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Comments on August 27, 2014 Proposed Offset Protocol for ODS Projects

The attachment provides our suggested revisions, with accompanying rationale, to ARB's proposed Compliance Offset Protocol for Ozone Depleting Substances (ODS) Projects that was released for public comment on August 27, 2014 (announced on July 29, 2014).

Many of the comments here were submitted in response to the June 18, 2014 proposed ODS Protocol. As we have noted in those prior comments, it has been 6 years since we developed the original ODS protocol, and most of the parameters, assumptions, and other technical details remain valid. However, several assumptions are out of date that we note again in our comments here. For some of the suggested revisions, we are offering to quickly develop follow up data submissions in coordination with the U.S. EPA and relevant industry stakeholders.

We hope that ARB will review the suggestions included here with an eye towards expanding the supply of the highest quality offsets, and insuring that the Protocol retain its technical accuracy, representing current baseline conditions, with timely input from industry, government, and academic experts.

Sincerely,

Jeff Cohen
Senior VP

Definitions

(ADD) (15) "ODS Blowing Agent" means ODS entrained in insulation foam that was used in manufacture of the foam to provide insulation, structural and other performance properties. When purified, ODS blowing agents have identical chemical properties as ODS refrigerants and may be sold and used as refrigerants.

Section 2.1 Eligible Destruction Activities

(b) A destruction facility must meet ~~any applicable~~ all monitoring and operational requirements under CAA and NESHAP standards, as well as all applicable federal, state, and local laws, that apply directly to ODS destruction activities during the time the ODS destruction occurs.

(c) At the time of ODS destruction the destruction facility must have a valid Title V air permit, if applicable, and any other air or water permits required by local, state or federal law to destroy ODS and document compliance with all monitoring and operational requirements that apply to ODS destruction and ODS destruction project activities.

Rationale:

As we noted in prior comments submitted to ARB in June of 2013 & 2014, ODS destruction facilities operate under multiple permits, with hundreds of monitoring, recordkeeping, reporting, and operating requirements that are not related to ODS destruction activities. It is highly unlikely that any destruction facility will be able to demonstrate compliance with 100% of all permit conditions for 100% of the time.

For example, destruction facilities that utilize incineration technology to destroy ODS operate under U.S. Clean Air Act Title V permits, as well as State permits. These permits specify the Destruction and Removal Efficiency and overall combustion dynamics to assure operation within the Permit Conditions, Applicable MACT Standards and other site-specific parameters derived from Annual Compliance Performance Tests. So long as an ODS destruction facility demonstrates that it meets the Title V Permit Rules and Permit conditions applicable to operation during an ODS Destruction event, the facility should be deemed in compliance with the ARB ODS Protocol.

Another scenario is a facility that had non-compliance status prior to the destruction event, but was determined to have returned to compliance at the time of the destruction event. This facility should be considered in compliance for purposes of the

Protocol. Facilities subject to the ARB ODS protocol can still receive and destroy ODS, even if the facility is in non-compliance with permit terms and conditions, provided there is a compliance agreement or consent order between the facility and a regulatory agency, overseeing the facility, which contains a schedule to return the facility to compliance, coupled with confirmation from the regulatory agency that the facility can continue to receive ODS, for destruction, as the matter subject to the compliance order is not material to the effective destruction of ODS, under the ARB protocol. Examples of non-compliance which may be addressed through the Consent Order Process include, but are not limited to, storm water management and NPDES violations, OSHA violations, and non-ODS destruction related RCRA hazardous waste management violations.

The edit suggested above is consistent with ARB's intent to clarify the definition of regulatory compliance in the recently proposed revision to the general cap-and-trade regulations, 17 C.C.R, Section 95973(b):

> "An offset project is not eligible to receive ARB or registry offset credits for GHG reductions or GHG removal enhancements for the entire Reporting Period if the offset project is not in compliance with regulatory requirements *directly applicable* to the offset project during the Reporting Period."

Section 2.2 Eligible ODS

(a) ODS destroyed under this protocol must be from one or more of the eligible sources listed below:
  (1) Refrigerants from industrial, commercial or residential equipment, systems, and appliances or stockpiles;
  (2) ODS blowing agents extracted and concentrated from appliance foams; ~~or~~
  (3) Intact foam sourced from building insulation; or
  (4) ODS that can be sold for controlled use as aerosols in medical inhalers.

Rationale:

Under the Montreal Protocol "essential use nominations" program, limited production of CFCs was authorized in the U.S. and other countries for metered dose inhalers (MDIs). Essential use production in the U.S. was gradually phased out as the Food and Drug Administration approved CFC-free products, including HFC-propelled MDIs, dry powder inhalers, and oral medications. As of January 1, 2012, all production and

import of CFCs in the U.S. for MDIs ended, and on January 1, 2013, sale of CFC-based inhalers ended in the United States. With the exception of Russia and China, the rest of the world has also ended production and consumption of CFC HFCs.

A portion of the CFCs that had been produced under the essential use nominations in the U.S. before 2012 have never been used. The resulting stockpile is now eligible for export and sale for use in MDIs in Russia and China. According to the Montreal Protocol Medical Technical Options Committee of the Technology and Economics Assessment Panel, there will no additional production of CFCs in Russia beginning in 2015 (TEAP, 2014). There may be new, limited production of CFCs for MDIs in China in 2015, pending approval by the Parties to the Montreal Protocol (TEAP, 2014). Even if CFC production is approved for China for 2015, if some of the existing CFC stockpiles are destroyed, there would be no new, compensatory CFC production; the essential use nominations and production allocations are fixed quantities based on projected demand and the status of the transition to CFC-free alternatives (TEAP, 2014).

Under business as usual, the U.S. CFC stockpile will be sold for use, and eventually released to the atmosphere. In contrast, under the alternative "project" scenario, the CFCs would be destroyed. The destruction would prevent direct GHG emissions, and result in increased use of CFC-free alternative products. The CFC-free alternative products will include HFC-based inhalers so the proposed protocol revision would account for the GHG emissions associated with "replacement technologies".

Medical aerosols destroyed before 2012 when the U.S. phased out all essential use exemptions would not be eligible for offset credits.

EOS will work with U.S. EPA and industry stakeholders to develop the methodology for ARB's approval to quantify the GHG emission reductions associated with destruction of eligible ODS aerosols.

Section 2.2 Eligible ODS

(c) ODS produced exclusively for or used as solvents. ~~medical aerosols,~~ or applications not listed above are not eligible.

Rationale:
In many cases, the same CFCs were produced for a variety of applications. There are stockpiles of CFCs that were originally produced for multiple potential markets that

have never been used, and that are eligible for use as refrigerant applications today. These materials should therefore be eligible for destruction credits. The restriction against destruction credits would still apply to ODS that has been used as solvent.

Section 2.2.1 Refrigerant Sources

(c) ODS extracted from a foam source that are eligible for use in refrigeration or air conditioning equipment are considered as ODS refrigerants provided that the ODS are extracted under negative pressure in a nitrogen environment. ~~not part of this source category and must be considered as a foam source.~~

Rationale:

The protocol assumes a baseline whereby insulation foam is landfilled. As a result, not a single foam project has been undertaken due to the restrictions and discounting of the current protocol. Instead, since the protocol was developed in 2009, the new business-as-usual for a significant quantity of appliance foam in the U.S. is extraction of the CFC-11 blowing agent for re-use as a refrigerant. CFC-11 is being extracted from foam at major appliance recycling centers in the U.S. The extracted CFC-11 is being processed for sale and re-use as a refrigerant to recharge older air conditioning/refrigeration equipment, as allowed by U.S. EPA.

Over the past 2 years, EOS has provided ARB with information on the relevant technologies and the activities. EOS is willing to work with US EPA and industry stakeholders to provide ARB with additional, current data and other technical information.

The new baseline would only apply to projects that demonstrate that the extracted CFC-11 or other ODS blowing agent can be sold and used as a refrigerant.

Section 2.2.2 Foam Sources

(c) The only foam sources eligible under this protocol are building and appliance insulation foams. *Other sources, such as transport refrigeration units, are not eligible.*

> We are interested in the rationale for excluding foam from transport refrigeration units.

(d) To be eligible to generate ARB or registry offset credits, the ODS blowing agent must be destroyed in one of two ways:

(1) The ODS blowing agent must be extracted from the foam under negative pressure in a nitrogen environment and collected, stored, and transported in cylinders or other hermetically sealed containers;

Rationale:
To insure worker and public safety, and minimize risks of fugitive emissions, the protocol should require best available technology for extraction of ODS blowing agent, including maintenance of a nitrogen environment in addition to negative pressure.

Section 5.3 Accounting for Disqualified ODS Material After Destruction

(a) The total weight of each container of disqualified ODS shall be considered as the original container's full capacity when the ODS was purchased and must include documentation identifying the weight capacity of the disqualified container.

Rationale:
Section 5.3 (a) is ambiguous in describing which container of disqualified ODS must be considered. We suggest clarifying that the disqualified ODS container is the container that the ODS was originally purchased in. The OPO must also have full documentation on that particular container to be able to make the calculations for backing out the disqualified ODS post-destruction.

Section 6.2 Point of Origin Determination

(b) Point of Origin is defined as follows:

(1) For refrigerant ODS which is stored ~~within~~ as a stockpile for more than 24 months prior to acquisition by the Offset Project Operator:

(A) The point of origin for stockpiled refrigerant ODS ~~which became part of the stockpile before January 1, 2015~~ is the location of the stockpile.

~~(B) The point of origin for refrigerant ODS after December 31, 2014 is the site at which greater than or equal to 500 pounds of ODS is first aggregated into a single or multiple containers after December 31, 2014. The point of origin may be the location of the stockpile or a site prior to the ODS becoming part of the stockpile~~

Rationale:
We are unclear on the intent of the draft language in 6.2(b)(1). The subsequent section 6.2(b)(2) already defines the point of origin for ODS stockpiled "for at least 24 months prior to acquisition" by the OPO. As written, this new Section 6.2(b)(1) would

eliminate ODS refrigerants stockpiled after December 31, 2014. We do not see any rationale for such a change.

(c) (3) If refrigeration or air conditioning equipment containing at least 500 pounds of ODS is transported prior to the ODS being removed from the equipment, then the point of origin is the site at which the refrigerant was removed from the refrigeration or air conditioning equipment ~~was last in service.~~

Rationale:
There are many cases where refrigeration equipment is removed and transported to other locations and stored for extended periods of time prior to extraction as part of the demanufacturing process. Via email on 2/21/14 and again in the 6/20/14 version of the protocol, ARB clarified that the point of origin for refrigerant removed from refrigeration equipment that has been transported from its service location should be considered as the location where the refrigerant is extracted. By changing the interpretation, ARB will unnecessarily eliminate otherwise eligible ODS and increase the atmospheric release of these gases.

Appendix D ODS Mass and Composition from Refrigerant and Appliance Foam Projects – Quantification Methodology

(b) (1) (C) A refrigerant container with a capacity of over 1,000 pounds must be placed on the scale motionless for at least 3 minutes before the weight measurement is recorded.

Rationale:
The above changes are to ensure the time measurement isn't interpreted as meaning exactly three minutes, and that the container may be left motionless on the scale longer as needed to obtain an accurate weight measurement.

The following sections within Appendix D should also include the same language as above on the 3-minute weight interval to provide additional time as needed for accurate weight determination.

(b) (2) (B) & (b) (3) (C)

Section 6.6 Other Monitoring Requirements – Quantification Methodology

(a) Projects using this protocol to quantify emission reductions from destroying ODS refrigerant, extracted from foam, must meet the following requirements:

1) Documentation that the ODS is eligible for sale and use as refrigerant

2) Documentation that ODS extracted using the same technology from the foam in identical types of refrigeration equipment has been processed and sold for use as refrigerant
3) The extraction must occur under negative pressure in a nitrogen environment
4) The recovered ODS must be collected, stored, and transported in containers meeting DOT standards for refrigerants
5) The processes, training, QA/QC, and management systems relevant to the collection, storage, and transport of the ODS must be documented.

Rationale:
As noted in our comments above related to Section 2.2.1, ODS is being extracted from foam and sold for use as refrigerant. In those cases, the baseline scenario and the environmental outcome is the same as ODS recovered from refrigeration and air conditioning equipment for re-use as refrigerant. This proposed additional monitoring requirement would put the burden on the project developer to prove that the ODS extracted from foam can in fact be sold as refrigerant.

(b) Projects destroying ODS blowing agent recovered from foam must meet the monitoring requirements listed above in Section 6.6(b)(3), (4), and (5), and follow the procedures in appendix C. The Offset Project Operator or, if applicable, the Authorized Project Designee must collect and maintain documentation showing conformance with the procedures in appendix C.

Rationale:
Clarifying that the recovery/extraction of ODS from foam requires the same procedures and monitoring under any project scenario.

Appendix B, Table B.2 Parameters for ODS Foam

ODS Blowing Agent	100-yr Global Warming Potential (t CO_2e/t ODS) (GWP_i)	Appliance ODS blowing agent 10-year emission rate ($ER_{i,app}$)	Building ODS blowing agent 10-year emission rate ($ER_{i,build}$)
CFC-11	4,750	~~44%~~ 56%	~~20%~~ 38%
CFC-12	10,900	~~55%~~ 63%	~~36%~~ 47%
HCFC-22	1,810	~~75%~~ 80%	~~65%~~ 72%
HCFC-141b	725	~~50%~~ 58%	~~29%~~ 41%

Rationale:
As we have commented previously, for quantification of baseline emissions of ODS from appliance foam, the ARB protocol is still relying on the assumptions in the CAR 1.0 ODS Protocol regarding the percentage of blowing agent that is released during: (a) foam shredding, plus (b) foam compaction, plus (c) landfill decomposition.

The estimated release of ODS over the course of landfill decomposition of the remaining foam material was derived from a laboratory study (Scheutz et al., 2007) where pure ODS blowing agent was mixed in test tubes with simulated landfill material, inoculated with anaerobic bacteria capable of digesting CFCs and HCFCs. ***This study was not intended to reflect real world conditions and yielded extremely high estimates for the amount of ODS that would be decomposed in an actual landfill***:

- The idealized anaerobic conditions maintained in the laboratory test tubes would be unlikely in an active landfill
- The "landfill" material in the study contained only shredder residue, rather than the diverse mix of solid waste in a typical municipal landfill
- In contrast to the simulated conditions in the experiments, actual landfills would not be biologically pretreated, and there would be larger quantities of landfill gas generated

Based on an admittedly conservative reading of the laboratory study, the CAR protocol assumed that 35% of the CFC-11 blowing agent remaining in the landfilled material would be released in the landfill, and that 95% of that CFC-11 would undergo anaerobic degradation in landfills. This resulted in an estimate that 1% (0.35 * 0.05) of the CFC-11 blowing agent in appliance foam would be released to the atmosphere. When added to the contributions from shredding and compaction (24% + 19%, respectively), the protocol estimates for the baseline that a total of 44% of CFC-11 in appliance foam would be released to the atmosphere.

In its protocol, CAR recognized that there is considerable uncertainty regarding the extent of anaerobic degradation of ODS foam blowing agents in U.S. landfills. At the time of the CAR protocol development, EOS and other working group members suggested that given the major limitations in the Scheutz et al laboratory study, that the protocol use a 50% factor for the amount of ODS blowing agent degraded in the landfill, rather than 95%. Since then, the researchers involved in the Scheutz et al. study have also made the same comments to EPA and to ARB staff.

More recently, a German research institute (RUK Ingenieugruppe, 2012)[1] subjected the assumptions made by Scheutz et al. to experimental and computational checks and concluded the following:

- Scheutz et al. 2007 assumed that the half-life of the anaerobic degradation of R11 was ten times longer than that indicated by the laboratory experiments.
- A value of 5% for the percentage of CFC-11 that would not undergo anaerobic degradation is only justified for the kind of "mono-landfill" investigated by Scheutz et al that generates very small quantities of landfill gas. Only in very rare cases will the type of mono-landfill assumed in the CAR methodology provide an adequate representation of baseline emissions.
- The value assumed for the percent of ODS blowing agent degraded should reflect the particular type of landfill under consideration.

RUK calculated R-11 landfill degradation rates for a range of solid-waste disposal sites representing a range of climate zones. The re-calculated degradation rates are based on case studies using the landfill gas forecasting model used in CDM and JI projects, approved by the UNFCCC:

Location	Climate Zone	Percent of released CFC-11 blowing agent not degraded in anaerobic landfill conditions
Europe: Central, without biological pre-treatment	Wet temperate	83.6%
Europe: Northern	Wet temperate	64.2%
Asia: South-central	Moist and wet tropical	62.9%
Africa: Southern	Wet temperate	61.9%
America: Central	Dry tropical	55.2%
Asia: Western & Middle East	Dry temperate	48.3%
Minimum: mono-landfill for shredder waste (as assumed in CAR methodology)	(no relevant influence)	5.0%

[1] *Landfill behaviour of CFCs in foams recovered from end-of-life refrigeration equipment – Application of results to specific waste disposal scenarios*. Ingenieugruppe RUK on behalf of RAL Quality Assurance Association for the Demanufacture of Refrigeration Equipment (March 2012).

Since the UNFCCC landfill modeling was developed for CDM/JI projects, the RUK analysis does not present factors specific to the United States. However, the range of geographic regions in the U.S. are fairly represented by the range of case study locations used by RUK, and therefore it would be reasonable to use the range of factors listed above (48.3-83.6%) to reflect the range in U.S. landfill conditions, with the mid-point of this range (66%) a good estimate for the average U.S. landfill.

Incorporating this updated degradation factor, the R11 emissions from foam that is shredded and landfilled or "randomly dumped" can be calculated using the following equation from the original protocol:

$FR_D = (1 - FR_S - FR_V) * F * R$

where:

FR_S: Percentage of R11 released during shredding

FR_V: Percentage of R11 released during compaction

F: Percentage of remaining R11 released during anaerobic conditions

R: Percentage of released R11 not degraded in anaerobic landfill conditions

Assuming the same terms as in the original protocol for shredding, compaction, and R-11 released in the landfill, yields a revised factor for the total amount of R11 that would be released:

24% + 19% + 13% = 56%

The RUK analysis did not calculate degradation rates for the other blowing agents; here we assume the same rate (66%) as calculated for R-11.

ODS Blowing Agent	Appliance Blowing Agent 10-year emission rate (ER_{ij})	Building ODS blowing agent 10-year emission rate (ER_{ij})
CFC-11	56%	38%
CFC-12	63%	47%
HCFC-22	81%	72%
HCFC-141b	58%	41%

Appendix D. ODS Mass and Composition from Concentrated ODS – Quantification Methodology

(3) The full weight must be measured no more than 48 hours prior to commencement of destruction per the ~~Certificate of Destruction~~ CEMS data;

(4) The empty weight must be measured no more than 48 hours-after the conclusion of destruction per the ~~Certificate of Destruction~~ CEMS data;

Rationale:

The Certificate of Destruction only provides the start and end **dates** of destruction. It does not provide an hourly start or end time of destruction, however, the Continuous Emissions Monitoring System data does. Requiring that the dates on the Certificate of Destruction be used to comply with a deadline calculated in hours would not be feasible.