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EXECUTIVE COMMITTEE OF  
THE MULTILATERAL FUND FOR THE  
IMPLEMENTATION OF THE MONTREAL PROTOCOL  
Fifty-third Meeting  
Montreal, 26-30 November 2007

### Addendum

#### PROJECT PROPOSAL: BRAZIL

This document is being issued to include the comments and recommendation of the Fund Secretariat on the following project proposal:

##### Process agent

- Phase-out of carbon tetrachloride as process agent in two applications at Braskem

UNDP

Pre-session documents of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol are without prejudice to any decision that the Executive Committee might take following issuance of the document.

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**PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT  
BRAZIL**

| <b>PROJECT TITLE(S)</b>   | <b>BILATERAL/IMPLEMENTING AGENCY</b> |
|---|--------------------------------------|
| (a) Phase-out of carbon tetrachloride as process agent in two applications at Braskem | UNDP                                 |

| <b>NATIONAL CO-ORDINATING AGENCY</b> |
|--------------------------------------|
|--------------------------------------|

**LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT****A: ARTICLE-7 DATA (ODP TONNES, 2006, AS OF NOVEMBER 2007)**

|        |       |     |      |
|--------|-------|-----|------|
| CFC    | 477.8 | CTC | 0.1  |
| Halons | 2.0   | MB  | 76.8 |
| TCA    | 0     |     |      |

**B: COUNTRY PROGRAMME SECTORAL DATA (ODP TONNES, 2006, AS OF NOVEMBER 2007)**

| ODS    | Subsector/quantity   | Subsector/quantity | Subsector/quantity | Subsector/quantity |
|--------|----------------------|--------------------|--------------------|--------------------|
| CFC    | Ref. servicing 337.9 | MDI: 141.5         |                    |                    |
| CTC    | Lab use: 0.1         |                    |                    |                    |
| Halons | 2.0                  |                    |                    |                    |
| MB     | 220.8                |                    |                    |                    |

|  |     |
|--|-----|
| <b>CFC consumption remaining eligible for funding (ODP tonnes)</b> | n/a |
|--|-----|

| <b>CURRENT YEAR BUSINESS PLAN ALLOCATIONS</b> |     | <b>Funding US \$</b> | <b>Phase-out ODP tonnes</b> |
|---|-----|----------------------|-----------------------------|
|   | (a) | 450,000              | 10                          |

| <b>PROJECT TITLE:</b>                               | (a)       |
|---|-----------|
| ODS use at enterprise (ODP tonnes):                 | 248.1     |
| ODS to be phased out (ODP tonnes):                  | 498.7     |
| ODS to be phased in (ODP tonnes):                   | n/a       |
| Project duration (months):                          | 24        |
| Initial amount requested (US \$):                   | 1,236,054 |
| Final project costs (US \$):                        |           |
| Incremental Capital Cost:                           | 8,000     |
| Contingency (10 %):                                 | 0         |
| Incremental Operating Cost:                         | 1,129,204 |
| Technical assistance Cost:                          | 41,350    |
| Total Project Cost:                                 | 1,178,554 |
| Local ownership (%):                                | 100%      |
| Export component (%):                               | 0%        |
| Requested grant (US \$):                            | 1,178,554 |
| Cost-effectiveness (US \$/kg):                      | 2.36      |
| Implementing agency support cost (US \$):           | 88,392    |
| Total cost of project to Multilateral Fund (US \$): | 1,266,946 |
| Status of counterpart funding (Y/N):                | No        |
| Project monitoring milestones included (Y/N):       | Yes       |

|                                     |                              |
|-------------------------------------|------------------------------|
| <b>SECRETARIAT'S RECOMMENDATION</b> | For individual consideration |
|-------------------------------------|------------------------------|

## PROJECT DESCRIPTION

1. On behalf of the Government of Brazil, UNDP as the lead agency submitted a project for the phase-out of CTC as a process agent for consideration by the Executive Committee at its 52<sup>nd</sup> Meeting. The total cost of the project as originally submitted was US \$4,476,578 plus agency support cost of US \$335,743. The project proposed retroactive funding for one process agent application and funding of emission control measures for a second application. The CTC baseline for compliance is 411.6 ODP tonnes. The project was subsequently withdrawn and resubmitted to the 53<sup>rd</sup> Meeting.

### Background

2. The objective of this project is to assist the Government of Brazil to ensure timely, sustainable and cost-effective compliance with its obligations on CTC consumption and production under the Montreal Protocol. Brazil has effectively succeeded in the elimination of CTC consumption except for that discussed below, which is well below 0.5 per cent of its baseline consumption of 411.6 ODP tonnes.

3. In addition to a license and quota system, legislation is in place to prohibit the use of CTC in Brazil for almost all emissive uses. This restricts CTC consumption to laboratory uses and process agent applications. Other than project preparation, seven activities supported by the Multilateral Fund have been implemented in Brazil's solvent sector; the phase-out of CTC, TCA and CFC 113 in the solvent sector is now complete.

4. In preparation for this project, UNDP checked the Technical Register (Cadastro Tecnico Federal) on all CTC users in Brazil for the period 2003-2006, with no exceptions noted from the approved users. Visits were made by UNDP to trade associations active in those application sectors where CTC might be used. According to the feedback received, there were no users of CTC that had not yet been identified. Furthermore, discussion with the third-party incineration companies operating in Brazil revealed no waste streams that contain CTC beyond that of Braskem Maceio, one of the two process agent applications identified (see below).

5. CTC is also used in very small quantities for laboratory uses. The sole such use reported was that of the company Merck which imported 86 ODP kg in 2005, previous years imports being between 78 ODP kg and 130 ODP kg per year. Merck had been receiving ultra-pure grade CTC for redistribution to a number of smaller users including universities and research centres. Exact imports in 2006 for that purpose still need to be confirmed by Brazil but are believed to be below 130 ODP kg. Merck distributed much of this volume to smaller users, and current efforts are directed towards understanding the specific uses to which CTC is put by the approximately 30 users, in order to establish possible ways to phase out the use of CTC there.

6. There is no reported use of CTC in the agrochemical or pharmaceutical sectors. In the chemical processing industry CTC has been historically found to be used in two applications, one of which has been discontinued and the other one still being in use.

Use of CTC for the elimination of NCI3 in chlorine production

7. CTC has been used to remove nitrogen trichloride (NCI3) from the production process of chlorine. The use of CTC in the elimination of NCI3 in chlor-alkali production has been recognized by TEAP and adopted by the Meeting of the Parties in its decision XIX/15. The related application is in the plant of the company Braskem at Maceio. The CTC use has averaged at 52.8 ODP tonnes/year in the last five years. The original project proposal foresaw investing some US \$4.1 million for converting CTC use to chloroform use in that application. Two more companies in Brazil, Carbocloro (largely owned by OxyChem of USA) and Cenibra used the same process in the past. While the first has converted the plant but would not be eligible for funding, the second has discontinued chlorine production altogether.

8. Braskem at Maceio has been using destruction technology to eliminate emissions of CTC from the process. Therefore the actual consumption according to the definition of the Montreal Protocol has not exceeded 1.04 ODP tonnes/year in recent years, despite the relatively high use of CTC; the difference of 51.76 ODP tonnes/year between use and consumption has been destroyed. The use of CTC currently continues and the company plans to use CTC for an additional period of 5 to 6 years, before converting at its own cost the chlorine production to membrane technology, for which no NCI3 elimination technology and therefore no CTC would be required.

Use of CTC in the manufacturing of VCM

9. CTC has been used as an energy reduction agent in the manufacture of vinyl chloride monomer (VCM). The use of CTC in the production of vinyl chloride monomer has been recognized by TEAP and adopted by the Meeting of the Parties in its decision XIX/15. The related application is in the plant of the company Braskem at Camacari, which used CTC for this purpose until the end of 2000. The discontinuation of CTC use after that time lead to an increased natural gas consumption in VCM manufacturing associated with accordingly higher operating cost. The use of CTC in the process was typically in the order of 575 ODP tonnes per year, while CTC emerging from the process was typically destroyed at the level of 330 ODP tonnes/year, hence the consumption was typically in the order of 245 ODP tonnes/year. Exact numbers for the consumption in different years have been provided by UNDP. The discontinuation is subject to a retroactive funding request in view of the additional operating costs caused by CTC discontinuation.

Proposed activities

10. After initial comments on the original submission UNDP modified, in co-operation with the company and the Government of Brazil, the proposed activities for the NCI3-elimination at the Maceio plant. Instead of a conversion to the use of chloroform, the emission control measures being undertaken are the main subject of the current funding requests. CTC is removed from the process at different points in the chlorine production process. At one point, CTC contaminated with NCI3 is drained from time to time, packaged into drums and shipped to a destruction site operated by a different entity (external destruction). At another point in the process, CTC is part of a waste gas stream and is continuously incinerated together with the waste gas (on-line destruction). The on-line incinerator has downtimes during which the waste

gas, including the CTC, is simply vented for lack of storage possibilities. The vented gases during the down times are the predominant losses, with the vented gases being estimated to be 95 per cent of the emissions. Maximum levels of other losses (CTC carried with the end product, filling losses) have been quantified and turned out to be of low significance, and the exact levels are difficult to quantify. UNDP requests funding on the basis of the costs of an upgrade of the online incinerator in 2002, which reduced the off-times significantly, and of the associated annual costs for both the online destruction and the external destruction from the time of the upgrade until the end of 2009. For the years until conversion of the facility to a different chlorine production technology, no funding therefore being requested. UNDP presented detailed historical and recent data regarding the operation of the plant, the amounts of CTC used and destroyed, and the associated cost. Funding is requested for the on-line destruction on the basis of the share of CTC in the incinerated waste stream (i.e. 1 per cent). An overview over the main cost items is provided in the below table.

|  | Past years |        |        |        |               | Present and future years<br>2007-2009 |
|--|------------|--------|--------|--------|---------------|---------------------------------------|
|  | 2002       | 2003   | 2004   | 2005   | 2006          |                                       |
| Investment for on-line destruction (US\$), calculated as 1% of the total investment cost for the destruction facility  | 8,000      |        |        |        |               |                                       |
| Annual cost for on-line destruction (US \$), calculated as 1% of the total operating cost for the destruction facility | 5,600      | 5,600  | 5,600  | 5,600  | 5,600         | 5,600                                 |
| Annual cost for external destruction (US \$)   | 8,939      | 9,265  | 8,532  | 9,266  | 13,664        | 10,642                                |
| Annual Total (US \$)   | 22,539     | 14,865 | 14,132 | 14,866 | 19,264        | 16,242                                |
| <b>Total (US \$)</b>   |            |        |        |        | <b>85,666</b> | <b>48,726</b>                         |
|  |            |        |        |        |               | <b>134,392</b>                        |

11. For the VCM plant in Camacari, also owned by Braskem, UNDP proposes retroactive funding of incremental operating cost for two years of operations, namely 2001 and 2002. By the end of 2000 the plant stopped the use of CTC in the production of VCM. The use of CTC as an additive in the conversion of EDC to VCM allows the use of lower EDC cracking temperatures, and hence requires less fuel. The cessation of CTC by Braskem Camacari caused a documented increase in the consumption of natural gas in the range of 15-20 per cent per year since 2000 using the average pattern in the years 1998 until 2000 as a baseline. On that basis it was shown that the incremental operating costs of ceasing CTC in this application amount to US \$401,838 in the first year and US \$600,974 in the second year, amounting to US \$1,002,812 in incremental operating cost.

12. UNDP proposes in addition a technical assistance component intended to support the country in developing an optimised system for the monitoring of imports and their separation into feedstock and non-feedstock uses, and for the monitoring of quantities of CTC for destruction. The cost of that component is US \$41,350.

## **SECRETARIAT'S COMMENTS AND RECOMMENDATION**

### **COMMENTS**

13. UNDP had prepared a project for the 52<sup>nd</sup> Meeting to phase out the consumption of CTC, other than in laboratory uses. The Secretariat pointed out that according to the country programme data reported by Brazil, laboratory uses are the only uses left in the country. UNDP advised the Secretariat that one of the beneficiaries had already phased out the use of CTC, and was therefore not part of the current reporting and is requesting retroactive funding. The other beneficiary had used stockpiled CTC, which has in the meantime been largely used up. UNDP provided detailed information on the historical levels of stockpiled CTC in Brazil over several years as part of the documentation.

14. UNDP submitted originally a project which included the conversion of the Braskem Maceio plant from using CTC for removing NCl3 from a chlorine stream to using chloroform as the predominant cost item. During the review by the Secretariat it became apparent that the actual consumption was potentially minimal since the predominant part of the CTC was being destroyed. The Secretariat informed UNDP that the future CTC consumption needs of Brazil, which in the documentation were calculated based on imports of CTC, are likely to be substantially lower since CTC is being destroyed, and that the actual consumption might be only the CTC emitted to the atmosphere. The Secretariat advised that investigation was needed to check if the destruction facilities fulfil the requirements defined in the respective decision of the Meeting of the Parties, and if so to develop an alternative project proposal focussing on emission control, to determine the most cost effective approach.

15. This advice was based on decision X/14 (Annex III) of the Meeting of the Parties where the Parties indicated, inter alia, that the Executive Committee may consider a range of options to reduce the emissions of controlled substances from process agent use by Article 5 Parties to "levels agreed by the Executive Committee to be reasonably achievable in a cost-effective manner without undue abandonment of infrastructure". Incremental costs which covered a range of cost-effective measures including, for example, process conversions, plant closures, emissions control technologies and industrial rationalisation, to reduce emissions of controlled substances to these levels should be eligible for funding in accordance with the rules and guidelines of the Executive Committee of the Multilateral Fund.

16. The emission control measures under this project component result in a reduction of emissions typically by 98.48 per cent in relation to the CTC use by the company. Typical emissions of 0.78 ODP tonnes per year for the remaining years from 2008 to 2013 could be reduced by another 90 per cent if, instead of the emission control approach a conversion to chloroform as a process agent would be undertaken. The phase-out would not be complete since small amounts of CTC would be produced in the application when using chloroform, but this is not included in the calculation. It is noteworthy in terms of global benefits that the continued use of CTC and its controlled destruction takes place against the background of a global over-supply of CTC from by-production. A conversion would remove a possible monitored use of that by-production. In addition, the production of the necessary chloroform would lead to by-production of even more CTC. The global environmental benefits of a conversion appear therefore doubtful. The plant will convert to a different production technology without the need

for NCl<sub>3</sub> removal not later than 2013, therefore a conversion to chloroform would have a lifetime of less than 6 years. The cost effectiveness of such a conversion would be US \$77.74/kg, as compared to the cost effectiveness of the emission control measures of US \$2.62/kg.

17. UNDP undertook to ensure that the destruction technology used is adhering to the relevant decisions of the Meeting of the Parties, and reported that this is indeed the case. The approach regarding emission control has a number of regulatory requirements for Brazil, and specific reporting requirements to the Ozone Secretariat for Brazil and the Executive Committee through the Secretariat and the Ozone Secretariat to the Meeting of the Parties. The necessary framework for this case has been defined in close collaboration with the Ozone Secretariat and UNDP. The Government of Brazil and Braskem as the owner of the Maceio plant have informed UNDP that a continuous use of CTC with subsequent destruction of more than 98 per cent would be an acceptable solution.

18. TEAP has defined the use of CTC in the manufacturing of VCM as a process agent use, this definition was adopted by the Parties in September 2007, and therefore the cost associated with the discontinuation appears eligible.

19. For this project the funding is predominantly retroactive, therefore a performance based agreement with several tranches does not appear to be appropriate. On this basis, the Secretariat and UNDP discussed the possibility of developing commitments on CTC phase-out acceptable to the Government of Brazil, while providing the necessary reassurance to the Executive Committee that the consumption is indeed minimized and, subsequently, will be phased out. With these components, the project leads to the complete phase-out of CTC consumption in the country save for quantities emitted in the Braskem Maceio plant of less than 2 ODP tonnes per year, and with the exemption of laboratory uses. The laboratory uses are representing a consumption of presently less than 0.15 ODP tonne/year which might be addressed in a subsequent project. As of today this is the only CTC consumption in Brazil which remains eligible for funding.

## **RECOMMENDATION**

20. The Fund Secretariat recommends that the Executive Committee:

- (a) Notes the understanding between the Government of Brazil and the Executive Committee that this project is the last phase-out project for the consumption of CTC in Brazil, and that no further funding for phase-out of CTC consumption in Brazil will be sought from the Multilateral Fund, except for:
  - (i) Uses which might be defined as process agent uses by a future Meeting of the Parties, and which are at present existing in the country; and
  - (ii) 0.15 ODP tonnes of laboratory uses;
- (b) Notes the commitment of the Government of Brazil to limit the consumption for those process agent applications approved to date by the Meeting of the Parties to zero tonnes of CTC, with the exception of an annual consumption of up to 2 ODP tonnes per year until and including 2013 for the Braskem Maceio Chlorine-Alkali plant for the process agent application “Elimination of NCl<sub>3</sub> in chlor-alkali

production”, as included as application number 1 in the list approved by the 19th Meeting of the Parties;

- (c) Notes the commitment of the Government of Brazil to:
  - (i) ensure that the necessary data for an assessment of the CTC streams in the Braskem Maceio Chlorine-Alkaline plant on the basis of a mass balance are collected;
  - (ii) monitor the collection and subsequent destruction of CTC drained from the NCl<sub>3</sub> removal application at the Braskem Maceio Chlorine-Alkaline plant, and ensure that except for minor filling losses the destruction of the whole amount is being carried out; and
  - (iii) monitor that the on-line destruction facility, i.e. the on-site incinerator described in the project document, is online for at least 97 per cent of the production time, during which at least 97 per cent of the production occurred;
- (d) Notes the commitment of the Government of Brazil to report the resulting data regarding the amounts of CTC destroyed as well as the import of CTC for this application annually to the Ozone Secretariat as part of the reporting of Article 7 data;
- (e) Requests the Fund Secretariat to inform the Ozone Secretariat of this decision and, in particular, its sub-paragraph (b); and
- (f) Approves the project for the “phase-out of carbon tetrachloride (CTC) as process agent” with associated support costs at the funding level shown in the table below:

|     | <b>Project Title</b>  | <b>Project Funding<br/>(US \$)</b> | <b>Support Cost<br/>(US \$)</b> | <b>Implementing<br/>Agency</b> |
|-----|---|------------------------------------|---------------------------------|--------------------------------|
| (a) | Phase-out of carbon tetrachloride as process agent in two applications at Braskem | 1,178,554                          | 88,392                          | UNDP                           |

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