

CONCERNS ABOUT CDM PROJECTS BASED ON DECOMPOSITION OF HFC-23 EMISSIONS FROM 22 HCFC PRODUCTION SITES

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Background

HFC-23 is a by-product from HCFC-22 production (CHClF_2), which is used as refrigerant and as a feedstock for the production of PTFE (Polytetrafluoroethylene - Teflon). Typically, the ratio of HFC-23/HCFC-22 is 3 to 4%. HFC-23 is a GHG of low toxicity but with a high global warming potential ($\text{GWP} = 11'700$ according to IPCC second assessment report). As HFC-23 reportedly is a non marketable gas, most of it is presently being emitted to atmosphere from HCFC-22 production plants in China, India, South Korea and Brazil.

On 26th September 2003 the CDM Executive Board has approved the baseline methodology AM0001 "incineration of HFC-23 waste streams". This methodology is based on the HFC23 decomposition project in Ulsan, South Korea. The "Ulsan project" as well as the "Project for GHG emission reduction by thermal oxidation of HFC-23 of Gujarat Fluorochemicals Ltd"¹ covers one HCFC-22 production site each. They plan to mitigate 5-6 million tCO₂ equivalents each per year. The Gujarat Fluorochemicals Ltd. Project has obtained host country endorsement in February 2004, though reportedly one of the reviewing experts has expressed concerns about the inadequate contribution to sustainable development. The Gujarat Fluorochemicals Ltd has recently entered into an CER purchase agreement with Japanese and British investors.²

¹ PDD by Pricewaterhouse Coopers, New Delhi, November 14, 2004.

² Point carbon of 19.5.2004 informed: Japanese Sumitomo Corp. and British firm Ineos Fluor Holdings Ltd. have secured a deal with Indian firm Gujarat Fluorochemicals Ltd. that will give them a total of 5 million tonnes of CO₂ emission rights a year from 2005, one of the world's largest volumes from a single CDM project. Total investment in the project is estimated at roughly 300 million yen. How the emission rights will be split up between Sumitomo and Ineos Fluor has yet to be decided, but the latter plans to sell its share in Europe, according to Nikkei. Under the deal, Sumitomo and Ineos Fluor will install at a plant of the New Delhi chemical company equipment to break down a chlorofluorocarbon substitute produced as a by-product from the company's operations into CO₂ and fluoride. The annual CO₂ emission rights of 5 million tons equal to roughly 1% of the entire Japanese industry's annual global warming gas emissions in fiscal 1990, or 0.4% of the entire amount released in Japan.

About this note

This note is based on ongoing work within the National Strategy Study Programme of the World Bank where the author is involved as leader of the international team of experts for the studies in China and India. The author also has some 10 years of experience in the field of the implementation of the Montreal Protocol, again mainly in India (Indo-Swiss-German cooperation). The author benefited from a number of discussions on the problems related to HFC-23 decomposition CDM projects with his colleague from GTZ, Stephan Sicars, as well as with Indian national Montreal Protocol experts such as Dr. Sukumar Devotta, director NEERI³ and member of the IPCC/TEAP task force on HFCs. Stephan Sicars had represented Germany in a workshop on HFC-23 decomposition organized by the Government of China on 3/4th February. He had reported to BMZ-BMU and allowed the author to bring to notice the conclusion of this report to Swiss authorities, considering the long standing Swiss-German cooperation with India in Montreal Protocol matters. This note is a non-paper to bring the matter of potentially adverse effects of HFC-23 CDM projects to notice.

Main concerns

Besides these above mentioned two pipelined projects from South Korea and India, there is a significant HFC23 abatement potential in HCFC production facilities in China. A consortium of Japanese, Italian and Chinese partners are currently examining the possibility to integrate 12 different HCFC-22 production plants⁴ and abating potentially up to 60 mio t CO₂ per year, which seems huge compared to similar projects in Korea or India.

- Such projects generate CERs at cost in the order of 0.5 USD/t CO₂e compared to current carbon market prices in the order of 3.5-5 USD/t CO₂e.
- The workshop held in China in February 2004 has estimated the potential of HCFC-22 producers in the developing world to supply a CER amount significantly above 100 Million t CO₂e/year.
- If in the China case a central HFC-23 decomposition facility is chosen, which is not located at the HCFC-22 manufacturing sites, this will require the reformulation of the approved baseline and monitoring methodology AM0001.
- Many carbon market experts do estimate the annual CER supply potential from the global carbon market to fall in the order of 100 – 200 million t CO₂e by 2010. The

³ National Environment Engineering Research Institute

⁴ 5000 tons HFC-23 per year are equivalent to 58.5 million tons CO₂e abatement annually.

supply of 100 million tCO₂e/a from HFC23 decomposition projects could hence capture 50% of the global CDM market share, put carbon offset prices under pressure and would make life difficult for demonstrating additionality for energy related CDM project. Projects reducing carbon emissions from the energy sector were seen as the rationale for CDM establishment in Kyoto, as they were expected to leverage the needed capital to progress towards lower carbon intensity energy systems in the South.

- In addition the registration of HFC-23 decomposition projects would generate adverse effects on the implementation of the Montreal Protocol.

Based on these concerns the author concludes that it would be advisable not to endorse registration of HFC23 projects from side of the CDM Executive Board. The approval of the pipelined Korean and Indian HFC-23 decomposition projects⁵ would set in motion a chain leading to the following ill effects:

- Once the Korean Ulsan Chemicals and the Gujarat Fluorochemicals Ltd HFC 23 project are approved, all the other HCFC producers in the developing world (in particular in India and China) would be put under significant competitive pressure to come forward with similar CDM projects, as the decomposition cost are around 0.5 USD/tCO₂ equivalent⁶ only, the relative transaction cost on CO₂e basis are low (one plant, few stakeholders) and at a potential sales price of 3.5-4 USD/tCO₂e the profits accruing from CER sales would allow the manufacturers with CDM projects to significantly reduce HCFC-22 sales prices⁷. So any HCFC-22 producer without a HFC-23 CDM project is likely to face severe competitive disadvantages. Even at the present low international carbon offset prices, HFC-23 decomposition is an attractive business due to the high HFC-23 GWP value of 11'700!
- As mentioned above, 6-11 Chinese HCFC-22 producers have identified a total CER potential up to 60 MtCO₂e/year based on HFC-23 decomposition that could reach the carbon market by 2008. This is likely to draw the CER price range below the PCF/CERUPT price range of 3.5-5 USD/tCO₂.

⁵ Methodology 23incin AM0001

⁶ Conclusion from workshop in China with HCFC22 producers: They presented this figure of 0.5USD/tCO₂ which is not displayed in the PDDs of the Ulsam or the Gujarat project.

⁷ According to a back of the envelope calculation this elasticity can be estimated as follows: Assuming HFC-23 decomposition CER generation cost of 1 USD/tCO₂e (0.5USD/tCO₂e decomposition cost and 0.1 USD/tCO₂e transaction cost) and a CER sales price of 3.50-4.0 USD/tCO₂e, the production cost of HCFC-22 would be reduced by **30-40%**. This is based on assumed HCFC-22 production cost of USD 3.50/kg, a HFC-23 to HCFC-22 co-production ration of 4:100 and a HFC-23 GWP value of 11'700 ().

- Prospects for continued low carbon prices will shy away investors from CDM investments to the energy sector where they are most needed and cost are typically above 4USD/tCO₂. Thus, there is a considerable risk that HFC-23 projects contribute to the grounding of the sustainable development objectives targeted through the CDM mechanism.
- Well informed insiders have assured the author that projects from at least 2 other Indian CFC/HCFC producers are likely to follow, if Ulsan and Gurarat Fluorochemicals Ltd. are successfully validated and registered.
- Under a scenario of KP ratification, the profits from HFC-23 decomposition sales will pull down HCFC-22 prices. This will pass on the wrong signal to HCFC22 producers. They should gradually phase out production capacity along with the Montreal Protocol control regime for HCFC-22. HCFC-22 production, controlled under the Montreal Protocol, is expected to freeze at 2015 emissions levels in non-Annex I countries by 2016 only. A complete phase out for non-Annex I countries is targeted by 2040, however, without a clear schedule yet.
- Low priced HCFC-22 will increase the GHG load of the atmosphere. This load is currently not reported under the UNFCCC GHG inventories. Lower HCFC-22 production costs do further establish a barrier to early phase out of HCFC-22 as developing country markets do become more addicted to low priced HCFC-22. Though not a part of the Kyoto GHG basket HCFC22 is a powerful GHG with a GWP comparable to HFC134a ($GWP_{100} = 1'300$). Back of envelope projections suggest that HCFC22 emissions will account for 6% of the Chinese total GHG emissions by 2010, if accounted as per IPCC 1st tier methodologies. The global warming caused by HCFC22 should therefore be of concern also to UNFCCC.
- This case gives evidence for a deficit in across Multilateral Environment Agreement coordination in the field of ODS/GHG regulation as regards the Cl and F gases: The Montreal Protocol control schedules (2030 with a service tail up to 2040) lie significantly more distant in the future than the end of the 1st commitment period of the Kyoto Protocol (2012), where the carbon offset market should be fully established.
Thus, in the special case of HFC23, carbon trading does introduce a perverse incentive which does challenge the environmental integrity of both Protocols.
- The EB approved Methodology AM0001 has other draw backs related to incomplete environmental impact assessment: The consulted Indian Montreal Protocol experts observed that the Ulsan proposal is not proposing state of the art technology for HFC23 decomposition as e.g. applied by Solvay in a plant near Frankfurt: Rather

than going for thermal oxidation with the present HFC23 mass flow stream of 4% of HCFC22, this mass flow stream could be reduced in a first step to half - however at some cost in terms of reduced HCFC22 output. With AM0001 endorsed as it stands, no commercial incentive has been inbuilt for a reduction of the HFC waste stream.

- To reduce the waste stream upfront would have an additional advantage with regard to reducing the fluorine output which has to be treated as waste after decomposition. Secondly: It would be environmentally more sustainable to start using the captured HFC23 as feedstock in some other process rather than putting it to thermal oxidation. The problem with oxidation is that the fluorine does not “disappear” but has to be washed out as HF from the exhaust gas stream and then is to be disposed as F-salt. F-salts are highly soluble and need therefore to be disposed in underground hazardous waste landfills⁸. India just operates one such landfill. This is hence a scarce resource. In developing countries management of hazardous wastes is generally seen as a challenge. Providing green light to AM0001 based CDM projects challenges compliance with environmental integrity. This methodology should minimally contain a clause that in a first step the HFC23 gas stream should be reduced (event at cost of some HCFC22 equivalent output) before the remaining waste stream is put to thermal oxidation.

Recommendations

It is therefore recommended:

- to reconsider the AM0001 methodology with a view to ensure environmental integrity;
- to assess at greater depth the adverse effects of HFC-23 CDM on the implementation of the Montreal Protocol.

⁸ “Untertagedeponie”.