

**Mexico Efficient Lighting and Appliances Project**  
**CTF Trust Fund Committee Review**  
**Response to the Government of Germany**  
**November 3, 2010**

Note: This is the response provided to the GEFSEC for the same question raised under the GEF by the Government of Germany. This information was submitted by the World Bank to the GEFSEC on October 7, 2010.

In response to the comments from the Government of Germany, the Bank staff incorporated into their dialogue with the Mexican proponents a fuller exploration of the use of natural refrigerants under this project. As currently designed, the project is entirely consistent with Mexico's commitments under the Montreal Protocol. It will encourage the substitution of new, more efficient, MP-compliant refrigerators for older, relatively inefficient mostly CFC-based refrigerators. The existing refrigerant-technology mix that dominates the Mexican market is a function of the response by the private sector to prevailing market forces. Neither the World Bank nor the GoM exercise direct control over technology choice in this market. Therefore, the Bank and the GoM are not "choosing a technology" for this project. Rather, they are providing incentives to accelerate the uptake of more efficient appliances, provided that they meet energy efficiency standards and comply with the MP commitments of the GoM. As the outcome to this discussion, the Government of Mexico and the World Bank have agreed that support to efficient refrigerators under this project will be technology-neutral. That is to say, the value of vouchers and subsidies provided will be equivalent in value for all refrigerators of a given size category that meet the efficiency standard, regardless of the refrigerant used.

The Government of Mexico has neither the interest nor ability to change this market-based technology choice over the immediate term. However, in the discussion of the natural refrigerant options, the following points—which are consistent with the GoM's HCFC Phase Out Management Plan (HPMP) which is under preparation—were raised.

An assessment of the current market for refrigerators being undertaken by the GoM's National Ozone Unit (NOU) within the Ministry of Environment (SEMARNAT) as part of the GoM's HPMP shows that approximately 3.9 million new refrigerators were produced in Mexico in 2009.<sup>1</sup> In addition, approximately 50,000 units were imported (mostly from the US but also some from China, Korea, and others) and nearly 1 million units were exported. Hence, the domestic market in Mexico accounted for sales of approximately 2.9 million units in 2009. The assessment estimates that 98% of the refrigerators produced and sold make use of HFC-134a as a refrigerant and the remaining 2% make use of hydrocarbons (such as R600a). Hydrocarbon-based refrigerators are produced and sold by two companies operating in Mexico.

The dominance of HFCs in the Mexican refrigerator market can be linked to the industry's close relationship to the North American industry: commercial relationships to hydrocarbon suppliers

---

<sup>1</sup> Government of Mexico, National Ozone Unit. HCFC Phase-Out Management Plan (HPMP). Forthcoming, December 2010.

are nowhere near as well-developed as those to HFC industries. At the time that Mexican industry was moving away from the use of CFC's to comply with the MP (in the 1990's) many Mexican firms felt that the conversion from CFC technology directly to hydrocarbon technology would be more expensive, and retrofitting manufacturing facilities would be more difficult. In many instances, land or space considerations played a role in these cost calculations. In summary, cost considerations combined with commercial considerations to make HFCs the predominant refrigerant in the Mexican market.

Despite the current dominance of the Mexican market by HFCs, the GoM and the World Bank acknowledge that when assessed in isolation from other factors, hydrocarbons are environmentally superior to HFCs. The GWP of hydrocarbons is equivalent to that assumed for CO<sub>2</sub> with a GWP of one (1) while the GWP of HFC-134a equals 1300. But market forces would dictate that an instantaneous switch to hydrocarbons is not practically possible and efforts to provide selective subsidy support only to hydrocarbon refrigerators will lead to enormous implementation delays and additional administrative complexities. Such delays will result in an exacerbation of the global environmental problems caused by the release of CFCs from an aged refrigerator fleet and the emissions associated from the continued use of these inefficient, older appliances. Hence, a heavy-handed approach to supporting hydrocarbons in this case will result in a worsening of global environmental conditions: the best becomes the enemy of the good.

To illustrate the issue of timeliness and urgency in responding to these global environmental challenges, the Bank undertook some scenario analyses in consultation with SEMARNAT to estimate the climate benefits of replacing appliances with the different alternative refrigerant technologies, taking into account their availability on the Mexican market over time. Since the project involves replacement of domestic refrigerators and air-conditioning units, the analysis compares benefits of converting from CFC-12 to HFC-134a and hydrocarbons in case of domestic refrigerators, and from HCFC-22 to R-410A and hydrocarbons in case of air-conditioning equipment (See Table X below).

Based on the current design of the project, we expect that the current market share of 2% of hydrocarbon units and 98% of HFC units would remain unchanged. The replacement schedule of about 420,000 units per year could be easily supported by the current availability of HFC units in the Mexican market. Under the project scenario, using the assumption that energy efficiency of both hydrocarbon and HFC units are comparable, the expected climate benefits during the project implementation period of 4 years represent about 4 million tonnes CO<sub>2</sub>e cumulative savings.

In contrast, under a scenario where vouchers are given only to hydrocarbon-based appliances, the number of units to be replaced would be significantly constrained due to the limited supply of the products in the market. Because the current market share of hydrocarbons is 2%, any increases in market share would have to come from imports until the industry could be re-aligned to produce hydrocarbon-based appliances. Moreover, the successful deployment of this technology would also be constrained by the capacity of the service network to maintain the hydrocarbon-based equipment. Taking the above in the account, this scenario assumes that the most optimistic increase in market availability for hydrocarbons would be at most 5% a year. Thus, assuming an initial starting market share of 5% in year 1 (vs. the actual market share of 2%), the

scenario assumes that the hydrocarbon share might rise to 25% market share in year 5. Under these assumptions, a total of nearly 1 million tonnes CO<sub>2</sub>e cumulative savings would be demonstrated by the fifth year of the project. Thus, the first scenario representing the project case would result in a net global environmental benefit of about 3 million tons of CO<sub>2</sub>e when compared to this scenario accelerating the uptake of hydrocarbon units.

Table X: Global Environment Benefits Under Different Scenarios

Scenario 1					Project Impact
Number of Appliances Replaced	450,000	450,000	400,000	400,000	1,700,000
GWh saved	200	600	900	1,200	2,900
CO <sub>2</sub> emission reduction (tCO <sub>2</sub> )	103,000	308,000	463,000	617,000	1,491,000
Refrigerator Climate benefits (CFC-12 vs HFC-134a)	114,453	228,906	330,642	432,378	1,106,379
A/C Climate benefits (HCFC-22 vs R410A)	148,500	297,000	429,000	561,000	1,435,500
				Total	<b>4,032,879</b>
Scenario 2					Project Impact
Number of Appliances Replaced	22,500	45,000	60,000	80,000	207,500
GWh saved	10	60	135	240	445
CO <sub>2</sub> emission reduction (tCO <sub>2</sub> )	19,400	116,400	261,900	465,600	863,300
Refrigerator Climate benefits (CFC-12 vs HC)	5,957	17,871	33,755	54,935	112,518
A/C Climate benefits (HCFC-22 vs HC)	1,212	3,635	6,866	11,174	22,886
				Total	<b>998,704</b>

From this analyses, it is clear that the approach proposed in this document—to provide technology-neutral support to energy efficient refrigerators regardless of refrigerant category—is consistent with the GoM’s goals of making immediate gains in energy efficiency and in reducing its overall GHG emissions rapidly.

Finally, the view of Mexico’s industrial stakeholders was sought with respect to the idea of providing a more generous subsidy to hydrocarbon refrigerators than to HFC-based refrigerators to compensate for the extra global environmental benefits associated with the natural refrigerant. Not surprisingly, this suggestion was strongly opposed by the bulk of industry. They find the suggestion that an additional subsidy be provided to the refrigerators making use of hydrocarbons to be unacceptable. However, industrial stakeholders endorsed the technology neutral option in which all refrigerators meeting the energy efficiency requirement should be eligible for the voucher and subsidy. Their view is that they have taken their decisions on what technology to adopt in phasing out HFCs and that any such incentive favoring the hydrocarbon manufacturers alone is tantamount to changing the rules of the game. While this attitude may change in future if the market share of hydrocarbons increases and the costs of its adoption falls, at present the implementation of such a suggestion is simply unacceptable to the vast majority of industrial stakeholders.

In assessing the above issues, the Government of Mexico has decided that being technology-neutral by providing the voucher subsidy to all refrigerators meeting the energy efficiency requirements of the program is the best way to achieve rapid results in this initiative. Following the discussions that have taken place to explore these options, the World Bank supports the GoM in its position.