bit.ly/2JhDBKi> (explaining derivation of marginal abatement cost curves and breakeven prices for HFC replacement).

with the Kigali timetable would yield annual net social savings of between \$19.3 million and \$25.1 million.⁶² While the costs and benefits would fall unevenly, the overall impact would not be significantly negative even for small businesses that would have a harder time absorbing the necessary up-front capital costs.⁶³ Importantly, EPA’s discussion of HFC phasedown highlighted the energy efficiency gains that are expected to accompany a transition away from HFCs.⁶⁴ As happened with the transition away from CFCs in the 1990s and 2000s, redesign and accelerated replacement can again yield significant improvements in the energy efficiency—and thus also cost-effectiveness—of systems and devices.⁶⁵

These benefits are less likely to materialize for U.S. stakeholders if U.S. regulators break ranks with those of Canada, the EU, Japan, and elsewhere. The reason is simple and easily grasped: capturing these benefits is contingent on stakeholders’ investments in new chemicals, processes, equipment, and standards not being undercut by the possibility of ongoing sales of HFCs.⁶⁶

c. Snapshot of the HFC Phasedown in the U.S. and Globally

HFC phasedown has already begun and proceeds apace, in the U.S. and elsewhere. The Air Conditioning Heating & Refrigeration Institute (“AHRI”), which represents about 90% of U.S. air conditioning manufacturers and 70% of manufacturers globally, launched its Low-GWP Alternative Refrigerants Evaluation Program in 2011 to consolidate and coordinate the tasks of evaluating HFC replacements.⁶⁷ In September 2014, the Obama White House was able to collate a long list of phasedown initiatives

⁶² Protection of Stratospheric Ozone: Change of Listing Status for Certain Substitutes Under the Significant New Alternatives Policy Program, 80 Fed. Reg. 42870, 42944 (July 20, 2015), <https://bit.ly/2GupYz>. EPA estimated the net economic impact of the rule to be roughly \$25 million (and maximal up-front costs to be about \$42 million), which is well below the \$100 million threshold used to identify “major” regulations for which full cost-benefit analysis must be conducted in advance of adoption. *Id.*

⁶³ *Id.*; see also ICF, *supra* note 61, at 34 (“This analysis indicates that fewer than 80 of the nearly 500,000 affected small businesses—or <0.1%—could incur costs in excess of 1% of annual sales, and that fewer than 60 small businesses could incur costs in excess of 3% of annual sales. These estimates are below the thresholds for a substantial number determination (i.e., fewer than 100 businesses, and less than 20% of affected entities).”).

⁶⁴ 80 Fed. Reg. at 42921–922.

⁶⁵ *Id.* at 42922 (“Throughout the history of the SNAP program, EPA has seen the energy efficiency of refrigeration and air-conditioning equipment increase, despite changing refrigerant options.”) & 42946; see also generally Shah et al., *supra* note 48 (discussing opportunities for boosting energy efficiency gains by coordinating with HFC phasedown).

⁶⁶ Danfoss, *supra* note 50, at 6–7 (“When investing in new technology and competence build up, major drivers ensuring the certainty for industry are legislation and derived standardization. * * * Regulatory certainty is, of course, vital.”); Stephen O. Andersen et al., Chatham House, A Global Response to HFCs through Fair and Effective Ozone and Climate Policies 2 (July 2014) (“As the experience of the Montreal Protocol has shown, the single most effective action the international community can take is to create a climate of regulatory certainty that HFCs will be phased down.”).

⁶⁷ AHRI, Participants’ Handbook: AHRI Low-GWP Alternative Refrigerants Evaluation Program (Low-GWP AREP) 4 (Apr. 2015), <https://bit.ly/2uRfKhA>.

being undertaken by U.S. companies and trade associations: examples include Coca-Cola, which committed to purchasing only HFC-free refrigeration equipment; several air conditioning unit manufacturers, which set aggressive targets for production of HFC-free equipment lines; and retailers like Kroger and Target, which announced investments in non-HFC refrigeration equipment and facilities.⁶⁸ By 2016, Honeywell had already spent over \$500 million in R&D and capital spending for the development HFC-replacements,⁶⁹ and in February 2017 Chemours broke ground on a HFO production facility in Corpus Christi, Texas.⁷⁰

The EU adopted its “F-Gas Regulation” (which included a mobile air conditioning or “MAC” Directive) in 2006, and tightened it in 2014;⁷¹ one survey of stakeholders credits those ambitious and stringent measures with EU companies’ unrivaled progress toward phasedown.⁷² Japan enacted enforceable HFC phasedown legislation in 2015.⁷³ Australia,⁷⁴ New Zealand,⁷⁵ and Canada⁷⁶ all took concrete regulatory steps toward phasedown in 2017. And China, which issued the *First Catalogue of Recommended Substitutes for HCFCs* in February 2016, is now implementing *Stage 2 HCFC Phase-out Management Plan (HPMP)*.⁷⁷ One assessment of

⁶⁸ Fact Sheet: Obama Administration Partners with Private Sector on New Commitments to Slash Emissions of Potent Greenhouse Gases and Catalyze Global HFC Phase Down (Sept. 16, 2014), <https://bit.ly/2qhksAD>.

⁶⁹ Hiroko Tabuchi & Danny Hakim, How the Chemical Industry Joined the Fight Against Climate Change, N.Y. Times, Oct. 16, 2016, <https://nyti.ms/2qcaz6b>; Malathi Nayak, U.S. companies brace for climate-friendly alternatives in cooling systems, Thomson Reuters, Oct. 16, 2016, <https://reut.rs/2GCsfin> (reporting over \$500 million in investments by Honeywell alone).

⁷⁰ Nayak, supra note 69; Robbie Orvis, Economy-Wide Gains, 9.5 Billion Tons HFC Emissions At Risk from U.S. Court of Appeals Ruling, Forbes, Aug. 22, 2017, <https://bit.ly/2GYXBDe>.

⁷¹ Regulation of the European Parliament and of the Council on fluorinated gases and repealing Regulation (EC) No 842/2006, F-gas Regulation (EU) N 517/2014.

⁷² Shecco (commissioned by EU Green Party), F-Gas Regulation Shaking Up the HVAC&R Industry 44 (Oct. 2016) (“André Fourie, head of water security and environmental value at SABMiller, stated: ‘There is only one reason why our European business is ahead of the rest – and that’s because [F-Gas] Regulation has moved faster in Europe.’”).

⁷³ Ozone Layer Protection Law (1998), which targets CFCs and HCFCs, and April 2015’s Act on Rational Use and Proper Management of Fluorocarbons 2015 (revised 2015, which targets HFCs). Atsuhiko Meno, *Laws and Regulation for Fluorocarbons in Japan*, Ministry of Economy, Trade and Industry, Japan (METI) (August 20, 2015), https://www.jraia.or.jp/english/icr/ICR2015_METI.pdf.

⁷⁴ [Australia] Ozone Protection and Synthetic Greenhouse Gas Management Legislation Amendment Bill 2017, <https://bit.ly/2HjLSSr> (updating existing legislative framework to address HFCs as well as CFCs and HCFCs).

⁷⁵ New Zealand Ministry for the Environment, New Zealand’s phase down of hydrofluorocarbons to ratify the Kigali Amendment to the Montreal Protocol and associated supporting measures (2017), <https://bit.ly/2IDkKZ7>.

⁷⁶ Regulations Amending the Ozone-depleting Substances and Halocarbon Alternatives Regulations, SOR/2017-216 (Oct. 5, 2017), <https://bit.ly/2qgkvLU>.

⁷⁷ Carolyn Zhong, *China’s Actions to Promote Low-GWP Alternatives: The 27th China Refrigeration Exhibition*, Environmental Investigation Agency (April 12, 2016), <https://eia-global.org/blog-posts/chinas-actions-to-promote-low-gwp-alternatives-the-27th-china-refrigeration>.

phasedown measures taken in China’s light-duty motor vehicle sector makes the notable point that, owing to EU and US leadership, “this transition cannot be avoided regardless of China’s decision-making if Chinese manufacturers wish to compete globally.”⁷⁸

Nations that ratify the Kigali Amendment will begin reporting their progress in 2019, but for now there is no comprehensive, centralized means of tracking how successfully HFCs are being displaced by low-GWP alternatives. The International Energy Agency has launched a tracking tool, but it represents a nascent effort rather than a mature one.⁷⁹ Mobile air conditioning systems provide a useful illustration of current phasedown efforts. Spurred by the EU’s 2006 MAC Directive, which banned use of HFC-134a in newly marketed vehicles starting in 2011,⁸⁰ carmakers and their suppliers identified two likely options for replacing HFC-134a: HFO-1234yf, and concentrated CO₂. Various firms in the MAC supply chain, led by those in the EU, have since pursued research towards making one or the other commercially competitive,⁸¹ and have in the past few years begun to scale-up HFO-1234yf production and distribution capacity in particular.⁸² Those research and capital investments *assume* that HFC-134a will eventually be banned in all jurisdictions, not just the EU, and would be undermined by a decision in one or more sizeable jurisdictions not to do so.

V. Conclusion

For the reasons discussed above, the Committee supports passage of S.2448, the AIM Act, and encourages the New York State congressional delegation to actively support the bill. Recognizing the critical need to reduce emissions of HFCs in order to effectively combat climate change, and that passage of federal legislation is uncertain, the Committee also supports parallel efforts to enact legislation at the state level, in New York and elsewhere, to phase out HFCs. Governor Cuomo has already demonstrated his commitment to pursuing a regulatory approach. State legislation would provide even greater regulatory certainty.

⁷⁸ Li Du, Dan Meszler, and Ray Minijares, *White Paper: Technical Assessment of an HFC-134a Phase-Out in the Chinese Light-Duty Motor Vehicle Sector*, ICCT (May 2016), https://www.theicct.org/sites/default/files/publications/ICCT_HFC-134a_China-fleet_201609.pdf.

⁷⁹ Brian F. Gerke & Gabrielle Dreyfus, Lawrence Berkeley Nat’l Lab., *The Advanced Cooling Market Tracker: Monitoring deployment of climate-friendly cooling technology worldwide* (Sept. 2017), <https://bit.ly/2GF41br>; see also International Energy Agency, *The AC Challenge*, <http://www.iea.org/cem/AC-Challenge/>.

⁸⁰ Directive 2006/40/EC of the European Parliament and of the Council of 17 May 2006 relating to emissions from air conditioning systems in motor vehicles and amending Council Directive 70/156/EEC.

⁸¹ Bitzer, *supra* note 57, at 11, 35 (“it is not yet possible to make a prediction as to whether the CO₂ technology can in the long run prevail in this application.”).

⁸² Sherry et al., *supra* note 51, at 4 (larger-scale HFO-1234yf production facilities are only now coming on line); see also Honeywell, Press Release: Honeywell Starts Up \$300 Million Automotive Refrigerant Production Facility In Louisiana (May 16, 2017), <https://bit.ly/2H5Iqkc>; Chemours, Press Release: Chemours Announces Major Investments in New U.S. HFO-1234yf Plant (May 2, 2016), <https://bit.ly/2EvCF1k>.

We would welcome the opportunity to discuss these matters further at your convenience.

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