Public Comment on
Mexico ODS Project Protocol Draft Version 1.0
for Climate Action Reserve

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Required Protocol inputs:

- Programa Especial de Cambio Climático 2014 – 2018, carbon tax, national NAMA registry with 23 NAMAs
- Mexican refrigerator replacement programmes, FIPATERM, PFAEE to ELAP[i] (70% of replaced units 10-14yrs old, 30% >15yrs old)
- 90% of refrigerator sales are from Mabe, Whirlpool and Samsung, all with large production of all possible technological options, 2012: total stock 19.1 mio, annual sales 2.55 mio
- Multilateral Fund (MLF) financing of ODS destruction[ii] and HPMP[iii]
- for CAR Article 5 ODS Protocol, two projects were realized in Mexico (#691, #826); CAR US ODS Protocol has not yet been used for foam blowing agent, other Mexican CAR Protocols (biogas) have been implemented in 8 projects so far, all small-scale
- Centros de Acopio y Destrucción[iv](CAyD), created in 2006, recovered on average 30.8 gr/fridge[v] from 1.59 mio fridges 2009-12 (15% of all eligible households[vi]), ~26% of the total CFC-12 refrigerant. The recovered gases are treated in 14 Centros de Reciclado de Refrigerantes, like CAyD companies authorized by Semarnat and supervised aiming at World Bank environmental safeguard standards.

These six dimensions of the Mexican context should be addressed in the design of a Mexico ODS Protocol. Even so it is challenging to integrate these factors systematically, these six are essential. They contain the potential volume of abatement, the possible technologies, the firms and their past behavior. Even so volume, costs and incomes cannot be predicted, most of these factors can be approximated to anticipate the projects such a Protocol invites.

The first two dimensions are needed for the demand side of a Mexico ODS Protocol, those factors determining the flow of End-of-Life appliances. The dominance of three producers is relevant because their shifts to HCFC-141b and to HFC-134a determine the volume of these and the declining CFC volumes in the End-of-Life appliances arriving at CAyDs in the next years. The Mexico ODS Protocol applies the Montreal Protocol's TEAP 2002 recommendations for destruction and could furthermore integrate the ODS export funding and destruction technology funding and results in the recent years since TEAP 2002. When ALL Montreal Protocol funded ODS exports are using CAR's Article 5 ODS Protocol, then the impact of a Mexico ODS Protocol on Montreal funding can be anticipated. Some National Ozone Units decided to destroy CFC domestically and others not, CAR could be cognizant and even refer to the criteria and amount of Montreal funding. The last two dimensions account for firms and their behavior,

the users of a Mexico ODS Protocol, whose recycling work is partly paid by SENER, supervised and controlled by SENER and SEMARNAT. The high variation in recovery rates (endnote 5) indicates that the possible impact of a Mexico Protocol will be very uneven.

2.3 Eligible ODS

The proposed Protocol excludes all blowing agents extracted from foam out of excessive caution. End-of-life appliance foam in Mexico comprises CFC-11, HCFC-141b, HFC-134a, HFC-245fa and cyclopentane. These five substances should not be treated as a group because they have little in common and there is no reason for treating them as a group. Instead, specific factors can be considered for including/excluding blowing agent CFC-11, other reasons for HCFC-141b and yet another set for blowing agent HFC's possible eligibility.

Regarding blowing agent CFC-11, most countries have effectively stopped producing or importing it in 2008, ahead of the Montreal Protocol deadline 2010. Seven years later, it is not a question of caution to prevent new CFC-11 production as justification for excluding blowing agent CFC-11.

For blowing agent HCFC-141b, the Mexico HPMP[vii] stage I used 2.5mio$ for the conversion of Mabe's production to cyclopentane as blowing agent, as well as in three commercial refrigeration companies. Therefore Whirlpool is the last remaining HCFC-141b user as foam blowing agent in Mexico. The Government of Mexico has committed to reduce HCFC consumption by 35% in 2018, 50% in 2020 and 67.5% in 2022.

> This accelerated phase-out should be included in Table 2.1 of the proposed Protocol instead of the Article 5 schedule.

The Mexico HPMP also comprises a national licensing and quota system for imports and exports of HCFC, and a specific customs tariff for each HCFC[viii].
If the National Ozone Unit in Semarnat operates this system effectively, it is not possible for virgin HCFC-141b to be fraudulently declared recovered blowing agent, besides the fact that with the GWP of 700, the income from fraudulently obtained CRT certificates is in $/kg the same as the production cost of HCFC-141b. Therefore there is insignificant or no incentive for fraud with HCFC-141b even if the National Ozone Unit were unable to effectively run the licensing and quota system.

> HCFC-141b eligibility in Mexico should be considered with similar merit as HCFC-141b eligibility in the US ODS Protocol.

Finally, recovered HFC-134a can be credited with avoided energy consumption during the production of new HFC-134a.

Impact of Article 5 ODS Protocol

In five years, the Article 5 Protocol has brought End-of-Life CFC only from Mexico for destruction into the US, all other imports to the US from other countries (Nepal and India) have been virgin CFC stocks. The Mexican infrastructure for

refrigerator dismantling has not responded to the incentive from the Article 5 Protocol because the CFC-12 recovered is only 26% whereas >80% is technically feasible (with currently used equipment, funded in 2006 by Montreal Protocol's MLF). The only independent assessment of the CAyDs[ix], funded from the World Bank and KfW, concluded that the variation in recovery is due to operational practices.

Only in Brasil and Ghana new automatised refrigerator recycling plants currently recover all ODS (refrigerant and blowing agent, sometimes called demanufacturing or stage I and II recycling) and one of three plants in Brasil has been issued "Swiss Charter Units"[x] (similar unit as CRT) in 2013 for destroying the recovered ODS. Both in Mexico and in Brasil, electric utilities are spending large funds to replace old refrigerators. In Mexico ELAP included 50mio$ from CTF and 100mio$ from an IBRD loan, and at present the Mexican government pursues a second phase with the CTF. ELAP has paid 18 US$/refrigerator[xi] to the CAyDs for the dismantling and in addition, CAyDs get 8 US$/kg CFC recovered if >96%pure. Institutional barriers are the likely reasons why no automatised recycling plants appear in Mexico compared to Brasil (value of other recycled fractions assumed similar, Brasil also got recovery equipment from MLF like Mexico, both countries have entrepreneurial private sectors, number of fridges >10yrs similar). Efforts and initiatives in Mexico by several members of the workgroup that produced US ODS Protocol, by strong carbon traders and manufacturers have not succeeded so far. Additional incentives are necessary to reach all End-of-Life ODS in Mexico.

The low recovery in Mexico seems congruent with the high recovery in Brasil not bringing ODS to destruction in the US. Since the Article 5 Protocol's exclusion of foam might be structurally counterproductive by preventing such recycling plants as in Brasil and Ghana, its specific extension to Mexico could create incentives that are more likely to be effective in the Mexican context. Against this conclusion, one can assert that the number of Article 5 ODS projects is too small to draw conclusions, or consider complex interferences[xii] between CAR and Montreal disposal funding (for example that UNDP in Ghana is politically more influential).

General comments about eligibility and foam

Another fundamental eligibility aspect is the possible crediting for foam being burnt in waste-to-energy plants. This is standard practice in the US and would provide incentives to operate the current CAyDs in Mexico, bagging foam and destroying it in Mexico. Since it would be difficult to establish what foam blowing agents are in a large mass of foam, the lowest blowing agent concentration with the lowest GWP could be used to calculate the emission reduction conservatively. Crediting this foam destruction should be considered as the most pragmatic and realistic solution for Mexico. Problems in accounting for the emission reductions can be resolved.

During the Webinar 26 February, CAR indicated that more resources might become available for further improvements of the protocol. The most important potential improvement is the counterproductive demand that CFC must be destroyed from concentrated (liquid) form. In light of hundreds of millions CFC

containing refrigerators worldwide and the investments needed to get CFC into liquid form, in the range of 2 – 4mio US$ per 100,000 refrigerators per annum capacity, it is certain that the majority of CFC worldwide (in Montreal Protocol language "banks") will end up in the atmosphere. Most of the hundreds of millions CFC containing refrigerators in the world are far from a recycling plant and this will remain so, even if there would be 100 more large scale recycling plants to be build.

The only technology that can reach the majority of hundreds of millions of refrigerators with CFC is manual dismantling and collection of the foam. Foam can be collected, ground to powder under vacuum, or burnt as fuel. Therefore an effective Article 5 countries – oriented ODS protocol can include criteria to destroy manually separated foam and estimate the emission reduction credited with offsets.

5.1 Foam baseline

During the CAR Webinar 26 February, problems of establishing a baseline for blowing agent emissions were mentioned. The US ODS Protocol gives defaults in Table 5.4 for the ODS emissions during shredding and landfilling, all taken from Scheutz et al., 2007[xiii], p.7721 (Table 3), with a landfill reactor model estimating the degradation of ODS under anaerobic conditions. Scheutz et al. research at Technical University of Denmark was funded by AHAM and aimed at investigating whether foam ODS emissions from landfills can be reduced by landfill operations themselves.

Scheutz et al. defined representative foam conditions and representative landfill conditions, as a basis for modeling the highest ODS degradation (model MOCLA-FOAM). It is not possible to establish to what extend these defaults in the US ODS Protocol are conservative but the two main elements of conservativeness are a) real landfills not being fully anaerobic, and b) foam in the landfill not being 5cm cubes without mechanical stress (stated p.7720, any deformation increases blowing agent release). Scheutz et al. (p.7721) further state "In normal landfill operation, waste is compacted to gain landfill volume. How the compaction is affecting initial and long-term release rates for blowing agents is not known". Compaction affects CFC-11 emission much less than HCFC-141b because CFC-11 decays much faster. The two main elements of conservativeness (a and b) are certainly larger than the influence of landfill waste composition or other physical parameters. Another aspect adding yet more conservativeness is that microbiological decay of CFC-11 under anaerobic conditions produces HFC-41 (besides HCFC-21, HCFC-31 and nonvolatile compounds), which does not decay and is thus emitted to the atmosphere. HFC-41 has a GWP of 141[xiv] and this emission reduction is not accounted for.

Overall, if the Scheutz et al. results permit a conservative estimate for US landfills, there is no reason why these would not also apply in Mexico. The degree of compaction of a landfill only affects the level of conservativeness. The conservativeness remains if Scheutz et al. modeling chose the landfill parameters

reflecting the lowest emissions situation (highest ODS microbiological decay). TEAP, 2005, Report of the Task Force on Foam End-of-Life Issues, refers to other research in Colombia and Germany confirming Scheutz et al. results. Considerable adaptation to Mexican conditions is also possible by running the MOCLA-FOAM model for landfill conditions and foam particle conditions representative for Mexico. This would reduce the level of conservativeness of the defaults for a foam baseline more in line with waste baselines in other cap-and-trade methodologies.

5.2.1 Project Emissions

The project emissions from replacement refrigerants is assumed at 13.5% (Equation 5.5) which is not realistic, given the dominance of three producers, their actual specifications are preferable and considerably lower. Perhaps it is a wise approach on policy grounds to request data from Mabe, Whirlpool and Samsung and use the highest one. All three produce some refrigerator models that have effectively no leakage at all, and they know what leakage their main production lines achieve. The proposed Protocol does not list NOM-015-ENER-2002 (in Appendix E), the Mexican legislation that requires manufacturers to certify their products. Including this law would also underline that refrigerator exchange programmes bringing in the majority of End-of-Life refrigerators to the CAyD comply with the energy efficiency classes in this legislation.

A related issue for project emissions are the replacement refrigerants. The proposed Protocol states on p.22 that HCFC-22 and HFC-410a are common substitutes but this is a partial result from the GIZ-Proklima inventory. HCFC-22 and HFC-410a are not used for domestic refrigerators, only industrial systems. Therefore the replacement refrigerants for CFC-12 from CAyD are only HFC-134a and isobutane and the market share data available allows to calculate the GWP accordingly.

5.2.2 Destruction and Transportation

The proposed Protocol states that Quimobásicos is the only destruction facility currently authorized to destroy ODS and that a destruction trial was conducted by the National Ozone Unit at the Ecoltec cement kiln in 2008. A further potential adaptation to the Mexican context could be using the data from both in place of the Transport and Destruction default of 7.5 $kgCO_2e/kgODS$.

The author of this comment on the Mexico Protocol was also the author of the two public comments from GTZ-Proklima for the US ODS Protocol in December 2009. He co-wrote AMS-II.O and AMS-III.X for refrigerators and has never had a commercial stake in any offset trade or project.

[i] Energy Institute @ Haas, 2013, Cash for Coolers: Evaluating a Large-scale Appliance Replacement Program in Mexico, Berkeley: Working Paper Series.
[ii] UNEP/OzL.Pro/ExCom/70/54, Report on Progress and Experiences gained in Demonstration Projects for the Disposal of Unwanted ODS.
www.multilateralfund.org/70/English/1/7054.pdf
[iii] UNEP/OzL.Pro/ExCom/73/43, Project Proposal: Mexico HCFC phase-out management plan(HPMP) stage I and stage II.
www.multilateralfund.org/73/English/1/7343.pdf
[iv] Andrade Salaverría P, 2010, Evaluación Ambiental y Plan de Manejo Ambiental del Programa de Eficiencia Energética Coordinado por la Secretaría de Energía.
http://portal.energia.gob.mx/webSener/res/Acerca_de/Borrador-EA_y_PMA-CONSULTA_PUBL ICA_12mar10.pdf
SEMARNAT, Sistema de Información y Seguimento de Sustancias Agotadores de la Capa de Ozono, www.sissao.semarnat.gob.mx
[v] The best CAyD recovered 86.6 gr/fridge, the least recovery was 2 gr/fridge. However, the data quality is difficult to ascertain. Cited in:
UNEP/OzL.Pro/ExCom/66/Inf.2, Study on Disposal for ODS Collected from Refrigerators and Air Conditioners under the Mexican Efficient Lighting and Appliances Programme (Submitted by the World Bank March 2012), funded by MLF.
www.multilateralfund.org/66/English/1/66%20Inf.2.pdf
[vi] Energy Institute @ Haas, 2013, p.7
[vii] UNEP/OzL.Pro/ExCom/73/43
[viii] *Ibid*. which implies that Whirlpool stops HCFC-141b before 2020.
This situation exists in many Article 5 countries and the TEAP acknowledges that the HPMP "are highly vulnerable to any changes in phase-out strategy in major multi-national companies", UNEP/TEAP, 2014, Decision XXV/5 Task Force Report Additional Information on Alternatives to ODS, p. 31.
CAR can be cognizant of the negotiations between national government's Ozone Units and the multi-national companies often dominating the production of appliances. And one should recognize NAFTA in the Mexican case.
[ix] Andrade Salaverría P, 2010.
[x] 1.22 tCO2e/fridge, sold in the Swiss ETS. This plants complies with the EU regulations on ODS recovery (WEEE directive).
https://mer.markit.com/br-reg/PublicReport.action?getDocumentById=true&document_id=103000000018805
[xi] UNEP/OzL.Pro/ExCom/66/Inf.2, p.6.
[xii] Oberthür, S. and Stokke, O., 2011, *Managing Institutional Complexity. Regime Interplay and Global Environmental Change*, Cambridge: MIT Press.
Grammig, T., 2014, Does the right hand know what the left hand is doing? IN: Carrapatoso, A. and Kürzinger, E., *Climate-resilient Development*, London: Routledge.
[xiii] Scheutz, C. et al., 2007, Attenuation of Fluorocarbons Released from Foam Insulation in Landfills, *Environmental Science & Technology*, 41/22: 7714-7722.
[xiv] IPCC, 2013*, Climate Change 2013: The Physical Science Basis. Contribution to WG I to the Fifth Assessment Report of the IPCC*, chapter 8, 8SM-25.