



Administrator Lisa P. Jackson  
Environmental Protection Agency  
Ariel Rios Building  
1200 Pennsylvania Avenue, N.W.  
Washington, DC 20460

May 7, 2010

Re: Petition to Remove HFC-134a from the List of Acceptable  
Substitutes under the Significant New Alternatives Policy  
Program

Dear Administrator Jackson:

The Natural Resources Defense Council (NRDC) and the other undersigned organizations hereby petition the Environmental Protection Agency (EPA) to remove HFC-134a from the list of acceptable substitutes for CFC-12 in motor vehicle air conditioning systems maintained under EPA's Significant New Alternatives Policy (SNAP) program, and to remove HFC-134a from such list in any other end-use category (e.g., aerosols, stationary refrigeration) where more benign alternatives are available. This petition is filed pursuant to Section 612(d) of the Clean Air Act and 40 C.F.R. § 82.184(b)(3). Under section 612 of the Clean Air Act, EPA has the authority to evaluate alternatives to ozone-depleting substances (ODS) identified in section 602 and to publish a list of acceptable and unacceptable substitutes through the SNAP program. EPA also has the authority to revise this list on its own, or in response to a petition, to remove a substitute previously listed as acceptable.

#### Motor Vehicle Air Conditioning Systems

CFC-12 is a Class I ozone-depleting chemical under section 602. EPA was required to identify acceptable substitutes for CFC-12 by considering their "atmospheric effects and related health and environmental impacts," the "general population risks from ambient exposure to compounds with direct toxicity to increased ground-level ozone," "ecosystem risks," "occupational risks," "consumer risks," "flammability," and "cost and availability of the substitute."<sup>1</sup> In 1995, EPA determined HFC-134a to be an acceptable substitute for CFC-12 in motor vehicle air conditioning (MVAC) systems because it has an ozone-depleting potential (ODP) of zero and a global warming potential (GWP) of 1300, as compared to CFC-12's ODP of 1 and GWP of 10,890.<sup>2</sup> Since then, more attractive

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<sup>1</sup> Significant New Alternatives Policy Program, Agency Review of SNAP Submissions, 40 C.F.R. § 82.180(a)(7)(i)-(ii) (2009).

<sup>2</sup> Protection of Stratospheric Ozone, 60 Fed. Reg. 31,092, 31,097 (June 13, 1995).

alternatives for MVAC systems have become available. Currently, there are other substitutes for CFC-12 that have been approved or are in the approval process with significantly lower ODPs and GWPs than CFC-12 and HFC-134a – carbon dioxide (CO<sub>2</sub>),<sup>3</sup> HFC-152a,<sup>4</sup> and HFO-1234yf.<sup>5</sup> In light of the health and environmental goals of the SNAP program and the availability of MVAC substitutes that present much lower risks to health and environment than those associated with HFC-134a, NRDC and its co-petitioners request that EPA remove HFC-134a from the acceptable substitutes list for MVAC systems.

The Significant New Alternatives Policy program implements section 612 of the Clean Air Act. The SNAP program was created to assure the health and environmental safety of alternatives for ozone-depleting substances that were being phased out under Section 602 of the Act. The purpose of the SNAP program is “to allow a safe, smooth transition away from ozone-depleting compounds by identifying substitutes that offer lower overall risks to human health and the environment.”<sup>6</sup> Section 602 of the Clean Air Act contains a list of Class I and Class II ozone-depleting substances which have been or are being phased out. Under the SNAP program EPA evaluates proposed substitutes to these ODS and classifies the substitutes as acceptable, acceptable subject to use limits or conditions, or unacceptable.<sup>7</sup> The SNAP approval process provides EPA an opportunity to review proposed alternatives before they enter the marketplace. SNAP determinations thus can drive commercial development towards substitutes that present a lower overall risk to human health and the environment.

Applicants for listing of potential substitute applications must provide certain information, including the name and description of the substitute, physical and chemical information, toxicity data, and health and safety studies.<sup>8</sup> In addition, applicants must include information concerning the ozone-depleting potential and global warming impacts of the substance, including “information on the GWP index and the indirect contributions to global warming caused by the production or use of the substitute.”<sup>9</sup> EPA’s acceptability determinations are comparative evaluations, where EPA looks not only at the proposed substitute in comparison to the relevant Class I or Class II substance listed in Section 602, but also in comparison to “other substitutes for the same end-use.” As such, EPA must consider not only the original ODS but also the other listed substitutes for that substance in analyzing whether to list new alternatives. For example, in the context of MVAC systems, HFO-1234yf is being evaluated as a substitute for both CFC-12 and HFC-134a. In comparing these substitutes directly with each other, EPA then may “prohibit the use of those substitutes found, based on the same comparisons, to

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<sup>3</sup> Protection of Stratospheric Ozone, 59 Fed. Reg. 13,044, 13,082 (Mar. 14, 1994).

<sup>4</sup> Substitute Listing in the Motor Vehicle Air Conditioning Sector, 71 Fed. Reg. 55,140 (Sept. 21, 2006).

<sup>5</sup> Protection of Stratospheric Ozone: New Substitute in the Motor Vehicle Air Conditioning Sector Under the Significant New Alternatives Policy (SNAP) Program, 74 Fed. Reg. 53,445 (proposed Oct. 19, 2009).

<sup>6</sup> Environmental Protection Agency, Significant New Alternatives Policy (SNAP) Program, <http://www.epa.gov/ozone/snap/index.html> (last visited Mar. 17, 2009).

<sup>7</sup> *Id.*

<sup>8</sup> Significant New Alternatives Policy Program, Information Required to be Submitted, 40 C.F.R. § 82.178 (2009).

<sup>9</sup> *Id.*

increase overall risks.”<sup>10</sup> This progressively comparative analysis allows the SNAP program to continually promote new and less environmentally harmful substitutes as they are developed and listed.

EPA’s criteria for risk comparison in the SNAP program support Title VI’s goal of phasing out ODS from the marketplace in conjunction with the Montreal Protocol. EPA must explicitly analyze, among other things, “[a]tmospheric effects and related health and environmental impacts. . .[and] [g]eneral population risks from ambient exposure to compounds with direct toxicity and to increased ground-level ozone.”<sup>11</sup> In promulgating the initial SNAP rule in 1994, the agency noted that they had “followed several guiding principles in developing the SNAP program.”<sup>12</sup> The rule outlines a comparative risk framework, where

[t]he Agency's risk evaluation compares risks of substitutes to risks from continued use of ozone-depleting compounds as well as to risks associated with other substitutes. This evaluation considers effects due to ozone depletion as well as effects due to direct toxicity of substitutes<sup>13</sup>

The proposed rule outlining the SNAP program elaborates on the climate-focused nature of this risk analysis, where the “‘overall risk’ characterization will consider such factors as: Toxicity and exposure -- both human health and ecological; chlorine loadings; ozone-depletion potential; global-warming potential; and flammability.”<sup>14</sup>

In light of the comparative nature of the SNAP analysis and given that other acceptable substitutes are on the market or soon to be available, we request that EPA remove HFC-134a from the list of acceptable alternatives for MVAC purposes, on a schedule that is based on the most rapid feasible introduction of one or more of the above-mentioned acceptable alternatives – including HFO-1234yf on the assumption that it receives final SNAP approval as soon as possible. Due to the comparative and progressive nature of the SNAP program, HFO-1234yf and other potential substitutes should be considered substitutes not only for CFC-12 (the initial ODS at issue) but also for alternatives already listed, including HFC-134a. In light of this, we request that EPA establish a schedule for rapidly phasing out the use of HFC-134a in new vehicles and a schedule for subsequently phasing out its use in older vehicles. This approach will allow the auto industry to rapidly transition to HFO-1234yf or other acceptable alternatives in MVAC systems.

EPA initially approved HFC-134a for use as an acceptable alternative in 1995. The initial approval stated that:

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<sup>10</sup> Significant New Alternatives Policy Program, Purpose and Scope, 40 C.F.R. § 82.170 (2009).

<sup>11</sup> Significant New Alternatives Policy Program, Agency Review of SNAP Submissions, 40 C.F.R. § 82.180(a)(7)(i)-(ii) (2009).

<sup>12</sup> 59 Fed. Reg. at 13,046.

<sup>13</sup> *Id.*

<sup>14</sup> Protection of Stratospheric Ozone; Request for Data and Advanced Notice of Proposed Rulemaking, 57 Fed. Reg. 1984, 1985 (Jan. 16, 1992).

HFC-134a does not contribute to ozone depletion. HFC-134a's GWP and atmospheric lifetime are close to those of other alternatives which have been determined to be acceptable for this end-use. However, HFC-134a's contribution to global warming could be significant in leaky end-uses such as motor vehicle air conditioning systems (MVACS). EPA has determined that the use of HFC-134a in these applications is acceptable because industry continues to develop technology to limit emissions. In addition, the number of substitutes available for use in MVACS is currently limited. HFC-134a is not flammable and its toxicity is low.<sup>15</sup>

This analysis, though it may have been appropriate in 1995, does not hold true today, and highlights the necessity of phasing out HFC-134a. First, HFC-134a's GWP of 1300 is no longer close to that of other alternatives. For example, CO<sub>2</sub> has a GWP of 1, and HFO-1234yf has a GWP of 4.<sup>16</sup> Further, the clean car rules jointly promulgated by EPA and the National Highway Traffic Safety Administration (NHTSA) specifically note that leakage of HFC-134a from MVAC systems continues to be a significant contributor to global warming emissions from motor vehicles.<sup>17</sup> Finally, both Europe and California have plans to ban use of HFC-134a in MVAC systems, *infra*, and the automobile industry should begin to phase out this substance in preparation for this change. In short, the properties of HFC-134a make it unacceptable as an approved alternative for MVAC systems under the SNAP program in light of current available alternatives. The additional step of removing HFC-134a from the list of acceptable substitutes will signal the automobile industry to accelerate the pace of the transition to more benign alternatives.

The most promising alternative poised to enter the market is HFO-1234yf. EPA has proposed to add HFO-1234yf to the list of approved alternatives for MVAC systems under the SNAP program.<sup>18</sup> HFO-1234yf has an ODP of zero, a GWP of 4, and a very short atmospheric lifetime of only 11 days.<sup>19</sup> Further, the substance can be used in both new MVAC systems and retrofitted for older systems. In its comments to this proposed rule, NRDC noted that EPA had identified some potential for HFO-1234yf to contribute to ground-level ozone.<sup>20</sup> NRDC's comments noted several reasons why the analysis prepared for EPA's proposal may have overstated its contribution to ground-level ozone and requested that EPA evaluate the current science to ensure that the substance's contribution to ground-level ozone is properly estimated. For these reasons, NRDC stated that it saw no reason to object to approval of HFO-1234yf for use in MVACs with the use conditions included in the proposed approval.

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<sup>15</sup> 60 Fed. Reg. at 31,097.

<sup>16</sup> *See supra*, notes 2, 4.

<sup>17</sup> Environmental Protection Agency, Final Rulemaking: Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards at 207, <http://www.epa.gov/otaq/climate/regulations/ldv-ghg-final-rule.pdf> (last visited April 22, 2010).

<sup>18</sup> Protection of Stratospheric Ozone: New Substitute in the Motor Vehicle Air Conditioning Sector Under the Significant New Alternatives Policy (SNAP) Program, 74 Fed. Reg. 53,445 (Oct. 19, 2009).

<sup>19</sup> *Id.* at 53,447.

<sup>20</sup> Comments of Natural Resources Defense Council on *Protection of Stratospheric Ozone: New Substitute in the Motor Vehicle Air Conditioning Sector under the Significant New Alternatives Policy (SNAP) Program; Proposed Rule*, 74 Fed. Reg. 53, 445 (Oct. 19, 2009), Docket No. EPA-HQ-OAR-2008-0664.

In addition to HFO-1234yf, other alternatives are available for MVAC end-uses. The presence of these approved alternatives under the SNAP program provides additional support for phasing out HFC-134a use in MVAC systems. In a recent proposed rulemaking regarding CO<sub>2</sub> and HFC-152a, EPA explicitly considered the risks associated with those substances “in relation to the risks associated with the predominant ozone-depleting substance (ODS) refrigerant substitute in MVACs, HFC-134a.”<sup>21</sup> The structure of EPA’s comparison of these three accepted alternatives emphasizes the overall objective of the SNAP program to shift the market towards increasingly less environmentally harmful substitutes. Further, as the market shifts towards these less harmful substitutes, the SNAP program encourages further environmental gains through the approval of increasingly more environmentally friendly substitutes, to entirely replace previous alternatives that pose greater risks.

Carbon dioxide is currently a proposed alternative with use conditions for MVAC systems. CO<sub>2</sub> has an ODP of zero, and a GWP of one. EPA’s final rule entitled “Protection of Stratospheric Ozone” listed CO<sub>2</sub> as an acceptable substitute for CFC-12, and noted that CO<sub>2</sub> is a

well-known, nontoxic, nonflammable gas. Its GWP is defined as 1, and all other GWPs are indexed to it. Since it is readily available as a waste gas, no additional chemical will need to be produced. Thus, the use of CO<sub>2</sub> as a refrigerant will not contribute to global warming.<sup>22</sup>

EPA updated its data on CO<sub>2</sub> recently in a proposed rule regarding CO<sub>2</sub> and HFC-152a, adding use conditions to the acceptability determination on CO<sub>2</sub>.<sup>23</sup> EPA noted there were some health concerns for motor vehicle passengers and those who service the vehicles from high levels of carbon dioxide exposure. Nonetheless, as compared to HFC-134a, which has a GWP of 1,430, CO<sub>2</sub> is an attractive proposed alternative for MVAC systems in the context of global warming.

HFC-152a is a listed approved substitute for MVAC systems under the SNAP program. HFC-152a has an ODP of zero, a GWP of less than 150 and a toxicity profile that EPA has stated is “comparable to CFC-12 and its most prevalent substitute, HFC-134a.”<sup>24</sup> EPA has noted flammability concerns with HFC-152a at concentrations above 3.7%, but with proper management techniques to reduce leakage HFC-152a can be used successfully.<sup>25</sup> The existence of HFC-152a in the marketplace provides EPA with additional rationale to phase out and remove HFC-134a from the list of acceptable alternatives for the MVAC sector.

The joint rulemaking between EPA and NHTSA establishing fuel economy and emissions standards, further emphasizes the benefit of replacing HFC-134a with lower global warming potential, such as HFO-1234yf, CO<sub>2</sub>, and HFC-152a. The rule contains a

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<sup>21</sup> 71 Fed. Reg. at 55,142.

<sup>22</sup> 59 Fed. Reg. at 13,082.

<sup>23</sup> 71 Fed. Reg. at 55,140.

<sup>24</sup> 71 Fed. Reg. at 55,144.

<sup>25</sup> See, e.g., 73 Fed. Reg. at 33,306.

mechanism through which automobile manufacturers can generate credits from reducing MVAC leakage or adopting lower-GWP alternative refrigerants – credits that count towards compliance with EPA’s greenhouse gas emission standards.<sup>26</sup>

EPA has identified two ways that MVAC refrigerants contribute to vehicles’ total emissions of greenhouse gases: leakage of refrigerant into the atmosphere and consumption of fuel to provide power to the air conditioning system. The rule estimates that together these factors account for approximately 9% of GHG emissions from light-duty cars and trucks.<sup>27</sup> EPA points directly to HFC-134a and its high global warming potential as the reason that leakage contributes so greatly to GHG emissions. The rule states:

[D]ue to the high GWP of this HFC, a small leakage of the refrigerant has a much greater global warming impact than a similar amount of emissions of CO<sub>2</sub> or other mobile source GHGs. Manufacturers can reduce A/C leakage emissions of CO<sub>2</sub> or other mobile source GHGs. Manufacturers can reduce A/C leakage emissions by using leak-tight components. Also, manufacturers can largely eliminate the global warming impact of leakage emissions by adopting systems that use an alternative, low-GWP refrigerant.<sup>28</sup>

EPA puts forward these “A/C leakage credits” as a way to achieve reductions through the fleet averaging program.<sup>29</sup> The rule notes that Europe and California have plans to phase out HFC-134a, and in light of this:

[R]ecognizes that substituting a refrigerant with a significantly lower GWP will be a very effective way to reduce the impact of all forms of refrigerant emissions, including maintenance, accidents, and vehicle scrappage.<sup>30</sup>

In noting the benefit of phasing out HFC-134a, the rule explicitly points to HFO-1234yf as the preferred alternative. In light of this attractive alternative, MVAC systems going forward will not have to rely on older alternatives with higher ODPs and GWPs.

HFC-134a has a very high GWP, and its leakage from MVAC systems contributes significantly to GHG emissions from motor vehicles. There are other, less environmentally harmful substances available for use in MVAC systems, among them HFC-152a and potentially HFO-1234yf and CO<sub>2</sub>. Moreover, Europe and California have plans to ban HFC-134a. EPA should speed up the phase-out of HFC-134a to facilitate and expedite automakers’ smooth transition from this harmful substance to other approved alternatives for MVAC systems, in line with the stated goals of the SNAP program. Not only would this speed up what is an inevitable transition, but an expedited phase-out of HFC-134a would greatly reduce the overall GWP of MVAC systems.

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<sup>26</sup> *Supra*, note 17 at 207.

<sup>27</sup> *Id.*

<sup>28</sup> *Id.* at 207-8.

<sup>29</sup> *Id.* at 209.

<sup>30</sup> *Id.* at 212.

## Aerosols

HFC-134a is also a listed alternative for aerosol end-uses. It is listed as an alternative for CFC-11, HCFC-22, and HCFC-142b in this use category.<sup>31</sup> At this time, however, there are many other approved alternatives for these ODS in the aerosol products, rendering HFC-134a unacceptable as a substitute. The SNAP program requires EPA to analyze newly listed alternatives in comparison with both the original ODS for which alternatives were required and available alternatives. In comparing alternatives against each other to continually increase the SNAP program's efficacy, other approved alternatives emerge as superior to HFC-134a in the aerosols sector. HFC-152a is an acceptable alternative for all of the ozone-depleting aerosols. HFC-152a's GWP (<150) is much more attractive than that of HFC-134a (1300), and as with MVAC systems, this comparison indicates that EPA should cancel the use of HFC-134a as an alternative in the aerosols sector.

Saturated Light Hydrocarbons such as C3-C6 are also approved alternatives for these aerosol end-uses. Even more so than for HFC-152a, the comparison of C3-C6 and comparable hydrocarbons with HFC-134a strongly support HFC-134a's removal from the SNAP alternatives list. These hydrocarbons are both "zero-ODP and zero-GWP."<sup>32</sup> Not only are they an "excellent propellant" but they are also "inexpensive" and "readily available from most chemical manufacturers."<sup>33</sup>

Other approved alternatives, which provide a similar rationale for removing HFC-134a in the aerosols sector, include dimethyl ether, compressed gasses such as carbon dioxide and nitrous oxide, and non-aerosol delivery systems. Compressed gasses have "low toxicity and industrial practices for using these substitutes are well established."<sup>34</sup> Alternative processes such as "finger and trigger pumps" do not even require the use of chemicals, and the only real concern with these processes is that "persons using manual pumps or sprays on a continuous basis may become fatigued... thus reducing consumer satisfaction."<sup>35</sup> Dimethyl ether does have some ability "to contribute to ground-level ozone," but EPA states "increases in ground level ozone formation from use of DME can be controlled through existing VOC regulations."<sup>36</sup> All of these available and approved alternatives make the continued acceptability of HFC-134a inappropriate for aerosol end-uses.

## Other End-Uses

EPA currently lists HFC-134a as an acceptable alternative for fire suppression and explosion protection foam blowing agents, and, as noted above, for the aerosol and refrigerant and air conditioning sectors. There are many other alternatives approved for

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<sup>31</sup> Environmental Protection Agency, Substitute Aerosol Solvents and Propellants under SNAP as of September 28, 2006, <http://www.epa.gov/ozone/snap/aerosol/aerosol.pdf> (last visited Mar. 30, 2009).

<sup>32</sup> Protection of Stratospheric Ozone: Final Rule, 59 Fed. Reg. 13,044, 13,083 (Mar. 18, 1994).

<sup>33</sup> *Id.* at 13,114.

<sup>34</sup> Protection of Stratospheric Ozone: Notice of Proposed Rulemaking, 58 Fed. Reg. 28094, 28155 (May 12, 1993).

<sup>35</sup> *Id.* at 28,153.

<sup>36</sup> 59 Fed. Reg. at 13,116.

each sector and within each end-use, and so EPA should analyze HFC-134a within each of these sectors as it compares to other acceptable uses. For the SNAP program to continue to function effectively, the agency must identify those alternatives, such as HFC-134a, that have very high ODPs or GWPs, and compare them to other alternatives approved within that end-use. In identifying and eliminating these more harmful alternatives, the program can continue to phase out harmful ODS and move continuously towards less environmentally harmful alternatives.

In conclusion, EPA should approve this petition to remove HFC-134a from the list of acceptable substitutes for new and retrofitted MVAC systems, aerosols, and other appropriate end-uses. HFC-134a was approved at the inception of the SNAP program almost twenty years ago, but is now often the most damaging of the alternatives listed for particular end-uses, and to meet the statutory requirements of the SNAP program, EPA must now remove HFC-134a from the list of acceptable alternatives.

If you or your staff wish to discuss this petition, please contact me at [ddoniger@nrdc.org](mailto:ddoniger@nrdc.org) or (202) 289-2403.

Sincerely,

A handwritten signature in black ink that reads "David Doniger". The signature is written in a cursive, slightly slanted style.

David D. Doniger  
Policy Director, Climate Center  
Natural Resources Defense Council

On behalf of:  
Natural Resources Defense Council  
Institute for Governance &  
Sustainable Development  
Environmental Investigation Agency-US