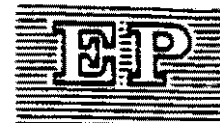




# United Nations Environment Programme



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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: THAILAND**

PROJECT COVER SHEET

COUNTRY: Thailand

PROJECT TITLE: ODS Investment Project

SECTOR COVERED: All

ODS CONSUMPTION IN SECTOR: 15,600 tons ODS in 1991

PROJECT DURATION: 3 years

PROJECT IMPACT: Will be determined in appraisal mission

TOTAL PROJECT COST: \$16.8 million

PROPOSED OTF GRANT: \$11.0 million

IMPLEMENTING AGENCY: World Bank

NATIONAL COORDINATING AGENCY: Department of Industrial Works (DIW)

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## FINAL EXECUTIVE PROJECT SUMMARY

### THAILAND - OZONE DEPLETING SUBSTANCES PHASE OUT INVESTMENT PROJECT

Grantee: Thailand

Executing Agency: Department of Industrial Works, Ministry of Industry

Beneficiaries: Firms participating in ODS phase out projects and implementing agencies.

Cost: US\$16.8 million equivalent

Financing: US\$11.0 million (from the Ozone Trust Fund)  
US\$ 5.8 million (from commercial sources)

Tentative Appraisal Date: 08/01/92

Tentative Grant Approval Date: 10/01/92

Peer Reviewers: Messrs. King (ENVPR), Redfern (EALCO),  
Arif (EMTEN), Rhatigan (LALCI)

Technical Review Panel: Messrs./Mes. Davis (ASTEN), Newcombe (ENVGC)  
External reviewer: Art Fitzgerald,  
Northern Telecom

#### Background

1. Since the mid 1970s, Thailand has been creating the policies and instruments for achieving rapid economic development while taking steps to protect the environment, including a strong support for the Montreal Protocol (MP) on the phase out of Ozone Depleting Substances (ODS). Thailand ratified the agreement in July 1989 and is eligible for funding from the Ozone Trust Fund (OTF) which was established under the MP to finance ODS phase out programs.

2. In 1991, Thailand consumed about 15,600 tons ODS which was equivalent to a weighted Ozone Depleting Potential (ODP) of about 10,000 tons (Annex 1). Per capita consumption was 0.16 kg ODP. All ODS consumed was imported since Thailand does not produce ODS. ODS was used in: (i) solvent cleaning in the electronic and metal working industry (37% of annual ODP weighted consumption), (ii) in air conditioning (23%), (iii) foam blowing (18%), (iv) refrigeration (14%), (v) fire-prevention, and (vi) aerosols (4%) each. As a result of fast industrial growth and rising standards of living ODS consumption increased by 2-1/2 times since 1986. Expansion of electronic and metal industries and increased production of refrigerators and vehicles with air-conditioning accounted for more than 80% of increased ODS consumption. As a result of slower economic growth in 1991 and some recent controls of ODS imports, growth of ODS consumption slowed down to 9% p.a. in 1991, compared to an average of 23% p.a. between 1986 and 1990.

3. Thailand's initial work program under the MP is to develop a Country Program (CP) for ODS phase out which will define a cost effective strategy and action program to fulfill (or exceed) the obligations under the MP and identify the need for technical and financial assistance. The draft CP will be based on the recommendations of an ODS Country Study scheduled to be completed by July 1992. In parallel, Thailand is preparing an initial investment program to be funded from the OTF.

4. The Department of Industrial Works (DIW) in the Ministry of Industry is the lead government agency responsible for MP related activities including the preparation of the CP and supervision of ODS phase out projects. The Office of the National Environment Board (ONEB) is responsible for national environmental policies and regulating industrial pollution. Both institutions have experience in the field of environmental policies, but are under-staffed and lack specialized know-how of ODS phase out projects. The Industrial Finance Corporation of Thailand (IFCT) is a development bank serving the industrial sector. It has been selected as financial intermediary for the proposed Project because of its experience in financing projects which involve technology transfer, pollution control, and energy conservation.

5. The Bank, with funding from OTF, is supporting development of Thailand's ODS phase out. The Bank is implementing agency for the Country Study and has approved an Engineering Project which would prepare pre-investment studies for projects to recycle ODS and to use non-ODS technologies. USEPA (USA) and MITI (Japan) have established a joint project with DIW to assist enterprises affiliated with US and Japanese firms in preparing projects for phasing out ODS. A UNEP/SIDA project offers technical assistance to Thai agencies on ODS phase out.

6. No adequate funding has so far been made available for investment in ODS phase out projects. Such funding would be provided by the proposed ODS Investment Project which the Bank is now preparing. An Initial Executive Project Summary (IEPS) for this Project was reviewed in November 1991. Based on the decisions during that meeting, the IEPS has been revised to include more detailed implementation arrangements and changes in the funding mechanism: the definition of eligible costs for OTF financing will be based on a methodology developed by the Bank, and funding for eligible costs (incremental plus financial incentive) will be provided as a grant.

#### Project Objectives

7. The objectives of the project are to (a) establish a line of grant to finance ODS phase out sub-projects in Thailand, and (b) to assist the Government in establishing an efficient mechanism to prepare, appraise, select, and finance ODS phase out sub-projects eligible for OTF funding;

#### Project Description and Costs

8. The Project has an investment and a technical assistance (TA) component:

- (a) Investment Component. A line of grant would be established in IFCT to provide grant funding to ODS phase out sub-projects which are eligible for OTF funding. A list of sub-projects likely to be funded under the Project is included in Annex 3. This list includes sub-projects to be prepared under the Engineering Project and the USEPA/MITI Program. The grant would cover the incremental costs of such sub-projects. Other costs would be financed from commercial sources.
- (b) Technical Assistance Component. The Project would provide assistance to institutions responsible for implementing the investment component and to enterprises undertaking ODS phase out projects. The component would include: (c) funding of two local consultants to assist DIW in reviewing sub-projects proposed for funding under the Project and supervision of sub-project implementation; (d) assisting IFCT in establishing an effective mechanism for appraising ODS sub-projects under the Project, including training of staff and purchase of computer equipment; (e) funding of consultants to assist enterprises in preparing and implementing subprojects, including training; (f) funding of consultants to prepare feasibility studies for additional ODS sub-projects in areas not yet fully covered, such as refrigeration, foam application and halon control.

9. Project Cost. Estimated Project costs are US\$ 16.8 million including an estimated reimbursable amount of US\$11.0 million which would be eligible for OTF grant funding. These estimates are based on the assumption that all Thai firms are eligible for OTF funding, including those local firms owned by companies based in developed countries. Prior to Bank appraisal, MPEC will be asked to clarify this matter which is not addressed in current MP guidelines. The estimates are based on a preliminary breakdown of subprojects by subsector and assumptions on their average reimbursable costs. (Annex 2). These calculations will be updated during the appraisal mission based on a methodology currently being developed by the Bank.<sup>1</sup> A detailed cost estimate is attached in Annex 2.

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<sup>1/</sup> See Annex 4 for a description of this methodology. See also Ken King, "Financing the Phasing Out of Ozone-Depleting Substances," World Bank, Environment Department, Divisional Working Paper No. 1992-12 (Washington, D.C.: World Bank, February 1992); and (forthcoming) World Bank, "Operational Interpretations of Incremental Costs and Eligible Expenditures."

In the case of Thailand, a financial discount rate of 12% is being suggested, equivalent to the estimated minimum financial rate of return for private investments in Thailand.

## Project Financing

10. The full cost of TA and reimbursable costs of subprojects would be financed by an OTF Grant to the Government. Subprojects will receive the eligible cost portion of the total cost as grants channelled through IFCT, with the balance financed from commercial sources, including IFCT and other financing institutions, or from the enterprises own resources. A financing plan is given below.

### Project Costs Estimates

|                                      | ----- US\$ million equivalent -----     |                    |                        |
|--------------------------------------|-----------------------------------------|--------------------|------------------------|
|                                      | <u>OTF Grant<br/>Eligible<br/>Costs</u> | <u>Other Costs</u> | <u>Total<br/>Costs</u> |
| Subprojects                          | 10.2                                    | 5.8                | 16.0                   |
| Financial Intermediation Fee         | 0.3                                     | -                  | 0.3                    |
| <u>Subtotal Investment Component</u> | <u>10.5</u>                             | <u>5.8</u>         | <u>16.3</u>            |
| <u>Subtotal TA Component</u>         | <u>0.5</u>                              | <u>-</u>           | <u>0.5</u>             |
| <u>Total</u>                         | <u>11.0</u>                             | <u>5.8</u>         | <u>16.8</u>            |

### Financing Plan

(US\$ million equivalent)

|                                             |             |
|---------------------------------------------|-------------|
| OTF Grant                                   | 11.0        |
| Commercial Loans/ or Enterprises' Own Funds | 5.8         |
| <u>Total</u>                                | <u>16.8</u> |

## Project Implementation

11. DIW will have responsibility for project implementation and will ensure that the Project is consistent with the CP for ODS phase out. DIW will also manage the TA component. IFCT will be responsible for implementation of the investment component, including project appraisal, disbursement of OTF funds, and supervision of subproject implementation. It has been proposed that IFCT will receive a fee equivalent to 3% of grants disbursed for its services. A Special Account would be established to facilitate disbursement of OTF grants. IFCT would receive technical assistance for establishing an effective funding mechanism.

12. Processing of subprojects requesting OTF funding would include the following steps. Project preparation: enterprises will be responsible for preparing pre-investment studies but will receive support from the USEPA/MITI program, the Engineering Project, or under the TA component of this Project. Appraisal: IFCT will appraise subprojects based on criteria to agreed upon. Preliminary criteria are included in Annex 4. IFCT normally prepares brief appraisal reports in Thai

with an English summary for projects under Baht 20 million (US\$800,000) and more thorough appraisals with English translation for projects above Baht 20 million. That limit will be lowered to US\$500,000 to comply with current MPEC guidelines. The summary for small projects would be prepared in accordance with MPEC format as shown in Annex 5. Technical Review: DIW will review each subproject to ensure that cost-effective technologies will be applied and that the subproject will conform with priorities established in the CP. Bank Review and Grant Approval: The Bank will review each appraisal summary and report prepared by IFCT to ensure compliance with MP goals and procedures before approving the grant. MPEC Review: No subproject approval by MPEC is required for projects of less than US\$500,000. Also, it is expected that once MPEC has approved this Project based on the final Project Document to be prepared after appraisal, it will not require individual approval of larger subprojects already included in this Project. Subproject Implementation: Each enterprise will be responsible for subproject implementation. Subproject Supervision: IFCT will have prime responsibility for supervising implementation of subprojects.

#### Auditing and Monitoring

13. DIW and IFCT will prepare quarterly progress reports acceptable to the Bank. ICFT will prepare an annual audit report acceptable to the Bank. The Bank will be responsible for supervising both the investment and TA component of the Project. A detailed supervision plan will be prepared during appraisal.

#### Procurement and Disbursement

14. Procurement of goods would follow Bank guidelines for Procurement of Goods. Since the amount involved in most individual subprojects would be small, local and international competitive shopping would be the preferred procedure. Consultants would be hired in accordance with Bank Guidelines for the Use of Consultants. Project funds are expected to be disbursed by the end of the third year, given the Government's strong commitment to phase out ODS. A detailed disbursement schedule will be prepared after Project appraisal.

#### Environmental Considerations

15. The overall Project objective is protection of the environment by reducing the emission of ODS. However, the substitution of ODS with other chemicals or technology changes may involve other environmental and safety risks. ONEB will be responsible for preparing EA's for the chemicals used in substitute technology, based on information from UNEP. Enterprises will prepare subproject Environmental Assessments (EAs) according to local regulations and acceptable to the Bank.

### Project Sustainability

16. The Project will assist the Government in establishing an efficient mechanism for developing and funding subprojects to initiate and sustain an ODS phase out program. The investment program will focus on priority sectors and cost-effective measures to be defined in the CP and will be complemented by changes in policies and regulations to ensure compliance with ODS phase out targets. The Project will also provide incentives to participating enterprises to start phase out projects quickly. Grant funding will compensate for financial, market, and technical risks of proposed investments and will provide acceptable returns on investments to participating enterprises. Financial incentives will be complemented by regulations and non-financial incentives to be determined by the CP.

### Rationale for Use of Ozone Trust Fund

17. The Project would form part of Thailand's ODS phase out program. The proposed Project is consistent with the Implementation Guidelines and Criteria For OTF funding established by the MP Executive Committee Annex 6).

### Lessons from Previous Bank Experience

18. Projects utilizing Ozone Trust Fund resources are being developed simultaneously in Mexico, China, Malaysia, Egypt, and other countries. None of these projects has been completed so far. Policies concerning the overall approach and methodology of the ODS phase out program in developing countries are being prepared under the direction of the Bank GEF Coordinator.

### Project Benefits

19. The Project will help the Government in implementing an accelerated ODS phase out program. The amount of ODS reduction will be determined when appraising subprojects. The TA component will strengthen DIW's and IFCT's implementation and supervisory capability. Participating firms will benefit from timely adjustment to non-ODS technologies in anticipation of a global phase out of ODS.

### Project Risks

20. Institutional weaknesses and understaffing of implementing agencies could slow down project execution. This problem is being addressed by TA, training, and consultants supporting regular staff. Another risk could be a lack of interest by private firms in ODS phase out investments. The Project will minimize this risk by providing information and TA for enterprises and grant funding for incremental costs of such investments.

### Issues and Actions

21. Key issues to be addressed are:

- a. agreement with the Government on the schedule for completion and adoption of the CP and its timely and efficient implementation (para.3);

- b. review of the preliminary list of subprojects and of their estimated total and reimbursable costs (para. 9) and the completion of their feasibility studies and appraisal reports (para 12);
- c. agreement on criteria for subproject eligibility, approval, and selection, including a decision on eligibility of foreign owned firms operating in Thailand for OTF funding (paras. 9 and 11);
- d. agreement on the methodology for determining the incremental costs of ODS phase out projects (para 9), and a level of grant funding (reimbursable costs) which would compensate enterprises for financial, market, and technical risks and would provide acceptable returns on investments ( paras. 9 and 10);
- e. agreement on project implementation arrangements with Ministry of Finance, DIW, and IFCT; agreement on terms and conditions of financial intermediation by IFCT, including determination of an appropriate fee (para. 11).

Project Review and Next Steps

22. The following next steps are suggested for processing the Project:
- a. submit FEPS to the MPEC for their approval in their meeting scheduled for June 24-28, 1992;
  - b. appraise the Project (scheduled for August 1992) and reach agreement with the Government on issues mentioned in para 19;
  - c. prepare MOD and Grant Agreement after appraisal for Bank approval (scheduled for October 1992).

OZONE DEPLETING POTENTIALS (ODPs)

| <u>Substance</u>                                                                 | <u>New ODP<br/>Assessment<br/>November 1991</u> | <u>ODP 1988<br/>Assessment</u> | <u>Global Warming<br/>Potential (GWP)</u> |
|----------------------------------------------------------------------------------|-------------------------------------------------|--------------------------------|-------------------------------------------|
| <u>CFCs</u>                                                                      |                                                 |                                |                                           |
| CFC-11                                                                           | 1.0                                             | 1.0                            | 1.0                                       |
| CFC-12                                                                           | 1.0                                             | 0.9-1.0                        | 3.0                                       |
| CFC-113                                                                          | 1.07                                            | 0.8-0.9                        | 1.4                                       |
| CFC-114                                                                          | 0.8                                             | 0.6-0.8                        | 3.9                                       |
| CFC-115                                                                          | 0.8                                             | 0.3-0.5                        | 7.5                                       |
| <u>HCFCs and<br/>HFCs</u>                                                        |                                                 |                                |                                           |
| HCFC-22                                                                          | 0.055                                           | 0.04-0.06                      | 0.3                                       |
| HCFC-123                                                                         | 0.02                                            | 0.013-0.022                    | 0.02                                      |
| HCFC-124                                                                         | 0.022                                           | 0.016-0.024                    | 0.1                                       |
| HCFC-125                                                                         | 0                                               | 0                              |                                           |
| HFC-134a                                                                         | 0                                               | 0                              |                                           |
| HCFC-141b                                                                        | 0.11                                            | 0.07-0.11                      | 0.1                                       |
| HCFC-142b                                                                        | 0.065                                           | 0.05-0.06                      | 0.4                                       |
| HFC-152a                                                                         | 0                                               |                                | 0.03                                      |
| HCFC-225CA                                                                       | 0.025                                           | -                              |                                           |
| HCFC-225CB                                                                       | 0.033                                           | -                              |                                           |
| <u>Halons</u>                                                                    |                                                 |                                |                                           |
| H-1301                                                                           | 16                                              | 10.0                           | 2.4                                       |
| H-1211                                                                           | 4                                               | 3.0                            |                                           |
| H-2402                                                                           | 7                                               |                                |                                           |
| CH <sub>3</sub> Br                                                               | 0.8                                             |                                |                                           |
| <u>Other ODS</u>                                                                 |                                                 |                                |                                           |
| Carbon Tetrachloride<br>(CCl <sub>4</sub> )                                      | 1.06                                            | 1.0-1.2                        | 0.35                                      |
| 1,1,1-trichloroethane (TCA)<br>methyl chloride, CH <sub>3</sub> CCl <sub>3</sub> | 0.12                                            | 0.1-0.16                       | 0.02                                      |

Source: UNEP/OZL Pro/VG.1/6/3: November 1991.

TECHNICAL ANNEX

ODS Consumption Background

1. ODS consumption in Thailand increased from about 6140 tons ODS in 1986 (not including small amounts of CFC-114 and halon 1301 and a larger volume of carbon tetrachloride for which no information is available) to 14,330 tons in 1990, corresponding to about 23% p.a. growth rate. Growth continued in 1991 but at a lower annual rate - about 9% - to reach a total ODS consumption of about 15,600 in 1991, which is equivalent to about 10,000 tons ODP (Annex 1). Per capita consumption was 0.16 kg. ODP. Details are shown below:

IMPORTS OF ODS: INTO THAILAND (1986-1991)

| Substance                                                           | Consumption (metric tons) |        |        |        |
|---------------------------------------------------------------------|---------------------------|--------|--------|--------|
|                                                                     | 1986                      | 1989   | 1990   | 1991   |
| CFC-11                                                              | 500                       | 1070   | 1754   | 1897   |
| CFC-12                                                              | 1100                      | 1925   | 2391   | 3125   |
| CFC-113                                                             | 1000                      | 2000   | 2827   | 3200   |
| CFC-114                                                             | NA                        | NA     | 49     | 50     |
| CFC-115                                                             | NA                        | NA     | 28     | 25     |
| Halon 1211                                                          | 20                        | 40     | 74     | 88     |
| Halon 1301                                                          | NA                        | NA     | 10     | 12     |
| 1,1,1-Trichloroethane                                               | 3517*                     | 5735*  | 7197   | 7114   |
| Carbon Tetrachloride                                                | NA                        | NA     | NA     | 137    |
| Total Unweighted                                                    | 6,137                     | 10,770 | 14,330 | 15,646 |
| Total ODP-Weighted                                                  | 3,170                     | 5,990  | 8,540  | 10,040 |
| CFC and Halon Per Capita (Annex A)                                  | 0.046                     | 0.084  | 0.12   | 0.14   |
| 1,1,1-Trichloroethane and Carbon Tetrachloride Per Capita (Annex B) | 0.0066                    | 0.010  | 0.013  | 0.015  |

NA = Data not available

Source: Department of Industrial Works and Customs Department

\* Source: Halogenated Solvents Industry Alliance, USA

2. The ODS that is imported in the largest quantities is 1,1,1-trichloroethane although over the past two years, imports of 1,1,1-trichloroethane have remained constant at about 7100 MT (equivalent to about 850 tons ODP). The primary use is in solvent cleaning applications. The second most widely used ODS in Thailand in recent years has been CFC-113, which is used to clean printed circuit boards (PCBs) metal parts and precision components. Some 3,200 MT of CFC-113 were imported into Thailand in 1991 (3400 tons ODP). Most of the consumption is by foreign companies or their subsidiaries that produce for the domestic and export market. Imports of CFC-11 were 1900 MT in 1991, an increase of 8% over the 1990 figure. The rise in consumption was primarily due to increased use of appliance insulation foams by home refrigerator/freezer manufacturers, and use of the chemical as a refrigerant in building chillers. Imports of CFC-12 in 1991 rose to about 3100 tons, a level almost equal to those of CFC-113, primarily because of increased consumption of mobile air conditioning and increased production of home refrigerators and freezers, all of which use CFC-12 as the refrigerant. CFC-11 and CFC-12 continued to be used in other refrigerated appliances, foam blowing, aerosol formulations, and other assorted. Small quantities of CFC-114, CFC-115, and carbon tetrachloride are used in the refrigeration, solvent cleaning, aerosols, and foam industries. Some carbon tetrachloride is also used in formulating printing inks. The estimates of 1991 consumption reached 140 MT in 1991. Halon 1211 and halon 1301 are used in small quantities for fire extinguishing applications. The consumption was estimated to be 88 MT for halon 1211 and 12 MT for halon 1301 in 1991.

#### Relationship to Country Program

3. The draft CP currently under preparation shows that an accelerated phase out program is more cost effective than following the schedule allowed by the MP for developing countries with a consumption of less than 0.3kg. per capita. DIW has informally indicated that Thailand is aiming to phase out the use of CFC by 1998, more than 10 years ahead of the year set by the MP. Except for some very specific essential uses, phase out of halons could also be phased out by that year.

#### Project Description

4. Technical Assistance Component. The Project would provide assistance to institutions responsible for implementing the investment component and to enterprises undertaking ODS phase out project. The component would include:

- (a) Consultants and computer equipment to assist DIW and ONEB, which are both understaffed, in the timely preparation of the CP and in the initial development, technical appraisal, and supervision of subprojects. (US\$100,000)
- (b) Consultants to assist IFCT in developing guidelines and an effective mechanism for appraising ODS sub-projects and determining their incremental costs. Technical assistance would include training of regular staff and computer equipment. (US\$80,000)

- (c) Local consultants to assist private enterprises, not covered by the USEPA/MITI program, in developing sub-project eligible for funding under the Project. (US\$200,000)
- (d) Consultants to prepare feasibility studies for additional projects in areas not yet fully covered such as refrigeration, foam application, and halon control (amount allocated \$120,000).

5. Investment Component. Full documented feasibility reports are being prepared for each investment project by the concerned enterprises, with the support of the USEPA/MITI program and under the Bank's Engineering Project. An initial group of about 20 subprojects in various stages of development has already been identified (Annex 3) as a result of a meeting between USEPA, MITI and DIW held in mid-March and preliminary findings of the Bank supported Engineering Project. MITI estimates that the total investment cost of subprojects it has so far in the field of refrigeration, air conditioning and electronics/metal cleaning will amount to about US\$47 million (no estimate of reimbursable costs is available for these projects).

6. The following breakdown of subprojects has been prepared based on the already identified 20 subprojects and on assumptions about their average reimbursable costs:

| Subproject Categories | No. of Projects | % of total cost eligible for OTF grant funding <sup>1</sup> | Reimbursable Costs | Total Costs |
|-----------------------|-----------------|-------------------------------------------------------------|--------------------|-------------|
| Solvents              | 9               | 50%                                                         | 3.0                | 6.0         |
| Foam                  | 5               | 50%                                                         | 2.0                | 4.0         |
| Refrigeration/AC      | 2               | 70%                                                         | 1.4                | 2.0         |
| Recycling             | 2               | 60%                                                         | 1.5                | 3.0         |
| Halons                | 2               | 100%                                                        | 2.0                | 2.0         |
| Total                 | 20              |                                                             | 10.2               | 16.0        |

7. Detailed appraisal reports will be prepared by IFCT for each subproject that requests OTF funding. Preliminary project summaries for the following projects are given in Annex 5 which illustrate the format of summary required under MP regulations.

- (i) MAC CFC Recycling
- (ii) Household Refrigeration CFC Recycling
- (iii) Thai Airways Solvent Phase Out

Each of these Project Summaries will be completed during appraisal mission or by the agency supporting the project preparation.

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<sup>1</sup> See Footnote 1 in para. 9 of FEPS

## Project Costs

8. Total Project costs have been estimated based on the preliminary list of 20 subprojects (Annex 3) and assumptions on average reimbursable costs.

### Project Costs Estimates

|                                                             | ----- US\$ million equivalent -----                                                      |                    |                              |
|-------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------|------------------------------|
|                                                             | <u>Reimbursable Cost</u><br><u>Eligible for OTE</u><br><u>Grant Funding <sup>1</sup></u> | <u>Other Costs</u> | <u>Total</u><br><u>Costs</u> |
| <u>A. INVESTMENT COMPONENT</u>                              |                                                                                          |                    |                              |
| <u>Subprojects prepared by</u><br><u>Engineering Study:</u> |                                                                                          |                    |                              |
| -Auto A/C CFC Recycling                                     | 0.9                                                                                      | 0.6                | 1.5                          |
| -Non-CDS Subprojects                                        | 3.3                                                                                      | 1.3                | 4.6                          |
| <u>Subprojects prepared by</u><br><u>USEPA/MIT/DIW:</u>     |                                                                                          |                    |                              |
| -Non CDS Subprojects                                        | 3.0                                                                                      | 3.0                | 6.0                          |
| <u>Other Subprojects:</u>                                   |                                                                                          |                    |                              |
| -CDS Substitution<br>Subprojects                            | 1.6                                                                                      | 0.4                | 2.0                          |
| -Recycling Subprojects                                      | 1.3                                                                                      | 0.3                | 1.6                          |
| <u>Subtotal Subprojects</u>                                 | 10.2                                                                                     | 5.6                | 15.8                         |
| Financial Intermediation Fee                                | 0.3                                                                                      | -                  | 0.3                          |
| <u>Subtotal Investment Component</u>                        | 10.5                                                                                     | 5.6                | 16.1                         |
| <u>B. TA COMPONENT</u>                                      |                                                                                          |                    |                              |
| TA for DIW and ONES                                         | 0.1                                                                                      | -                  | 0.1                          |
| TA for IPCT                                                 | 0.08                                                                                     | -                  | 0.08                         |
| Subproject Preparation                                      | 0.2                                                                                      | -                  | 0.2                          |
| Feasibility Studies                                         | 0.12                                                                                     | -                  | 0.12                         |
| <u>Subtotal TA Component</u>                                | 0.3                                                                                      | -                  | 0.3                          |
| <u>TOTAL PROJECT</u>                                        | 11.0                                                                                     | 5.6                | 16.6                         |

2/ See Footnote 1 in para. 9 of FEPS

Preliminary and Partial List of Investment Subprojects

|                                                      | Total<br>Cost<br>US\$ million<br>equivalent | Incremental<br>Cost<br>US\$ million<br>equivalent | Estimated ODS<br>abatement Cost<br>(\$/kg/yr) | Expected<br>Completion<br>Date |
|------------------------------------------------------|---------------------------------------------|---------------------------------------------------|-----------------------------------------------|--------------------------------|
| <u>Recycling Subprojects</u>                         |                                             |                                                   |                                               |                                |
| -MAC CFC Recycling                                   |                                             |                                                   |                                               | 1994                           |
| -Extension of Recycling<br>Subproject                |                                             |                                                   |                                               | 1995                           |
| -Household Refrigeration CFC<br>Recycling            |                                             |                                                   |                                               | 1995                           |
| - Halon Control                                      |                                             |                                                   |                                               | n.a.                           |
| <u>ODS Solvents Phase Out<br/>Subprojects</u>        |                                             |                                                   |                                               |                                |
| -NMA Thai (Minabon Group) CFC-<br>113 Phase Out      |                                             |                                                   |                                               | 1995-97                        |
| -Thai Airways ODS Phase Out                          |                                             |                                                   |                                               | 1994                           |
| -Chintek Electronics<br>Industries CFC-113 Phase Out |                                             |                                                   |                                               |                                |
| -Mizuki Electronics Co. CFC-113<br>substitution      |                                             |                                                   |                                               |                                |
| -Hitachi Consumer Products<br>(Thailand)             |                                             |                                                   |                                               | n.a.                           |
| -Thai CRT Co.                                        |                                             |                                                   |                                               | n.a.                           |
| <u>Matsushita Refrigeration</u>                      |                                             |                                                   |                                               |                                |
| -Hans Microelectronics Co.                           |                                             |                                                   |                                               | n.a.                           |
| <u>Other Subprojects</u>                             |                                             |                                                   |                                               |                                |
| Bangkok Foam Co                                      |                                             |                                                   |                                               | 1994                           |
| -Small Plastic Foam Firms                            |                                             |                                                   |                                               | 1994                           |
| <u>Matsushita Refrigeration</u>                      |                                             |                                                   |                                               |                                |
| -Nippondenso Thailand                                |                                             |                                                   |                                               | 1993                           |
| -Sharp Appliances<br>(Thailand) Ltd.                 |                                             |                                                   |                                               | 1995                           |
| -CFC substitution Central ACs                        |                                             |                                                   |                                               |                                |
| -CFC substitution Commercial<br>Refrigeration        |                                             |                                                   |                                               |                                |
| -CFC Substitution in household<br>Refrigeration      |                                             |                                                   |                                               | 1994                           |

A more complete list of subprojects is being prepared by DIW, MITI, USEPA and the consultants under the Engineering Project. Detailed estimates of total costs and incremental costs, by subprojects, will be prepared during appraisal and will be confirmed by the preinvestment studies underway. Estimates given in the EPS are taken from other Projects in other countries that are being developed concurrently.

SUBPROJECT ELIGIBILITY AND APPRAISAL CRITERIA

THAILAND - OZONE DEPLETING SUBSTANCES (ODS) PHASE OUT PROJECT

Subproject Eligibility

1. Projects should be on priority list as given in the CP or confirmed by DIW as essential to achieve CP objectives.
2. Projects should have direct result of a reduction of ODS consumption in the country.
3. Projects should be cost effective and based on environmentally sound technologies or substitutes.

Subproject Appraisal

1. Project scope - including full description, technology, source of supply; divided into (a) incremental component relating to ODS phase out and (b) other components.
2. Schedule and quantity of ODS phased out directly attributed to project, on annual and total basis.
3. Project costs, divided into (a) components relating to incremental cost of ODS phase out and (b) other components. Methodology for calculating incremental costs and determining reimbursable costs should be shown in detail and should be consistent with the Bank's interpretation of incremental costs and reimbursable costs (para 9, footnote 1 and annex 4). Foreign exchange and local costs should also be shown.
4. Financial analysis including FRR of Project and enterprise. Economic analysis including ERR of Projects and enterprises. Unit abatement cost as shown below.
5. Financing arrangements, sources, and terms and conditions, divided into (a) reimbursable costs related to ODS phase out to be financed as a grant from the OTF, (b) amount to be provided by the enterprise from its own resources; and (c) amount to be financed through loans from IFCT or other financial institutions at commercial interest rates, should be shown.
6. Project implementation arrangements including management, procurement, erection and testing, operation, marketing program and schedule for all implementation steps.

Subproject Selection

1. Priority should be given to subprojects with the most cost effective technology, with the lowest ODP unit abatement cost, in the shortest period of time. Formula for unit abatement cost is given below:

$$A = \frac{C(F) + (OC-OS)}{W}$$

WHERE:

- A - Unit abatement cost, \$/kg ODP saved/year (at full operation)
- C - Capital cost, including all initial one time costs such as technology, training
- F - Capital recovery factor; the annualized capital cost charges, discounted at a standard discount rate of 10% per year, over the economic life of the capital investment.
- OC - Annual Operating Costs at full operation
- OS - Annual Operating benefits at full operation
- W - Quantity of ODS saved annually expressed as ODP units