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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Thirty-second Meeting
Ouagadougou, 6-8 December 2000

PROJECT PROPOSALS: THAILAND

This document consist of the comments and recommendations of the Fund Secretariat on the following project proposals:

Foam:

• Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam (sprayfoam and blocks) at Isotech	World Bank

Halon:

• Terminal halon 1211 and halon 1301 phaseout project for fire equipment manufacturers and suppliers in Thailand converting to ABC powder, CO2, HFC-227ea and inert gases	World Bank

Refrigeration:

• Umbrella project to convert CFC-12 commercial refrigeration to HCFC-134a, and CFC-11 to HCFC-141b as the blowing agent for foam insulation at 224 small and medium sized enterprises	World Bank

PROJECT EVALUATION SHEET
THAILAND

SECTOR: Foam ODS use in sector (1999): 1,202 ODP tonnes

Sub-sector cost-effectiveness thresholds: Rigid US $7.83/kg

Project Titles:

(a) Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam (sprayfoam and blocks) at Isotech

Project Data	**Rigid**
	Isotech
Enterprise consumption (ODP tonnes)	25.00
Project impact (ODP tonnes)	22.70
Project duration (months)	36
Initial amount requested (US $)	153,193
Final project cost (US $):	
Incremental capital cost (a)	72,500
Contingency cost (b)	7,250
Incremental operating cost (c)	65,193
Total project cost (a+b+c)	144,943
Local ownership (%)	100%
Export component (%)	0%
Amount requested (US $)	144,943
Cost effectiveness (US $/kg.)	6.38
Counterpart funding confirmed?	Yes
National coordinating agency	Department of Industrial Works
Implementing agency	IBRD

Secretariat's Recommendations	
Amount recommended (US $)	144,943
Project impact (ODP tonnes)	22.70
Cost effectiveness (US $/kg)	6.38
Implementing agency support cost (US $)	18,843
Total cost to Multilateral Fund (US $)	163,786

PROJECT DESCRIPTION

Sector Background

- Latest available total ODS consumption (1999)	4,592.70 ODP tonnes
- Baseline consumption of Annex A Group I substances (CFCs)	6,082.10 ODP tonnes
- Consumption of Annex A Group I substances for the year 1999	3,783.00 ODP tonnes
- Baseline consumption of CFCs in foam sector	2,116.00 ODP tonnes
- Consumption of CFCs in foam sector in 1999	2,832.00 ODP tonnes
- Funds approved for investment projects in foam sector as of end of 1999	US $11,209.571
- Quantity of CFC to be phased out in investment projects in foam sector as of end of 1999	2,141.97 ODP tonnes
- Quantity of CFC phased out in investment projects in foam sector as of end of 1999	1,293.50 ODP tonnes
- Funds approved for investment projects in the foam sector in 2000	US $259,536
- Quantity of CFC to be phased out in investment projects in foam sector approved in 2000	34.00 ODP tonnes

1. The Executive Committee has as of its 31st Meeting in July 2000 approved the amount of US $11,469,107 to phase out 2,176 tonnes CFC from the foam sector, out of which 1,293.5 tonnes has been phased out.

Rigid Foam

(a) Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam (sprayfoam and blocks) at Isotech

Isotech

2. Isotech, a 100% Thai company founded in 1991 produces rigid polyurethane sprayfoam and small block foam for construction and other insulation applications. It operates a 8.5 kg/min Glascraft Mini II sprayfoam dispenser and uses handmixing technique for the production of the block foam. The company's CFC consumption was 25 tonnes in 1998.

3. Both sprayfoam and block foam production will be converted to HCFC-141b technology. This involves retrofit of Glascraft sprayfoam dispenser at US $7,500 and replacement of the handmixing technique with a 60 kg/min high pressure foam dispenser at US $90,000 with a company contribution of US $50,000 to account for technology upgrade. Trials and technology transfer and training amount to US $20,000. Incremental operating cost of US $65,193 is requested.

Justification for the use HCFC-141b

4. Justification for the use HCFC-141b by Isotech has been provided in the project document and as an annex to the document, including projected "techno-economic" impact of zero ODP technologies as well as estimated cost of conversion to zero ODP technology. The Government of Thailand has also provided a letter endorsing the use of HCFC-141b by the company consistent with the Decision 27/13.

Impact of the projects

5. 25 ODP tonnes will be phased after project impelementation. This will eliminate 0.6% of Thailand's 1999 consumption of Annex A Group I substances. There will be residual ODS consumption of 2.3 tonnes as a result of the use of HCFC-141b conversion technology.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The Fund Secretariat and the World Bank have discussed the project and agreed on the eligible grant as US $144,943.

RECOMMENDATIONS

1. The Fund Secretariat recommends blanket approval of the Isotech project with the level of funding and associated support cost indicated below.

	Project Title	Project Funding (US$)	Support Cost (US$)	Implementing Agency
(a)	Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam (sprayfoam and blocks) at Isotech	144,943	18,843	IBRD

Annex

Additional Justification For Using HCFC-141b Technology

The World Bank technical expert appraised the enterprise in September 1999, prior to the preparation of this project document, and had discussions with the company's representatives about the choice of technology for replacing the existing CFC-based technology. The enterprise was briefed in detail about the following:

(a) An overview of the available interim (low ODP) and permanent (zero ODP) replacement technologies.
(b) The "techno-economic impact" of each technology on the products manufactured, and the processes and practices employed.
(c) Possible implications of each technology, in terms of its known impact on environment, health and safety, such as ozone depleting potential, global warming potential, occupational health, etc.
(d) It was emphasized to these enterprises that HCFC technologies are interim technologies due to their residual ODP and therefore may continue to adversely affect the environment, although at a lower rate than CFCs.
(e) It was further explained that HCFCs may become controlled substances under present or future international conventions and will therefore also need to be phased out at a future date, and any investments required for their phase-out and for conversion to a permanent technology will have to be borne by the enterprises themselves.

The main conclusions reached by the enterprise through discussions with the World Bank technical expert were:

1. HCFC-141b will maintain the insulation properties required by the enterprise's customers for the insulating applications (both sprayfoam and blocks).

2. For the insulating applications, water based formulations do not provide sufficient insulation properties for the applications. Use of water based formulations could require an increase in foam thickness at higher densities (significant cost increases to the enterprise).

3. Hydrocarbon technology was seen as not a feasible option due to the fact that hydrocarbon technology is not recommended for field applications based on the lack of control of the operational conditions (presence of ignition sources, etc). In the block production, it is a feasible alternative from a technology standpoint, but is not practical, cost-effective, nor is it advisable from a safety perspective. The enterprise prefers to use a common chemical system for all its insulating foam applications. The costs for installing a pentane dispenser and premixer are very high (~$300,000), for which the enterprise would bear most of the cost.

In view of the above, the technology selected is HCFC-141b based systems in the interim, until permanent technology (either water based of HFC-based systems) is available and can provide the required physical properties.

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No. 0412/ 3647

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5 October B.E. 2543 (2000)

Dear Mr. Gorman,

Subject: Submission of Thailand ODSs Phaseout Projects and Endorsement the use of HCFC-141b as a transitional substance.

The Ozone Protection Unit within the Hazardous Substances Control Bureau, Department of Industrial Works, which is empowered by the Government to undertake the implementation of Thailand ODS phaseout program and to fulfill all obligations under the Montreal Protocol, would like to request the World Bank to submit the following projects for the consideration of the Executive Committee at its 32nd Meeting which will be held in December 2000.

1. Isotech and Chemicals Co., Ltd. – Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam (Sprayfaom and Blocks)

2. Terminal Halon 1211 and Halon 1301 Phaseout Project Plan for Fire Equipment Manufactures and Suppliers in Thailand

3 Final tranche of funding for Umbrella Project to Convert CFC-12 Commercial Refrigeration to HFC-134a, and CFC-11 to HCFC-141b as the Blowing Agent for Foam Insulation at 224 Small and Medium Sized Enterprises

In addition, the Ozone Unit realizes that two of these projects, Isotech and Chemicals Co., Ltd. and Umbrella Project will involve the use of HCFCs. Prior to submission of these projects, the Ozone Unit had thoroughly reviewed the choices of alternatives and special situation of these projects where beneficiaries of those projects are small and medium scale enterprises. Considering the choices of alternatives that are commercially viable at the present time and the safety issues associated with various options, the Ozone Unit agrees with the industry that the most technically and financially feasible technology for these enterprises is the HCFC technology. The decision to adopt this HCFC technology should not be perceived as the lack of commitments of the Thai Government with regard to Article 2F of the Montreal Protocol. In spite of the fact that the Executive Committee had already decided that no funding would be made available for the

future conversion from HCFC for the projects, the Thai Government believes that it is inevitable, at the present time, that HCFC must be used on an interim period as an alternative for the projects.

With this submission, we trust that the Executive Committee would approve the projects. The elimination of ODSs in these projects is considered as an essential component of the CFC phaseout strategy of the Thai Government and would contribute to the ability of the Thai Government to sustain the freeze of Thailand's consumption of ozone depleting substances.

I would like to take this opportunity to thank the World Bank for its continuing effort in assisting Thailand to phaseout the use of ozone depleting substances. Should you require any further clarification, please feel free to contact us. Thank you very much for your kind cooperation.

Sincerely yours,

(Wiraphon Rajadanuraks)
Director

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PROJECT EVALUATION SHEET
THAILAND

SECTOR: Halon ODS use in sector (1998/1999): 392.599ODP tonnes

Sub-sector cost-effectiveness thresholds: Fire Protection US $1.48/kg

Project Titles:

(a) Terminal halon 1211 and halon 1301 phaseout project for fire equipment manufacturers and suppliers in Thailand converting to ABC powder, CO2, HFC-227ea and inert gases

Project Data	**Extinguisher/fixed system**
	Terminal umbrella
Enterprise consumption (ODP tonnes)	436.00
Project impact (ODP tonnes)	436.00
Project duration (months)	37
Initial amount requested (US $)	940,500
Final project cost (US $):	
Incremental capital cost (a)	568,000
Contingency cost (b)	
Incremental operating cost (c)	
Total project cost (a+b+c)	568,000
Local ownership (%)	100%
Export component (%)	0%
Amount requested (US $)	568,000
Cost effectiveness (US $/kg.)	1.30
Counterpart funding confirmed?	
National coordinating agency	Department of Industrial Works
Implementing agency	IBRD

Secretariat's Recommendations	
Amount recommended (US $)	568,000
Project impact (ODP tonnes)	436.00
Cost effectiveness (US $/kg)	1.30
Implementing agency support cost (US $)	72,480
Total cost to Multilateral Fund (US $)	640,480

PROJECT DESCRIPTION

1. This project will lead to a complete phaseout of halon consumption (as defined by the Montreal Protocol) in Thailand. This terminal umbrella project will, when fully implemented, reduce the national consumption of halons from the present consumption of 436 ODP tonnes to o0 tonnes in 2003. The project and the requested funding is based on Decision 25/50 regarding terminal umbrella projects for a larger number of smaller enterprises. Thailand will develop and implement the necessary regulatory measure to prevent future import of halons from the end of 2003. The project will cover all remaining halon manufacturing enterprises in Thailand. Capital costs are requested for conversion of halon extinguisher manufacturers to ABC and CO2 extinguishers production and for conversion of halon system supply to other non-ODS substitute systems (HFC 227ea and inert gases). As a terminal umbrella project incremental operating costs and savings are not calculated.

2. A Halon Management and Banking project was approved at the 29th meeting of the Executive Committee. Accordingly, Thailand will introduce the necessary policies and legislation to stop new uses of halons and ban imports from end of 2003. This project will provide financial and technical support to the phaseout of the use of halon 1211 and halon 1301 in the manufacture of new fire extinguishers in Thailand. In addition more than 25 other halon consuming fire equipment companies were contacted during the preparation of the project. This project will cover these companies through a workshop and no additional funding will be requested in this sector.

3. The necessary national halon phaseout policies and regulation will support this terminal umbrella project. The policies are presently under discussions as part of the halon management and banking project. In addition to the policies regulating the use of halons, the regulation and enforcement of import of halons will be reviewed and strengthened. Import of large size (25 and 35 kg) halon fire extinguishers from China is a challenge, as it is neither captured by the Chinese export regulations, nor by the present Thai import control. The are two halon system manufacturers and suppliers in Thailand that are addressed in this project. The conversion to other substitutes are best dealt with through a combination of direct co-operation, financial support covering costs of introducing new substitutes and regulations controlling new application of halon 1301 and 1211.

4. The project lists the halon companies in Thailand. Aside from those fire equipment companies, larger corporations with their own in house safety organisations, smaller workshops, dealers and service shops exist which also are handling and servicing halon fire extinguishers and halon fire extinguishing systems. Hence the total number of larger corporations with own safety organization, fire equipment companies workshops and branches effected by the halon phaseout activities are estimated as more than 80 companies and corporations. Due to the ozone and halon regulations to be introduced and enforcement by the Government, all will have to terminate their halon operation activities. As many of them are only handling smaller amount of

halons and maybe only on a case by case basis, they will be dealt with through seminars and no funding is requested for conversion of equipment for those enterprises.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The project costs are consistent with capital costs recommended for use in preparing such projects in Decision 20/46 as well as previous decisions of the Executive Committee on the halon fire extinguisher and fixed system sub-sector.

2. Several companies included in this terminal umbrella project are halon fillers and suppliers that have halon filling equipment with minimum or inconsistent patterns of filling and refilling cylinders produced elsewhere. As part of the project, halon filling equipment will be destroyed for these 17 companies as well as for the three larger size halon extinguisher manufacturers.

3. The project will also provide system manufacturers equipment for alternative chemicals, licenses, some tooling, software, and training.

RECOMMENDATIONS

1. The Sub-Committee on Project Review may wish to consider recommending the approval of this project in amounts indicated in the tables below and with the understanding that this is a terminal project for the halon sector in Thailand.

	Project Title	Project Funding (US$)	Support Cost (US$)	Implementing Agency
(a)	Terminal halon 1211 and halon 1301 phaseout project for fire equipment manufacturers and suppliers in Thailand converting to ABC powder, CO2, HFC-227ea and inert gases	568,000	72,480	IBRD

PROJECT EVALUATION SHEET
THAILAND

SECTOR: Refrigeration ODS use in sector (1999): 2,062.2 ODP tonnes

Sub-sector cost-effectiveness thresholds: Commercial US $15.21/kg

Project Titles:

(a) Umbrella project to convert CFC-12 commercial refrigeration to HCFC-134a, and CFC-11 to HCFC-141b as the blowing agent for foam insulation at 224 small and medium sized enterprises

Project Data	**Commercial**
	Umbrella
ODP phase-out (ODP tonnes)	200
Proposed project duration (Months)	24
Maximum funding level approved (US $)	2,631,486
The first tranche disbursed (US $)	750,000
The second tranche disbursed (US $)	1,000,000
Amount requested for the third tranche (balance) (US $)	881,486
Cost effectiveness (US $/kg)	13.15
National Coordinating Agency	Dept. of Industrial Works, Ministry of Industry
Implementing Agency	The World Bank
Technical review completed?	Yes

Secretariat's Recommendations:	
Amount recommended (US $)	881,486
Project impact (ODP tonnes)	200
Cost effectiveness (US $/kg)	13.15
Implementing Agency support cost (US $)	106,963
Total cost to Multilateral Fund (US $)	988,449

PROJECT DESCRIPTION

Sector Background

- Latest available total ODS consumption (1999)	4,516.10 ODP tonnes
- Baseline consumption of Annex A Group I substances (CFCs)	6,082.10 ODP tonnes
- Consumption of Annex A Group I substances for the year 1997	3,610.60 ODP tonnes
- Baseline consumption of CFCs in refrigeration sector	Not Available ODP tonnes
- Consumption of CFCs in refrigeration sector in 1999	2,062.20 ODP tonnes
- Funds approved for investment projects in refrigeration sector as of July 2000 (31st Meeting)	US $12,956,733
- Quantity of CFC to be phased out in investment projects in refrigeration sector as of end of 1999	1,077.00 ODP tonnes

1. The commercial refrigeration sub-sector of Thailand is composed of approximately 15 large and a number of medium and small enterprises. Total consumption in the sector was estimated in 1999 at 2,062.2 tonnes of ODP. The Executive Committee has approved 20 projects for large enterprises in the sub-sector leading to phase out 1,077 ODP tonnes.

(a) Umbrella Project to Convert CFC-12 Commercial Refrigeration to HFC-134a, and CFC-11 to HCFC-141b as the Blowing Agent for Foam Insulation at 224 Small-and-Medium-Sized Enterprises.

2. This umbrella project was formulated by the World Bank to phase out 173 tonnes per year of CFC-12 (refrigerant) and CFC-11 (foam blowing agent) used in commercial refrigerators manufactured at 224 small-and medium-sized enterprises located throughout Thailand. The main products of these enterprises include refrigeration units, water coolers, and display cases that are sold to small grocery stores, “Mini-Marts”, schools, restaurants, and ice factories.

3. This project was approved by the Executive Committee at its 25th Meeting with “a maximum funding of US $2,631,486, on the understanding:

(a) That the amount be released in tranches;

(b) That an initial distribution of a tranche of US $750,000 be made to allow the project to move forward;

(c) That it be understood that no further tranches would be forthcoming until specific data were provided to the Executive Committee; and

(d) That if the specific data provided demonstrated that the project, through the non-service-related foam and refrigerant components, would achieve less than the 173 ODP-tonne reduction anticipated, the amount approved for the project would be reduced proportionally”. (Decision 25/42)

4. At the 28th Meeting, the World Bank requested the release of a second tranche of US $1,000,000. In support of its request, the World Bank provided information on the non-service-related ODP consumption data for 100 companies. The consumption of the 100 companies was 169.73 ODP tonnes which was determined using both production data and purchase invoices. The requested funds were approved by the Executive Committee.

5. Kulthorn Engineering (KE) was appointed by the Department of Industrial Worlds of Thailand to undertake management of this project. Implementation of the second phase started immediately after the Executive Committee's approval in July 1998. Sixteen workshops were held in major cities in six regions covering commercial refrigeration enterprises in 70 provinces across the country. This represents coverage of more than 93% of all provinces in Thailand.

6. The objectives of these workshops were to reconfirm the commitments of those enterprises that had already expressed their interest to participate in this project during the project preparation phase prior to the submission of the proposal of this project to the Executive Committee, and to inform all commercial refrigerator manufacturers of the Government's policy to ban production of CFC-based commercial refrigerators after the completion of this project. 412 commercial refrigerator manufacturers attended the sixteen workshops hosted by KE.

7. Questionnaires used for collecting data for the preparation of the project proposal were revised and distributed to all 412 enterprises attending the above workshops. These questionnaires were designed to collect basic information for confirming Multilateral Fund funding eligibility. Information required from each enterprise includes enterprises' names, information of contact persons, types of business (i.e. manufacturers, servicing shops, or distributors), year of establishment, consumption of CFC-11 and CFC-12, and baseline equipment.

8. Based on the returned questionnaires, 389 enterprises were identified as eligible for funding from the Multilateral Fund. Site visits were made to these 389 enterprises by technical teams from KE. After on-site interviews, 228 of the total 389 enterprises were confirmed as eligible for funding under this project. That is, all 228 enterprises were found to be producing commercial refrigerators, and were established prior to July 1995. The total number of enterprises to be covered and financed under this project therefore exceeds the original number of enterprises indicated in the project proposal (within the approved project cost).

9. Most enterprises covered under this project are small-and medium-sized enterprises. During on-site visits to the enterprises, information pertaining to CFC consumption and baseline equipment reported in the returned questionnaires of each enterprise was verified. For each enterprise invoices or receipts of CFC purchase were inspected. In case a complete purchase is not available, the quantities of CFC-11 and CFC-12 used in the units produced by the enterprise were measured by charging or weighing the units.

10. Total CFC-11 consumption by 228 enterprises has been determined to be 200 ODP tonnes which exceeds the 173 ODP tonnes target phase out in the project approved at the 25th Meeting.

11. The World Bank is now requesting approval of the remaining balance of US $881,486.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The Secretariat examined the information on the ODP consumption provided by the World Bank for 228 enterprises. The information contains data on the products manufactured by each of the 228 enterprises, the number of units produced per year, the CFC-12 amount charged per unit, the amount of foam used per unit (and therefore the amount of CFC-11 used), and the number of compressors used.

2. The Secretariat discussed with the World Bank the methodology of determining the consumption data reported for the 228 enterprises. It appears that only 13 enterprises provided a complete set of invoices for purchase of CFCs and CFC containing materials for 12 months in 1998. The remaining 215 enterprises provided purchase invoices for a minimum of three continuous months in 1998.

3. Some of these enterprises consume only about 6 to 10 kg of CFC for a 12-month production. According to information from the World Bank all the 215 enterprises with incomplete records, including enterprises with very small CFC consumption, were visited by the evaluation team and measurements of CFC consumption were carried out on the spot.

4. The Secretariat discussed with the World Bank the issue of quantities of CFC consumed in freezers produced by the enterprises. These quantities are 3-5 fold higher than the norm for similar equipment in Multilateral Fund projects and lead to high levels of overall claimed consumption. The World Bank provided information on the specific features of freezer designs used by the small-sized enterprises in Thailand, to explain the difference.

5. The Secretariat also requested information from the World Bank regarding the capacity of compressors used by the enterprises. It appears from the per unit CFC consumption that many of these enterprises might use compressors below 250 wt and subsequently be classified under the domestic refrigeration sector. The size of compressor could also facilitate verification of the size of the refrigeration equipment and subsequently the use of CFC per unit. The World Bank did not provide the requested information because in its view, the decision of the Executive Committee relating to the approval of subsequent tranches of this project required only that ODS consumption be verified. This has been done.

6. Information from the latest progress report indicates that completion of the project is due in December 2000, although some additional delay may be expected since approval is only being sought at the 32nd Meeting. Given that the reported 1999 consumption in the refrigeration sector is 2,062.2 ODP tonnes, the claimed ODP phase out (200 ODP tonnes) will lead to removal of about 10% of total consumption in the sector.

RECOMMENDATIONS

1. The Secretariat recommends the project for blanket approval at the costs indicated in the table below, subject to the following conditions:

(a) that no more funding will be requested for conversion of manufacturers of domestic and commercial refrigeration equipment in Thailand.

(b) that starting from January 2001 onwards, the ODP consumption data in the refrigeration sector reported by Thailand will take into account a reduction of 200 ODP tonnes resulting from the phase out achieved by this project.

	Project Title	Project Funding (US$)	Support Cost (US$)	Implementing Agency
(a)	Umbrella project to convert CFC-12 commercial refrigeration to HCFC-134a, and CFC-11 to HCFC-141b as the blowing agent for foam insulation at 224 small and medium sized enterprises	881,486	106,963	IBRD