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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Sixtieth Meeting
Montreal, 12-15 April 2010

PROJECT PROPOSALS: CHINA

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

Refrigeration

- Demonstration project for conversion from HCFC-22 technology to HFC-32 technology in the manufacture of commercial air-source chillers/heat pumps at Tsinghua Tong Fang Artificial Environment Co. Ltd. — UNDP
- Demonstration project for conversion from HCFC-22 technology to ammonia/CO_2 technology in the manufacture of two-stage refrigeration systems for cold storage and freezing applications at Yantai Moon Group Co. Ltd. — UNDP

PROJECT EVALUATION SHEET – NON-MULTI-YEAR INVESTMENT PROJECTS
CHINA

PROJECT TITLE(S)	BILATERAL/IMPLEMENTING AGENCY
(a) Demonstration project for conversion from HCFC-22 technology to HFC-32 technology in the manufacture of commercial air-source chillers/heat pumps at Tsinghua Tong Fang Artificial Environment Co. Ltd.	UNDP
(b) Demonstration project for conversion from HCFC-22 technology Ammonia/CO2 technology in the manufacture of two stage refrigeration systems for cold storage and freezing applications at Yantai Moon Group Co. Ltd.	UNDP

NATIONAL CO-ORDINATING AGENCY	Foreign Economic Cooperation Office / Ministry of Environmental Protection

LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT

A: ARTICLE-7 DATA (ODP TONNES, 2008, AS OF MARCH 2010)

Annex C, Group I	15,387.2		

B: COUNTRY PROGRAMME SECTORAL DATA (ODP TONNES, 2008, AS OF OCTOBER 2009)

ODS	Subsector/quantity	ODS	Subsector/quantity
HCFC-22	9,559.6	HCFC-123	7.3
HCFC-141b	4,415.3	HCFC-225ca	1.7
HCFC-142b	1,096.1	HCFC-225cb	0.2

CFC consumption remaining eligible for funding (ODP tonnes)	n/a

2008 BUSINESS PLAN ALLOCATIONS		Funding US $	Phase-out ODP tonnes
		Based on decision 55/43 (e)	n/a

PROJECT TITLE:	Tsinghua Tong Fang	Yantai Moon Group
ODS use at enterprise (ODP tonnes):	3.40	13.75
ODS to be phased out (ODP tonnes):	3.40	13.75
ODS to be phased in (ODP tonnes):	n/a	n/a
Project duration (months):	18	18
Initial amount requested (US $):	1,900,000	4,280,000
Final project costs (US $):		
Incremental Capital Cost:	502,662	2,798,325
Contingency (10 %):	50,266	279,833
Incremental Operating Cost:	676,408	1,207,300
Total Project Cost:	1,229,336	4,285,458
Local ownership (%):	100	100
Export component (%):	0	0
Requested grant (US $):	1,229,336	3,964,458
Cost-effectiveness (US $/kg metric):	19.86	15.86
Implementing agency support cost (US $):	92,200	297,334
Total cost of project to Multilateral Fund (US $):	1,321,536	4,261,792
Status of counterpart funding (Y/N):*	0	321,000
Project monitoring milestones included (Y/N):	Yes	Yes
SECRETARIAT'S RECOMMENDATION	For individual consideration	

*In the view of the Government of China the difference between the originally requested cost and the eligible cost above constitutes also counterpart funding. For Tsinghua Tong Fang this amount would be US $670,664, for Yantai Moon Group, in excess of the counterpart funding provided in the respective row of this table, another US $387,329

Demonstration project for conversion from HCFC-22 technology to HFC-32 technology in the manufacture of commercial air-source chillers/heat pumps at Tsinghua Tong Fang Artificial Environment Co. Ltd. (UNDP)

PROJECT DESCRIPTION

Introduction

1. UNDP, on behalf of the Government of China, submitted to the 60th Meeting a "Demonstration project for conversion from HCFC-22 technology to HFC-32 technology in the manufacture of commercial air-source chillers/heat pumps at Tsinghua Tong Fang Artificial Environment Co. Ltd." The project is addressing a consumption of 61.8 metric tonnes (3.40 ODP tonnes) of HCFC-22, as per 2008 consumption data. The project aims to demonstrate that HFC-32 technology is a viable replacement for the use of HCFC-22 as a refrigerant. UNDP was seeking incremental capital costs of US $995,555 and incremental operating costs of US $904,445, resulting in a funding request of US $1.9 million plus agency support costs. The cost effectiveness of this project as requested would be US $30.7/kg (metric).

2. The submission foresees that the demonstration project will cover product redesign and redevelopment, modifications and amendments to the existing manufacturing process, as well as safety and other measures to handle the flammability and other issues related to HFC-32. Laboratory testing, performance evaluation, product trials, prototype testing and technical assistance and training are also covered by the project proposal. The project proposal states that the successful implementation of this demonstration project would provide an environmentally safe and cost-effective alternative for the replacement of HCFC-22. This would, according to the project documents not only provide important knowledge for future conversions of similar manufacturers, but also enable the use of a technology which significantly reduces the climate impact of air-conditioning equipment as compared to the currently used HCFC-22.

Country, sector and enterprise background

3. It is stated in the project proposal that the refrigeration and air-conditioning sector in China has, over the last twenty years, grown at an average rate of 12 per cent per year. For the year 2008, the consumption in that sector is estimated to be 42,000 metric tonnes. The type of refrigeration systems under this project, here called "commercial air-source chillers/heat pump" are systems used for cooling or heating of hotels, restaurants, shops, and offices. Based on the preliminary data from ongoing surveys, the production of this type of products in the year 2008 in China was about 110,000 units, with a total HCFC-22 consumption of 1,200 metric tonnes in approximately 12 to 15 enterprises.

4. The enterprise itself has been established in 1989 and is a state-owned company. The products manufactured by the company have received several recognitions for their characteristics and quality. In 2009, the enterprise manufactured 4,073 units of commercial air source chillers/heat pumps. At the moment, Tsinghua Tong Fang Artificial Environment Co Ltd. has 12 different production lines. The demonstration project submitted for consideration of the Executive Committee considers one of those production lines. The eligibility of this particular production line in terms of the date when its capacity was established is presently under discussion with UNDP.

Technology selection

5. The enterprise selected HFC-32 as a replacement technology for HCFC-22. HFC-32 is an HFC which employs essentially the same technology as other HFCs, has similar thermodynamic refrigeration characteristics to HFC-410A often combined with a higher energy efficiency, is flammable and has a global warming potential (GWP) of 670 on a 100-year time horizon (IPCC/TEAP 2005). This implies a reduction in GWP of 62 per cent as compared to HCFC-22. This refrigerant should be well suited in

particular for heat pump applications. However, its flammability requires certain safety measures, similar to those employed when using hydrocarbons but simplified, i.e., according to UNDP, easier in particular in regard to restrictions regarding the use of the systems. However, using hydrocarbons would enable a further reduction in the GWP of the refrigerant by 95 per cent from the level of HFC-32. The project document cites several advantages of HFC-32, among them a very competitive price of only 30 per cent more than HCFC-22, its good performance and, according to the expectations of the company, its broad national and international acceptance in environmental terms due to its low GWP as compared to HCFC-22 and other, presently commonly used HFC refrigerants.

6. The following table provides the result of the calculations regarding the climate impact indicator.

Table 1 – Results of calculations of the climate impact indicator

Input					
	Country	[-]	**China**		
	Company data (name, location)	[-]	**Tsinghua Tong Fang Artificial Environment Co. Ltd.**		
	Select system type	[list]	Air conditioning, factory assembly	Air conditioning, factory assembly	Air conditioning, factory assembly
	General refrigeration information				
	HCFC to be replaced	[-]	HCFC-22	HCFC-22	HCFC-22
	Amount of refrigerant per unit	[kg]	3.5	8.4	16
	No. of units	[-]	1,387	858	1858
	Refrigeration capacity	[kW]	13	30	60
	Selection of alternative with minimum environmental impact				
	Share of exports (all countries)	[%]	0	0	0
	Calculation of the climate impact				
	Alternative refrigerant (more than one possible)	[list]	HC-290, HFC-410A, HFC-32	HC-290, HFC-410A, HFC-32	HC-290, HFC-410A, HFC-32

NOTE

All data displayed is specific to the case investigated and is not generic information about the performance of one alternative; performance can differ significantly depending on the case.

Output	*Note: The output is calculated as the climate impact of the refrigerant systems in their life time as compared to HCFC-22, on the basis of the amount produced within one year.*				
	Country		**China**		
	Identification of the alternative technology with minimum climate impact				
	List of alternatives for identification of the one with minimum climate impact	[Sorted list, best = top (% deviation from HCFC)]	HC-600a (-13.3%)		
			HC-290 (-7.1%)		
			HFC-134a (-3.2%)		
			HFC-32 (-1.4%)		
			HCFC-22		
			HFC-410A (11%)		
			HFC-404A (20%)		
	Calculation of the climate impact of the conversion				
	Alternative refrigerant 1		**HFC-410A**	**HFC-410A**	**HFC-410A**
	*Total direct impact (post conversion baseline)**	*[t CO2 equiv]*	*126*	*174*	*754*
	*Indirect impact (country)***	*[t CO2 equiv]*	*980*	*1,358*	*5,880*
	*Indirect impact (outside country)***	*[t CO2 equiv]*	*0*	*0*	*0*
	Total indirect impact	*[t CO2 equiv]*	*980*	*1,358*	*5,880*
	Total impact	**[t CO2 equiv]**	**1,106**	**1,532**	**6,634**
	Alternative refrigerant 2		**HFC-32*** **	**HFC-32*** **	**HFC-32*** **
	*Total direct impact (post conversion baseline)**	*[t CO2 equiv]*	*-532*	*-737*	*-3,193*
	*Total indirect impact (country)***	*[t CO2 equiv]*	*388.4****	*538****	*2329****
	*Total indirect impact (outside country)***	*[t CO2 equiv]*	*0*	*0*	*0*
	*Total indirect impact**	*[t CO2 equiv]*	*388*	*538*	*2,329*
	Total impact	**[t CO2 equiv]**	**144**	**-199**	**-864**
	Alternative refrigerant 3		**HC-290**	**HC-290**	**HC-290**
	*Total direct impact (post conversion baseline)**	*[t CO2 equiv]*	*-776*	*-1,075*	*-4,656*
	*Total indirect impact (country)***	*[t CO2 equiv]*	*55*	*77*	*332*
	*Total indirect impact (outside country)***	*[t CO2 equiv]*	*0*	*0*	*0*
	*Total indirect impact**	*[t CO2 equiv]*	*55*	*77*	*332*
	Total impact	**[t CO2 equiv]**	**-721**	**-998**	**-4,324**

*Direct impact: Different impact between alternative technology and HCFC technology for the substance-related emissions.

**Indirect impact: Difference in impact between alternative technology and HCFC technology for the energy-consumption-related emissions of CO2 when generating electricity.

*** Energy efficiency data for HFC-32 preliminary - changes possible

Conversion activities

7. The conversion activities foresee a system redesign related to some of the thermodynamic performance of HFC-32 as compared to HCFC-22. Significantly, the proposal also foresees a component redesign in particular of the heat exchangers where the proposal foresees to reduce the diameter of the copper tubing in the heat exchangers, leading to the need for a major retooling of heat exchanger manufacturing. The project proposal foresees also a number of safety precautions, additional leak detection equipment, as well as intensive testing and evaluation. Finally, training and technical assistance activities are also requested.

8. The submission included a broad overview of the related cost to convert three different units with capacities between 13 kWatt and 60 kWatt and the related manufacturing equipment. The project milestones, including commencing commercial production, foresee an implementation of the whole project within 18 months with the commercial production starting after 15 months.

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

9. The projects in this document (Tsinghua Tong Fang and Yantai Moon Group) are both deviating from the previously followed practice in the refrigeration and air conditioning sector in regard to technology transfer when CFCs were being phased out. While when phasing out CFCs Article 5 countries were mainly adapting such technologies to their products, which were already well established in industrialised countries due to the ten-year grace period, the situation has changed for the phase-out of HCFCs. One reason is that the manufacturing sector in certain Article 5 countries, in particular China, is increasingly close to the technology leaders in their fields; the other that the issue of climate change has reset the experience gained in the past years and, in order to use climate friendly technologies, some Article 5 countries will increasingly participate in developing the technology instead of having it transferred. This can lead to somewhat higher technology costs, in particular for the first projects in a given sector.

10. The technology choice of HFC-32 was further discussed between UNDP and the Secretariat. UNDP pointed to the good performance of HFC-32 in particular for heat pumps, the moderate GWP in comparison to HCFC-22, and the lack of other alternatives. Consequently, UNDP is of the opinion that HFC-32 appears to be a suitable compromise candidate in lieu of better alternatives for the refrigeration and air conditioning sector. UNDP also pointed to the urgency of developing and demonstrating solutions for the refrigeration and air conditioning sectors in order to reduce the growth in HCFC-22 consumption. China has experienced significant sustained growth in HCFC-22 consumption at an average of 25.6 per cent since 2003, and the related applications are likely to continue to grow, consequently, rapid availability of an acceptable alternative would have a significant impact. The quantity of ODS phase-out achieved by the project, if successful, is significant. The associated reduction in ODS achieved will be accounted for in the overall eligibility of China.

11. The Secretariat raised a number of cost issues with UNDP, in particular the conversion of the manufacturing of the heat exchangers. The company requests substantial cost for retooling of the heat exchanger production in order to accommodate the production to a lower tube diameter. The issue is further described in document UNEP/OzL.Pro/ExCom/60/47. The Secretariat maintained the position that the change of diameter in the refrigerant tubing of the heat exchangers is not incremental since it is related rather to desired improvements in the overall characteristics of the system than to the conversion from HCFC-22 to HFC-32. While the Secretariat maintained that the heat exchanger manufacturing is likely to be ineligible and should be separated out, UNDP pointed out that it appears that only a different heat exchanger configuration would allow the same energy efficiency to be reached as before. In this context,

UNDP also pointed to the fact that at this point in time there is virtually no information available about the energy performance and other characteristics of HFC-32 containing air-conditioning systems, and consequently a different heat exchanger configuration might be necessary, which would be eligible. UNDP and the Secretariat agreed finally, that 20 per cent of the cost related to the conversion of the heat exchanger production could be considered eligible for this new technology within a demonstration project.

12. The Secretariat raised a number of other cost issues with UNDP. These were partially related to the incremental operating costs where, at the current time and before proliferation of a new technology, the assessment of the cost difference between an existing system and a new system, which has not yet been designed, is difficult as no experience exists and also the demand for components is only miniscule leading to a non-competitive component market. UNDP and the Secretariat agreed on incremental cost as shown in the two tables below. Because of the novelty of the technology and the nature of this demonstration project, the Secretariat does not view the costs provided below as indicative of future funding levels.

Table 2: Incremental capital cost

Activity	Cost (US $)
System, component and process redesign	45,888
Prototype testing	77,941
Heat exchanger and related costs eligible part (20% of US 283,088)*	56,618
Product assembly	163,676
Quality inspection, finishing and testing	11,765
Prototype production trials and testing	72,808
Process and safety training	10,000
Reporting	
Report on project results	10,000
Dissemination of technical assistance workshop	5,000
Sub-total for reporting	15,000
Experts	
National experts	23,966
International experts	25,000
Sub-total for experts	48,966
Total for activities	502,662
Sub-total for incremental capital cost	502,662
Contingency	50,266
Total for incremental capital cost	552,928
Total for incremental operating cost	676,408
Project total (US $)	1,229,336

*The calculation of the eligibility of the heat exchanger and related costs was based 20% of the sum of dies for 7 mm diameter tubes (US $144,853), modification of tube bending machine (US $55,882), new vertical tube expanding machine (US $75,000) and sheet metal processing (US $7,353); while the originally requested cost for degreasing furnace is ineligible

Table 3: Incremental operating cost

Unit	60 kW unit	30 kW unit	13 kW unit	Total
Add. compressor costs	100	90	80	
Compressor oil costs	19	10	4	
Non-compressor per-unit costs/savings	55	64	72	

IOC per unit	174	164	156	
No. of units	1,858	858	1,357	4,073
IOC aggregated (US $)	323,664	140,781	211,963	676,408

13. The Secretariat recommends that the Executive Committee consider whether to fund this project at a level of US $1,229,336 plus agency support costs of US $92,200. The resulting cost effectiveness of the project is US $19.86/kg (metric). The Government of China points out that beyond the eligible cost and according to the calculations of the Government of China, the enterprise will have to contribute another US $670,664 of counterpart funding to achieve the conversion.

RECOMMENDATION

14. The Executive Committee may wish to consider:

(a) Approving the demonstration project for conversion from HCFC-22 technology to HFC-32 technology in the manufacture of commercial air-source chillers/heat pumps at Tsinghua Tong Fang Artificial Environment Co. Ltd. at a level of US $1,229,336 plus agency support cost of US $92,200 for UNDP;

(b) Requesting UNDP and the Government of China to deduct 3.40 ODP tonnes (61.9 metric tonnes) of HCFCs from the starting point for sustained aggregate reductions in eligible consumption, as set by China's HCFC phase-out management plan;

(c) Noting that with the partial funding of the conversion of the heat exchanger production, no more funding will be provided for the conversion of heat exchanger production at Tsinghua Tong Fang in the event that funding for the conversion of the manufacturing of other products at this company is requested in the future, and heat exchangers from the converted production can be used for such products;

(d) Further, requesting UNDP to provide to the Secretariat at the end of each year of the project's implementation period, or part thereof, progress reports that addressed the issues pertaining to the collection of accurate data in line with the objectives of decision 55/43(b); and

(e) Noting that the funding provided under this demonstration project is not indicative for future funding levels of similar conversions.

Demonstration project for conversion from HCFC-22 technology to ammonia/CO_2 technology in the manufacture of two-stage refrigeration systems for cold storage and freezing applications at Yantai Moon Group Co. Ltd. (UNDP)

PROJECT DESCRIPTION

Introduction

15. UNDP, on behalf of the Government of China, submitted to the 60th Meeting a "Demonstration project for conversion from HCFC-22 technology to ammonia/CO_2 technology in the manufacture of two-stage refrigeration systems for cold storage and freezing applications at Yantai Moon Group Co. Ltd". The project is addressing a consumption of 250 metric tonnes (13.75 ODP tonnes) of HCFC-22, as per 2008 consumption. The project aims to demonstrate the suitability of ammonia/CO_2 technology as a viable replacement for HCFC-22 in the manufacture of two-stage refrigeration systems for cold storage and freezing applications. UNDP has projected incremental capital cost of US $3,465,486 and incremental operating cost of US $1,207,300, resulting in a total of US $4,672,786. The enterprise offered to provide an amount of US $392,786, as a counterpart contribution, leading to a grant request of US $4.28 million plus agency support cost. The cost effectiveness of this project as requested would be US $17.12 per kg metric.

16. The submission foresees that the demonstration project will cover product redesign and development, production line conversion, process tooling modification, testing and performance evaluation, product trials, prototype testing, technical assistance and training. The objective is to convert one product line with a capacity of 100 units per year. The demonstration project is meant to contribute to the promotion of ammonia/CO_2 technology to replace two-stage HCFC-22 based refrigeration systems for large applications. The technology has been adopted in a number of non-Article 5 countries. The use of it is environmentally safe as well as cost effective, and the demonstration project is meant to enable replication of this technology is similar applications in China.

Country, sector and enterprise background

17. It is stated in the project proposal that the refrigeration and air conditioning sector in China has experienced a growth of 12 per cent per year over the last two decades. With improving living standards, the demand for food processing and cold storage infrastructure is increasing at a projected long-term annual rate of above 10 per cent a year, i.e. slightly slower than the sector growth. The demand for industrial refrigeration equipment in various applications is, according to the proposal, also expanding. In recent years, the short-term average annual growth rate of the manufacturing of large-scale industrial freezing and cold storage equipment has been over 15 per cent. The HCFC consumption in this sub-sector during 2008 was about 4,000 metric tonnes.

18. The Yantai Moon Group Co. Ltd. was established in 1956, and has been listed in the Shenzhen stock market since 1998. The company produces compressors and offers integrated systems for freezing and cold storage equipment and industrial refrigeration systems, as well as central air conditioning equipment and fresh fruit and vegetable technology. Over 70 per cent of its refrigeration products are using ammonia as a refrigerant.

Technology selection

19. The enterprise selected ammonia/CO_2 as a replacement technology for HCFC-22. This technology has been developed in the last decade in non-Article 5 countries for similar applications to those covered by Yantai Moon Group's production. The advantages of the technology are low pressure losses at the low-temperature side, low-pipe diameters, and with that, low installation cost and a high energy efficiency while using solely natural substances with negligible GWP. Because of its particular

characteristics such systems are used in applications where a large refrigeration capacity at low temperatures is required. Additional advantages stem from the inert character of CO_2, similar to HCFC-22; this allows its use with a large variety of materials and in sensitive areas where ammonia alone might not be the preferred choice. The cost of systems with a high-refrigeration capacity is very competitive. The project proposal further points out that while ammonia/CO_2 cascade technology has been used elsewhere, that its application has been sporadic and mainly focused on on-site assembled, custom-built legacy systems, and not on standardize product with economies of scale. According to the project proposal this initiative would offer an opportunity for using this technology on a commercial scale in integrated low-temperature refrigeration systems. The standardization of this technology would favour its widespread adoption as a HCFC-22 replacement and thus a demonstration of this technology has been considered critical by China for early adoption and dissemination.

Conversion activities

20. The conversion activities foresee product development and component development. The company wants to modify the existing component production lines for compressors and pressure vessels in order to enable the company to produce three typical specifications of ammonia/CO_2 refrigeration systems. To achieve this, the activities include product and process redesign, modification of production lines, modification of test devices to measure product performance, the manufacturing of prototypes, and the training of personnel. The list of activities proposed also includes technology dissemination and documentation.

21. Of the conversion activities, more than US $1.2 million of the requested incremental capital cost is related to the development, manufacturing and testing of screw-compressors using CO_2. Significant further costs are related to the development and conversion of manufacturing of pressure vessels for the use with CO_2, a high-pressure substance. The project milestones, including commencing commercial production, foresee an implementation of the whole project within 18 months with the commercial production starting after 15 months.

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

22. The choice of alternative technology for the project is innovative and reflects latest developments in non-Article 5 countries. The resulting equipment will be energy efficient, cost effective and environmentally benign. The Secretariat raised the question why HCFC-22 was actually used in this application at all. UNDP referred to the very low cost of the HCFC technology as the main reason and confirmed the consumption quantities of HCFC-22. The quantity of phase-out achieved by the project, if successful, is significant. The associated phase-out achieved will be accounted for in the overall eligibility of China.

23. A particular issue in this regard is the manufacturing of screw-compressors and their conversion from current use of HCFC-22 to the use of CO_2. The company requests substantial cost for the development and retooling of the screw-compressor production in order to make those compressors suitable for the high-working pressure of CO_2. The Secretariat and UNDP entered into very detailed technical discussions regarding the requested costs. The Secretariat agrees in principle that the costs appear eligible for a demonstration project, and the amounts appear to be reasonable. A significant part of the project costs are associated with the fact that the technology is not yet broadly documented and that the application in China deviates to some extent from the applications in other countries. Furthermore, the use is in a highly specialised sub-sector of refrigeration with only a very small number of companies worldwide. Because of the novelty of the technology and the nature of this demonstration project, the

Secretariat does not view the costs provided below as indicative of future funding levels. Table 1 provides an overview of the incremental cost of the project.

Table 1: Incremental capital cost

Item	Item cost (US $)	Totals (US $)
Product and process redesign		
System redesign	22,912	
Process redesign	21,000	
Compressor redesign	150,000	
Software heat exchange analysis software	80,000	
Certification testing and certification	10,000	
Miscellaneous documentation and research	8,000	
Total for product and process redesign		291,912
Modification of production lines		
Compressor		
-Compressor parts casting model	123,544	
-Compressor parts casting box	33,235	
-Tooling for CO_2 compressor	151,588	
-Measuring and inspection tools	58,603	
-CO_2 compressor machining tool	360,735	
-CO_2 compressor casing test device	29,265	
-CO_2 compressor air load test device	75,882	
Sub-total for compressor	832,852	
Pressure vessels		
-Equipment for stainless steel parts	102,941	
-Tooling for stainless steel containers	8,088	
-High-pressure testing of CO_2 vessels	45,588	
-Testing for CO_2 U-tube	5,882	
-Tooling for CO_2 U-tube	39,706	
-Development cost for CO_2 U-tube	7,353	
-CO_2 high pressure air drying system	20,588	
-Magnetic flaw detector for CO_2 vessels	16,029	
-Universal shock testing for CO_2 vessels	2,941	
-Impact testing for CO_2 vessels	3,971	
-Low-temperature test room	63,237	
-Welding test plate for CO_2 vessels	33,824	
Sub-total for pressure vessels	350,148	
Total for modification of production lines		1,183,000
Modification of test devices for product performance		
Materials and installation of test devices	167,073	
Pressure vessel parts	439,876	
Instruments for CO_2 compressor test device		
- Pressure transmitter (14 points)	8,529	
-Mass flow meter (3 sets)	3,823	
-Level transmitter (5 sets)	1,680	
-Instrument calibration outsourced	5,102	
Test software and debugging	51,471	
Consumables	1,765	
Test device commissioning	8,823	
Total for modification of test devices for product performance		688,142

Item	Item cost (US $)	Totals (US $)
Manufacturing of prototypes		
CO_2 compressor (four sets x 2 specifications)	118,897	
Pressure vessels	58,529	
System pressure vessels	158,224	
Ammonia system High temperature ammonia system	120,798	
Controls Electrical and other controls	17,647	
Total for manufacturing of prototypes		474,095
Personnel training		
Lecturer and trainer fees	17,645	
Lecturer and trainer travel expenses	8,236	
Organization and logistics	25,883	
Total for personnel training		51,764
Technology dissemination		
Technology dissemination workshop	24,412	
Technology communication	30,000	
Participation in exhibitions	10,000	
Total for technology dissemination		64,412
Technical assistance		
National experts throughout project implementation	20,000	
International experts throughout project implementation	25,000	
Total for technical assistance		45,000
Total for item		2,798,325
Sub-total for capital cost	2,798,325	
Contingencies (10%)	279,833	
Total for capital cost		3,078,158
Total for operating cost		1,207,300
Total (US $)		4,285,458

24. The original submission had assumed eligible cost of US $4,672,786 and had, on that basis, counterpart funding of US $392,786 leading to a funding request of US $4,280,000. Subsequently, as a result of the discussions between UNDP and the Secretariat, the eligible cost of the project was agreed at a total of US $4,285,458 including counterpart funding. UNDP, in consultation with the Government of China, informed the Secretariat that the counterpart funding contribution could under these circumstances not be offered at its original level, but at a reduced level of US $321,000.

25. On this basis, taking into account the counterpart funding, the Secretariat recommends funding at a level of US $3,964,458 plus agency support costs of US $297,334. The resulting cost effectiveness of the project is US $15.86/kg (metric). The Government of China points out that beyond, the eligible cost and according to the calculations of the Government of China, the enterprise will have to contribute another US $387,329 of counterpart funding to achieve the conversion.

RECOMMENDATION

26. The Executive Committee may wish to:

(a) Approve the demonstration project for conversion from HCFC-22 technology to ammonia/CO2 technology in the manufacture of two-stage refrigeration systems for cold storage and freezing applications at Yantai Moon Group Co. Ltd. at a level of US $3,964,458 plus agency support cost of US $297,334 for UNDP;

(b) To request UNDP and the Government of China to deduct 13.75 ODP tonnes (250 metric tonnes) of HCFCs from the starting point for sustained aggregate reductions in eligible consumption, as set by China's HCFC phase-out management plan;

(c) Further to request UNDP to provide to the Secretariat at the end of each year of the project's implementation period or part thereof progress reports that addressed the issues pertaining to the collection of accurate data in line with the objectives of decision 55/43(b); and

(d) Note that the funding provided under this demonstration project, as well as the funding level for particular items, is not indicative for future funding levels of similar conversions.

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