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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 PROPOSAL: TURKEY

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

Foam

- Validation of the use of HFO-1234ze as blowing agent in the manufacture of extruded polystyrene foam boardstock (phase I)

UNDP

**PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT
TURKEY**

PROJECT TITLE(S)**BILATERAL/IMPLEMENTING AGENCY**

(a) Validation of the use of HFO-1234ze as blowing agent in the manufacture of extruded polystyrene foam boardstock (phase I)	UNDP
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NATIONAL CO-ORDINATING AGENCY	Ministry of Environment and Forestry
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LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT**A: ARTICLE-7 DATA (ODP TONNES, 2008, AS OF FEBRUARY 2010)**

HCFCs	762.6		

B: COUNTRY PROGRAMME SECTORAL DATA (ODP TONNES, 2007, AS OF FEBRUARY 2010)

ODS			
HCFC-22	309.710	HCFC-124	0.012
HCFC-141b	256.603		
HCFC-142b	177.867		
HCFC-123	0.158	Total	744.4

CFC consumption remaining eligible for funding (ODP tonnes)	0.0
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CURRENT YEAR BUSINESS PLAN ALLOCATIONS		Funding US \$ million	Phase-out ODP tonnes
	(a)	Based on decision 55/43 (e)	n/a

PROJECT TITLE:	
ODS use at enterprise (ODP tonnes):	
ODS to be phased out (ODP tonnes):	n/a
ODS to be phased in (ODP tonnes):	n/a
Project duration (months):	10
Initial amount requested (US \$):	192,500
Final project costs (US \$):	
Incremental Capital Cost:	175,000
Contingency (10 %):	17,500
Incremental Operating Cost:	0
Total Project Cost:	192,500
Local ownership (%):	100%
Export component (%):	0%
Requested grant (US \$):	192,500
Cost-effectiveness (US \$/kg):	n/a
Implementing agency support cost (US \$):	17,325
Total cost of project to Multilateral Fund (US \$):	209,825
Status of counterpart funding (Y/N):	n/a
Project monitoring milestones included (Y/N):	Y

SECRETARIAT'S RECOMMENDATION	For Individual Consideration
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PROJECT DESCRIPTION

1. On behalf of the Government of Turkey, UNDP has submitted to the 60th Meeting of the Executive Committee a pilot project for validation of the use of HFO-1234ze as blowing agent in the manufacture of extruded polystyrene foam boardstock (phase I) in Turkey. The total cost of phase I of the pilot project is US \$192,500 plus agency support costs of US \$17,325.

Description of the extruded polystyrene foam sub-sector

2. Extruded polystyrene foams (XPS) falls into two categories: sheet for food applications where thermal insulation requirements are modest, and boardstock mostly used for construction where thermal insulation is critical. In the recent past, XPS production started in a few Article 5 countries (mainly China, Kuwait and Turkey, and to a lesser extent Argentina, Brazil, Egypt, Mexico and Saudi Arabia). Nearly all CFC used for manufacturing sheets has been converted to hydrocarbons. CFCs used for manufacturing boardstock were first replaced with HCFCs and most recently with HFCs (HFC-134a, HFC-152a), CO₂ (liquid carbon dioxide) or hydrocarbons in Europe and Japan. The significant variety in products required to serve the United States market (thinner and wider products with different thermal resistance standards and different fire-test-response characteristics) require different solutions.

HFO-1234ze technology

3. HFO-1234ze is a hydrofluoro-olefin (unsaturated HFC), with a shorter atmospheric life time than saturated HFC. It has zero ODP and a global warming potential (GWP) of 6. According to information published by the manufacturer (Honeywell), HFO-1234ze can be considered as a near drop-in replacement for HFC-134a in one-component foam applications. It has lower thermal conductivity than HFC-134a, which can lead to additional energy savings in finished foams; and it has improved solubility vis-à-vis HFC-134a in many polyurethane formulations. Based on its properties and some preliminary trials, HFO-1234ze has the potential to replace HCFCs as a blowing agent in the production of XPS boardstock; however, the technology has not been formally validated.

4. The commercialization of HFO-1234ze for use as a blowing agent has been allowed in the European Union since October 2008. Effective on 30 September 2009, the Significant New Alternatives Policy programme of the United States Environmental Protection Agency included HFO-1234ze in the list of acceptable substitutes for CFCs and HCFCs used in rigid polyurethane appliance foam; rigid polyurethane spray, commercial refrigeration, and sandwich panels; and polystyrene extruded boardstock (docket item EPA-HQ-OAR-2003-0118-0222).

Project description

5. The project proposes to validate the use of HFO-1234ze in the manufacture of XPS foam boardstock in Turkey, for the following reasons:

- (a) The XPS boardstock industry is large, with a consumption of 4,100 tonnes of blowing agents, of which 2,860 tonnes are HCFCs (HCFC-142b and HCFC-22);
- (b) Turkey is the second largest consumer of HCFC-142b among Article 5 countries;
- (c) The industry is under pressure from the Government, which is considering phasing out HCFC consumption by the end of 2015;
- (d) The sector has already begun testing alternatives to HCFCs, mainly HFC-134a, HFC-152a in combination with dimethylether (DME), hydrocarbons, and CO₂.

6. The project has been prepared around B-Plas Bursa Plastic, Metal ve Turizm San. Ve Tic. A.S. (B-Plas), a manufacturer of XPS foam. It will include installation of a new storage/feed operation for HFO-1234ze. Properties testing will be conducted at B-Plas and at Honeywell, and will be certified through an independent testing laboratory in Turkey. A final report will address the quality of the product, changes recommended to manufacturing equipment and cost analyses. Based on the trials to be conducted as part of the demonstration project, together with trials to be conducted by the Turkish XPS manufacturers (independently and at their own cost). Depending on the results of implementation of phase I, a phase-II proposal will be prepared for the conversion of XPS boardstock foam manufacturing plants.

7. The total cost of phase I has been estimated at US \$192,500 with the breakdown shown in the table below:

Description	US \$
Project preparation	40,000
Technology transfer and training	30,000
Trials, testing	70,000
Validation	10,000
Technology dissemination workshops	25,000
Contingencies (10 per cent)	17,500
Total	192,500

8. The cost for phase I is lower than for other HCFC pilot projects because the manufacturer of HFO-1234fa, Honeywell, had agreed to perform most tests in its facilities, thus avoiding the purchase of laboratory equipment. Furthermore, trials can be performed on existing production equipment with only minor retrofits.

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

9. The project proposal was first submitted by UNDP on behalf of the Government of Turkey to the 58th and 59th Meetings. The total cost of the project was US \$250,000 plus agency support costs of US \$18,750. In reviewing the proposal, the Secretariat noted that it was not eligible, considering the decision taken by the Executive Committee at its 57th Meeting with regard to the removal of HCFC demonstration projects from the implementing agencies' business plans, except for five projects in Brazil, China and Egypt (decision 57/6)). On this basis, the project was withdrawn at each Meeting. At its 59th Meeting, the Committee decided that additional HCFC projects that demonstrated alternative or new technology, and could provide the information required by decision 55/43, would be allowed for inclusion in the 2010 business plans of the bilateral and implementing agencies (decision 59/9).

10. During the review of the proposal when it was first submitted, the Secretariat raised a number of technical and cost-related issues, which have been satisfactorily addressed in the proposal submitted to the 60th Meeting. These issues are summarized below:

- (a) Considering the limited availability of HFO-1234ze in the market (current production of 1,000 tonnes/year), that the product has not yet been commercialized in the United States, its very high price (US \$12/kg), and the fact that multiple users in Europe are currently assessing the chemical in one-component foam, it would appear that the validation of HFO-1234ze at this time is premature. UNDP reported that the initial production level has already been increased to address the needs for the production of one-component foams in countries in the European Union as HFC-134a, the blowing agent commonly

used in those applications, is not longer allowed. UNDP reported that the manufacturer of HFO-1234ze stated that production can be increased quickly if needed to meet demand;

- (b) Honeywell, the manufacturer of the HFO-1234ez, will play the role of the technology provider. However, as Honeywell's experience in extruded polystyrene foam is limited, a process expert is required;
- (c) Discussion on cost-related issues for project preparation, technology transfer and training, and materials for trials, resulted in adjusting the overall cost of the project to US \$192,500.

11. During the discussion held at the 57th Meeting on the inclusion of HFO-1234ze as a demonstration project for replacing HCFC-141b as a blowing agent, some members expressed concerns regarding the flammability of HFO-1234ze and the potential formation of hazardous substances (such as hydrofluoric acid, hydrofluorocarbons and other fluorinated products) during combustion in case of fire. On these issues, UNDP reported that HFO-1234ze has been commercialized in Europe for use in one-component foam since July 2008. Significant information on the physical, toxicity, and flammability properties of this molecule were presented in two large technical conferences in 2008 (CPI Polyurethanes Technical Conference) and 2009 (UTECH). HFO-1234ze is available for wide customer sampling and for large-scale trials at any time. In addition to the commercialization of HFO-1234ze in one-component foam, there have been a number of XPS trials conducted globally using HFO-1234ze as the blowing agent with good results. HFO-1234ze has been tested and found to be non-flammable.

RECOMMENDATION

12. Noting that HFO-1234ze could be a potential cost-effective alternative for the phase-out of HCFCs in the manufacture of extruded polystyrene boardstock foam, a sector which is expanding in several Article 5 countries, and in light of the comments by the Secretariat, the Executive Committee may wish to consider approving the pilot project for validation of the use of HFO-1234ze as blowing agent in the manufacture of extruded polystyrene foam boardstock (phase I) in Turkey at a cost of US \$192,500 plus agency support costs of US \$17,325 for UNDP, on the understanding that the project would be the final validation project for HFO-1234ze in the manufacture of extruded polystyrene boardstock foam, and that approval of the project was without prejudice to consideration of any future funding request for phase II of the project by the Executive Committee.
