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Executive Committee of the
Interim Multilateral Fund for the
Implementation of the Montreal Protocol

Seventh Meeting
Montreal, 23-26 June 1992

Addendum

PROJECT PROPOSAL: BRAZIL

THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEplete THE OZONE LAYER

PROJECT COVER SHEET

COUNTRY: Federative Republic of Brazil

SECTORS COVERED: Refrigeration, foams, research and product development, atmospheric monitoring

**ODS CONSUMPTION IN
AFFECTED SECTORS:**

Refrigeration:	4,700 t/y (CFC)
Foam:	4,020 t/y (CFC)
Aerosol:	100 t/y (CFC)
Others:	500 t/y (CFC)

PROJECT TITLE: Ozone Depleting Substances Elimination Project

PROJECT DURATION: 3 years

PROJECT IMPACT: Estimated 5000 tons/yr. CFC Phase-Out

PROPOSED BUDGET: 8.0 million

IMPLEMENTING AGENCY: World Bank

**COORDINATING
NATIONAL AGENCIES:** Ozone Technical Group, National Development Bank (BNDES); National Fund for Studies and Projects (FINEP)

PROJECT SUMMARY

Please refer to attached Executive Project Summary

ANNEX 1

NATIONAL PRODUCTION AND CONSUMPTION PATTERNS

1. Production: CFC-11, CFC-12, CFC-113, CFC-114, HCFC-22, methyl chloroform and carbon tetrachloride are all produced in Brazil. Du Pont and Hoechst both produce CFC-11, CFC-12 and HCFC-22, whereas only Hoechst produces CFC-113, and CFC-114. Dow Chemical produces methyl chloroform. Du Pont and Hoechst have a combined production capacity of 20,000 tons CFC's or 10,000 tons HCFC 22 annually. Production of CFC-11 and CFC-12 peaked in 1987 at 8,000 tons. All Halons (50 tons/yr) are imported, as is some CFC-113 and CFC-114. The first commercial production of CFC substitutes in Brazil, HFC-134a by Hoechst, is scheduled for start up in early 1994.

2. Consumption: Total CFC consumption fell from 11,000 tons in 1987 to an estimated 10,000 tons for 1989, and 8700 tons for 1990, the decrease being accounted for almost entirely by reduced CFC-12 consumption. The shortfall between domestic CFC production and consumption is made up by imported CFC-113 and CFC-114. Estimated distribution by end use for 1989 was air conditioning/refrigeration 47%; foaming agent 40%; solvents 7%; aerosols 1%; and other 5%. Total consumption of CFC's in the production of polyurethane foam was 2,850 tons, accounting for 85% of CFC use as a foaming agent. Most of this is for rigid polyurethane production, substitution for flexible foam production having already taken place. Methyl chloroform consumption (12,800 tons/yr) by end use was metal cleaning - 82%; electronic component cleaning - 10%; aerosols, adhesives, and coatings 5%, and other - 3%. Carbon tetrachloride (12,000 tons/yr) is used exclusively as a raw material for CFC and other chemical intermediate production.

ANNEX 2

BRAZIL MONTREAL PROTOCOL PROGRAM SUBPROJECT PIPELINE

SUBPROJECTS IDENTIFIED AND/OR UNDERGOING GTO REVIEW FOR ELIGIBILITY

1. Installation of Low Latitude Atmospheric Ozone Monitoring Stations

The recent discovery of accelerated ozone layer depletion in the Northern Hemisphere has highlighted the desirability of establishing a worldwide network of stations for monitoring high altitude ozone concentrations. Various nations have established monitoring stations, and data is shared. The geographic distribution of monitoring stations is skewed, however, with the vast majority being in the high temperate and polar latitudes. Coverage in the equatorial and subtropical latitudes is particularly thin. Brazil currently has two Dobson stations, in Natal-RN, and Sao Jose dos Campos-SP, site of INPE. The Natal station has been operating since 1978, and is the most important, internationally recognized data collection site for equatorial latitudes. The Brazilian National Institute for Space Research (INPE) under the leadership of Dr. Volker Kirchhoff, is internationally recognized, and has cooperated with the American National Aviation and Space Administration (NASA) in research on ozone layer measurement.

The proposed subproject intends to rectify the low latitude gap by seeking funding for three stations of the more modern Brewer type, the initial group of a total of nine Brewer stations, which is considered to be the ideal national distribution. The monitoring stations will be among the first to begin systematic monitoring of the ozone layer in the tropical latitudes. While the monitoring stations will not reduce ODS consumption, they will, provide important links in a worldwide ozone layer monitoring system where a gap now exists.

The estimated budget for the purchase and installation of the first three stations, and operating costs for the first two years of operation is \$US 1.2 million. Since monitoring is not an activity "to facilitate compliance with the control measures", concern has been expressed as to whether this subproject is eligible for support, and whether the Bank is the appropriate implementing agency. It has therefore been suggested that the United Nations Environment Program (UNEP) might be the more appropriate MP implementing agency through whom financing for this project should be requested.

2. CFC-12 Collection, Recycling, and Conservation Program for Household Refrigerator Maintenance and Repair Shops

Under the organizational umbrella of ABINEE (The Brazilian Association of Electronics and Electric Appliance Manufacturers), and with the participation of Hoechst do Brasil, S.A., the objective of the project will be to provide authorized repair shops with equipment and training to permit collection and recycling of CFC-12 drawn from household refrigerators and freezers being serviced. After collection, the CFC-12 will be delivered to Hoechst for purification, and resale at reduced prices. Technology is also being developed for chemical decomposition of CFC's into non ODS byproducts, so that the recycled CFC's can eventually be phased out without emission into the atmosphere. The recycling program is meant to curtail consumption and

emissions of CFC's, while prolonging the useful life of the existing stock of CFC-12 refrigerators, during the period when HFC-134a refrigerators are being phased into the domestic market.

The project components for which funding is requested are 70% subsidization of the purchase price of the pumps and CFC-12 collection apparatus to be used by each repair shop, and operator training costs. Total investment per shop is less than \$US 1000. Under the plan, the shop will pay 30% of the purchase price, with the remainder to be financed by the project. Each of the several major refrigerator manufacturers which control over 75% of the market will be responsible for implementing the program with their respective service agent networks. An initial pilot program of x units will be used to develop recovery data and operating experience. If proven to be cost effective the program will be extended to an estimated y repair shops. Current data suggest that the average CFC-12 recovery rate per unit serviced should be quite high, as the most frequent cause of unit malfunction is compressor/motor failure, and not refrigerant leakage.

ABINES has recently applied for a \$US 40,000 project preparation credit from FINEP to be used to develop more precise design parameters and cost information for the program. It is anticipated that if the program is implemented on a national basis, approximately 1,500 shops would be equipped and trained at a total initial cost of \$US 2 million. Operating costs would be supported through profits from resale of the recycled CFC-12. Annual CFC-12 consumption for servicing of household refrigerators is currently estimated at 2,000 tons. If z percent could be recovered through the program in the initial year of full operation and eventually recycled q times, or until CFC-12 refrigerators are replaced by HFC-134a units, emissions of ,000 tons of CDS's into the atmosphere will have been avoided. The cost effectiveness in terms of Trust Fund resources will have been \$US /ton of emissions avoided.

3. Assembly Line Refitting for HFC-134a Refrigerator Compressor Production

The two largest Brazilian producers of compressors for household refrigerators, freezers, and window unit air conditioners, SICOM and ENBRACO, supply over 75% of the Brazilian market, and also export 60-70% of their production, mostly to Europe and the United States. In order to maintain these markets, they have already developed compressors for use with HFC-134a as a substitute refrigerant for CFC-12. These new designs have greater mechanical efficiency and slightly better overall thermal efficiency for equivalent service than CFC-12 units, thus resolving an original concern associated with HFC-134a. Testing of these units is now underway on a pilot scale in prototype household refrigerators developed by Climax-Westinghouse, Consul, Prodascimo and other domestic refrigerator producers. Commercial production for export markets is expected to begin before the end of 1993.

Mechanical design of HFC-134a compressors is quite similar to CFC-12 compressors, as is production. The major difference is that for reasons of compatibility with HFC-134a, the inexpensive mineral oil lubricants used with CFC-12 systems must be replaced by much more expensive ester oils, which also require different contact surface materials for gaskets, seals, storage tank liners, etc. Conversion to commercial scale production of HFC-134a compressors will require some assembly line modifications, most notably, the oil storage and filling equipment used for charging the compressors with the ester oils. ENBRACO has estimated the cost for central storage and refitting of two

assembly lines at \$US 300,000. The total estimated cost to refit all seven assembly lines is \$US 530,000.

Brazil's household refrigerator compressor industry produces some 15-20 million units per year, which are used in an equivalent number of refrigerators and freezers. Full conversion will permit the substitution of a like number of CFC-12 units with HFC-134a units. Assuming an average charge of 250 grams per unit, including handling/filling losses, this will represent the substitution of 3750-5000 tons/yr CFC-12 in new units plus the emissions generated by a like number of units in servicing and recharging operations over their average useful life.

It is anticipated that all major compressor manufacturers will eventually seek Trust Fund financing for these eligible incremental conversion costs.

4. Assembly Line Refitting for HFC-134a Refrigerator Production

As noted above, prototype designs already exist for household refrigerators and freezers which employ HFC-134a as the refrigerant, but continue to use as insulation panels rigid polyurethane foam with CFC-11 as the foaming agent. The nature of investment in assembly line conversion for production of units substituting HFC-134a as refrigerant, but retaining conventional polyurethane foam panels is similar to that for compressors - i.e. refitting of charging stations and storage tanks, at a cost of approximately \$US 100-200,000 per line.

5. Research and Product Development - Compressors, Rigid Foams and Refrigerators/Freezers

A major area of CFC substitution technology which has not been resolved is the development of CFC free refrigerator insulation panels. Current refrigerator designs typically use rigid polyurethane foam insulation panels which contain more CFC-11 as the foaming agent than CFC-12 as the refrigerant charge. When 30 % to 50 % of the CFC-11 is replaced by water in the foaming agent formulation, current box designs can still be used. To eliminate more than 50% of the CFC-11 from the polyurethane or switch to other currently available insulators, new box designs are required to retain the same level of energy and thermal efficiency. Research efforts now center on development of CFC free foams which: 1) result in overall energy efficiency equal to or better than existing designs; and 2) do not require redesign of refrigerator boxes to accommodate changed thermal characteristics of CFC free insulation panels. If redesigned boxes are required, product development and assembly line refitting costs will be considerably higher than those noted above.

Considerable in-house development work has already taken place and continues at all major Brazilian producers of compressors and refrigerators. It is, as a rule, taking place spontaneously, and being financed by the enterprises themselves, propelled by the need to gain or maintain market share in competitive domestic and export markets, and in order to protect proprietary technology. The GTO has received several inquiries concerning retroactive financing of in-house product development of what are clearly incremental costs of CFC substituting technology development. Guidance will be required

concerning eligibility for Trust Fund support, in light of: i) the retroactive nature of the costs in many cases; ii) the difficulty of quantifying and verifying incremental costs of development work carried out by regular company staff; and iii) enterprise expectations of generating positive rates of return on the investments in product development.

One of these requests, for development of a 250 BTU/hr. compressor with an efficiency rating of 4.9 BTU/watt-hour, estimated that incremental development costs were of the order of \$US 450,000.

6. Basic Research - High Efficiency Compressors for Use with HFC-134a

Funding will be requested to finance research to be undertaken by the mechanical engineering faculty of the Federal University of Santa Catarina in the area of impeller and mechanical design improvements for compressors for use with HFC-134a systems. Two separate research projects with a total contract value of \$US 150,000 have been discussed. Beneficiaries of the research would be EMBRACO and Consul.

7. Retrofitting of Central Chilling Systems for Conversion to HCFC-123 or HFC-134a Refrigerants

Major air conditioner manufacturers in the USA have already developed retrofit technology for converting existing CFC-11 central air conditioning and CFC-12 refrigeration systems for use with HCFC-123 and HFC-134a respectively. Such retrofit operations are eligible for Trust Fund subsidization. The most operable form would be a subsidy to the user for payment of contracts with installers (with the recommended conditionality that the replaced CFC's must be collected for recycle). It is to be expected that the major servicers and installers of central systems will be organizing an operation of this nature for eventual Trust Fund support.

The potential substitution effect of retrofitting of central air conditioning systems will be somewhat less in Brazil, however, than might ordinarily be expected for a nation with such a large stock of installations. Due to a quantitative restriction on the import of large centrifugal compressors between 1973 and 1988, virtually all the central air conditioning systems installed during this period in Brazil are HCFC-22/reciprocating rather than CFC-11/centrifugal systems. While such systems were more expensive to install, and consume more energy (95 % from hydro sources), HCFC-22 is not yet a controlled substance. There are, nevertheless, still sufficient numbers of candidates to make a retrofitting program worthwhile.

Costs for a retrofit conversion can vary widely, even for similar capacity systems, depending upon age, layout, general condition, etc. As a typical illustration from the Washington D.C. area, retrofitting of a 700 ton CFC-11 chiller for service with HCFC-123 cost \$US 80,000. Installed cost of a new replacement system would have been approximately \$US 300,000. The refrigerant charge to be substituted is approximately 800 kg., giving a cost of approximately \$US 100,000 per 1,000 kg. of refrigerant substituted, plus the incremental cost of the HCFC-123 refrigerant. Quoted costs for an HCFC-123 retrofit for nine 800 ton chillers for the Caracas, Venezuela metro system, also resulted in a cost of \$US 100,000 installation costs plus incremental cost of refrigerant per 1000 kg. of CFC-11 replaced by HCFC-123.

TRAMITAÇÃO DE PROJETOS

- 1 - Os interessados apresentam Sumário Executivo do Projeto em duas vias à Secretaria Executiva do GTO;
- 2 - A Secretaria Executiva distribuirá cópias do Sumário Executivo aos seus membros, no prazo mínimo de 15 (quinze) dias de antecedência da próxima reunião, cabendo à Secretaria Executiva proceder uma análise preliminar quanto aos cumprimentos dos requisitos exigidos para a devida apreciação pelo GTO.
- 3 - A análise e o enquadramento de cada Sumário executivo pelo GTO, será examinado na primeira reunião que ocorrer após o prazo citado no item 2. Na impossibilidade de uma decisão, a proposta passa a ser pauta prioritária da próxima reunião.
- 4 - O exame do enquadramento será efetuado com base nos termos do Protocolo de Montreal e nas metas estabelecidas pelo Programa Nacional, identificando, no caso de acolhimento, a Agência Implementadora Nacional que será encarregada da análise, contratação e acompanhamento do projeto.
- 5 - A Secretaria Executiva comunicará ao interessado a Decisão do GTO, informando os prazos e os roteiros adequados para apresentação do projeto a Agência Implementadora Nacional;
- 6 - O projeto será analisado pela Agência Implementadora Nacional de acordo com suas normas, observando as exigências gerais e específicas definidas pelo GTO quando do enquadramento;
- 7 - Qualquer diferença substancial entre o Sumário Executivo enquadrado e o projeto em análise será informada pela Agência Implementadora Nacional à Secretaria Executiva, podendo ser solicitado o reexame do enquadramento do pleito pelo GTO;

- 8 - Concluída a análise, o projeto será submetido a alçada decisória competente da Agência Implementadora Nacional, para aprovação, de acordo com as suas normas. Cópia do relatório de análise será encaminhada pela Agência Implementadora Nacional à Secretaria Executiva do GTO, ficando o Projeto e demais documentações utilizadas à disposição da Secretaria Executiva e dos membros do GTO, a todo e qualquer tempo.
- 9 - O GTO comunicará ao interessado, por intermédio de sua Secretaria Executiva, a decisão quanto ao projeto;
- 10 - Os projetos aprovados serão encaminhados pela Agência Implementadora Nacional à Agência Implementadora Internacional pertinente através dos órgãos nacionais competentes (ABC/DEAIN), quando for o caso;
- 11 - A Agência Implementadora Internacional comunicará simultaneamente sua decisão quanto ao projeto à Agência Implementadora Nacional e ao GTO;
- 12 - A Agência Implementadora Nacional constatará a operação aprovada com o interessado, conforme suas normas e demais disposições aplicáveis, após serem tomadas junto à Agência Internacional as medidas necessárias ao acesso aos recursos;
- 13 - A Agência Implementadora Nacional desembolsará os recursos que estejam à sua disposição e realizará o acompanhamento do projeto conforme suas normas em vigor, e definidas pelo GTO, mantendo informado o GTO, por intermédio de sua Secretaria Executiva, de todas as questões, ordinárias e relevantes, observadas;
- 14 - Sem prejuízo das atribuições da Agência Implementadora Nacional, fica facultado o acompanhamento dos Projetos a qualquer membro do GTO.

EDITAL DE CONVOCAÇÃO DE INSTITUIÇÕES PARA ORTEx
RECURSOS FINANCEIROS DO FUNDO MULTILATERAL INTERINO DO
PROTOCOLO DE MONTREAL

1. Por meio do Decreto nº 22.280, de 06 de junho de 1990, o Brasil aderiu ao Protocolo de Montreal sobre Substâncias Que Destroem a Camada de Ozônio, ratificando o compromisso de suspender a produção e a utilização das substâncias que afetam a camada de ozônio estratosférico, nos prazos estabelecidos pelo Protocolo. Na reunião de Londres - em junho de

1990 - foi criado o Fundo Multilateral Interino, por decisão das Partes, vigorando até 1991. O Fundo opera por meio das agências implementadoras internacionais: Banco Mundial, Programa das Nações Unidas para o Desenvolvimento (PNUD) e Programa das Nações Unidas para o Meio Ambiente (PNUMA), e, no Brasil, por meio do Banco Nacional de Desenvolvimento Econômico e Social (BNDES), e da Financiadora de Estudos e Projetos (FINEP).

2. O Departamento da Indústria e do Comércio do Ministério da Economia, Fazenda e Planejamento, Secretaria Executiva do "Grupo Interministerial para Estabelecer Diretrizes e Coordenar a Implementação das Normas do Protocolo de Montreal sobre Substâncias Que Destroem a Camada de Ozônio (GTO)", instituído pela Portaria Interministerial MCTP/ME/SCF-PR/CDAN - PR nº 029, de 04 de outubro de 1991, torna público e convoca instituições e demais instituições de pesquisa e desenvolvimento científico e tecnológico, a apresentarem propostas no âmbito do Fundo Multilateral Interino do Protocolo de Montreal.

3. O Fundo Multilateral Interino foi criado para cobrir custos incrementais referentes às despesas geradas em função da introdução/adaptação de medidas regulamentares para eliminar emissões de substâncias que destroem a camada de ozônio, em especial as controladas pelo Protocolo de Montreal (CFC, Halons, tetracloro de carbono e 1,1,1-Tricloroetileno), visando ao atendimento de:

- indústrias nacionais instaladas que fabricam e operam equipamentos aos usuários das substâncias controladas e que necessitam converter seus equipamentos/processos;
- divulgação, junto ao público em geral, das implicações do Protocolo de Montreal;
- pesquisa científica e desenvolvimento tecnológico e Banco de Dados.

4. Os recursos financeiros disponíveis para apoiar propostas serão aplicados a projetos que se enquadrem nas diretrizes estabelecidas pelo Protocolo de Montreal e nas prioridades nacionais.

4.1. São prioridades nacionais:

4.1.1. conversão industrial/desenvolvimento tecnológico com vistas à eliminação do uso das substâncias controladas em:

- indústrias de refrigeração;
- espumas para isolamento; flexíveis; e para embalagem;
- solventes;
- reciclagem das substâncias controladas;
- indústrias químicas.

4.1.2. desenvolvimento científico e fortalecimento institucional em institucional em instituições públicas e privadas voltadas para:

- pesquisas ligadas aos efeitos decorrentes de destruição da camada de ozônio;
- monitoramento do ozônio estratosférico;
- formação de recursos humanos, conscientização pública e dos prestadores de serviços (art. 9º Protocolo de Montreal);
- banco de dados;
- divulgação de dados referentes às obrigações preconizadas pelo Protocolo de Montreal; monitoramento; produção; importação e exportação;
- estimular o uso dos produtos que não afetam a camada de ozônio;
- fiscalização/acompanhamento da implementação do Programa Nacional.

5. Os projetos deverão ser apresentados na forma de Sumário Executivo, e apresentado ao GTO para enquadramento técnico e seleção.

6. Os sumários executivos deverão ser encaminhados à Divisão de Meio Ambiente do Departamento da Indústria e do Comércio da Secretaria Nacional de Economia - Esplanada dos Ministérios - Bloco K - Sala 831 - CEP: 70.063 - Brasília - DF - Fax (061) 223-5634 - Fone (061) 226-3048 ou 226-6228.

7. Requisitos básicos para apresentação de sumários executivos:

- o proponente deverá estar em conformidade com a legislação ambiental vigente;
- propostas enquadradas nas prioridades nacionais;
- propostas que apresentem maior potencial de redução da emissão das substâncias controladas;
- propostas de ampla distribuição geográfica;
- propostas de fácil implementação e fácil transferência de tecnologia.

8. O período para apresentação de projetos à Secretaria Executiva do GTO, será da data de publicação deste Edital até junho de 1991. Cumpra distando que este prazo poderá ser alterado em função do esgotamento do recurso, o qual será divulgado. Os solicitantes receberão um posicionamento em (10) dias úteis após a data de recebimento do sumário executivo pela Secretaria Executiva do GTO.

Brasília, 20 de dezembro de 1991.

DIÁRIO OFICIAL

1A-FEIRA, 27 DEZ 1991