Roundtable Dialogue on Current and Likely Future Technology Options to Meet Accelerated HCFC Phase-out Obligations

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Summary

S1 The Alliance for Responsible Atmospheric Policy (Alliance), the United Nations Environment Programme (UNEP), and the World Bank (the Bank) cosponsored a roundtable discussion to explore alternatives for HCFCs. The Bank hosted the meeting in Washington, D.C. Approximately forty people, mostly industry, participated.

S2 The sponsors established the roundtable objectives as presentations and discussions to assist developing countries [A5(1)] to identify the best ways and means of meeting HCFC phase-down obligations, and making cost-effective and sustainable choices. The period up to 31 December 2014, when A5(1) countries must reduce usage from baseline levels by 10%, was the specific focus.

S3 The Roundtable began with an overview of criteria and timetables. Each sector then provided an overview of history and alternatives. A roundtable discussion followed each sectoral presentation, including questions and participation from the rest of the attendees.

S4 It was noted that development of both chemicals and applications would prohibit consideration of any new alternatives during the next year, due to the lengthy timelines required for new technologies. It was also noted that significant activity continues to develop new low Global Warming Potential (GWP) alternatives. This industry is characterized by transition and despite the desire by Parties for a final transition, it probably will not occur. Chemical developers are confident that new, low GWP alternatives will be available in many markets in the next decade, but the more critical consideration is the best technology, not simply refrigerant or blowing agent.

S5 Some new, developing alternatives may provide lower Life Cycle Climate Performance (LCCP) than current, well established and currently marketed alternatives. In the interim, Parties will need all alternatives that currently exist, CO_2, hydrocarbons, ammonia and HFCs to meet their Montreal Protocol (MP) obligations, particularly if LCCP is to be optimized – and HFCs will be part of the alternatives for the foreseeable future.

S6 All anticipated that this would be the first of a series of roundtables and workshops.

Identified Needs

1. How best to evaluate atmospherically short lived chemicals?

2. Since cost is a major concern, particularly for small and medium-sized enterprises (SMEs), how should operating costs be defined? A difference exists between common usage and MP usage.
3. What is the best mechanism to convey appropriate and timely information on emerging technologies?
4. Should risk assessment be part of the alternatives criteria?

Roundtable Details

RDI. Welcome by Roundtable Sponsors

RDI.1 Steve Gorman introduced the Ozone Operations Resource Group members. The OORG provides technical support to the Bank. The 40 roundtable participants from various market sectors, companies, associations, industries and agencies, introduced themselves.

RDI.2 May Wall, attorney on behalf of the Alliance, spoke on the applicability of US antitrust policy and the Alliance checklist.

RDI.3 Steve Gorman, on behalf of the Bank, welcomed participants. He noted the meeting objectives, the Bank support for A5(1) country HCFC phase-out strategies and the Alliance member's technical expertise. The participants' unique roles created the rationale for this first Roundtable. The Bank's objectives included:

A. Identifying best practices and alternatives for HCFC phase-out, and the linkage with the climate change issue.

B. The Bank's and Implementing Agencies' need for technology insight in order to enable informed choices.

RDI.4 Dave Stirpe on behalf of the Alliance, noted they were celebrating 30 years of Montreal Protocol- issue collaboration and dialogue this year. Dialogue is important as it relates to Parties making alternatives choices. Industry may not have information on all alternatives and some future alternatives may not even exist today. Kevin Fay, Alliance Counsel, noted industry nominated HCFCs twenty years ago as transitional substances. HFCs will have a continuing role for the foreseeable future. The Alliance is committed to continue to build on its historical role of providing A5(1) Parties information. Transitions today also relate to other environmental needs, covering both ozone and climate change as well as other societal needs. The need continues to achieve technological and environmental objectives for global societies.

RDI.5 Raj Shende: On behalf of UNEP, welcomed participants and shared a historical perspective about HCFC phase out in the 1990s. He noted it has been just three months since Parties phased out all CFCs. He congratulated industry on the support and the A5(1) countries for an excellent job. He thanked the Bank for hosting this Roundtable. He noted the need to explore and guide the process with technology forecasting. Every technology has a transition, but today countries are looking for long term solutions for their phase-out – at least 15-20 years.

The situation has become more complex because we are now expecting more than one environmental benefit. He closed by suggesting a follow-up roundtable should be hosted in Paris or Nairobi. (Post meeting, he suggested China as another alternative.)

RDI.6 Vic Buxton, OORG Member and Roundtable Facilitator – He noted that we need to: 1. Know where you've been, 2. Know where you are 3. Know where you're going. The purpose of the Roundtable was to identify gaps and provide comparative analyses (respecting antitrust). He noted that the current markets can be characterized as creating both discord and challenges. The discord is due to the multiple alternatives that have been introduced and the challenges relate to addressing all Party requirements.

RDII. OORG/TEAP Member Presentations

RDII.1 **Lambert Kuijpers** – OORG technical expert for Refrigeration and Air-conditioning provided an overview of HCFC markets – where are they used, what is a low-GWP chemical and what choices exist for HCFC alternatives.

RDII.2 Sectors include commercial refrigeration, transport refrigeration, unitary air-conditioning, chiller air-conditioning and transport air-conditioning. The relevant chemical of concern in these sectors is mostly HCFC-22. He noted that developed and A5(1) Parties agreed to an accelerated phase-our schedule in 2007. The Parties have clearly indicated that they want to also achieve climate gains with the HCFC phase-out. But climate gains can only be realized if direct and indirect impacts of alternatives are comparable or lower than the application's HCFC-22 impact. He noted that the accelerated schedule should lead to an ozone layer recovery three years earlier than pre-acceleration, with potentially a major climate emissions impact as well.

RDII.3 He noted that decisions at the Port Ghalib MP Meeting of the Parties requested TEAP to complete an analysis of low-GWP alternatives, but low-GWP has never been defined. GWP is only a metric; for climate change this is radiative forcing impact, and is important. GWPs estimated for chemicals with lifetimes shorter than six months cannot be compared with "normal" GWPs since any chemical with a short lifetime is not well mixed in the atmosphere. The preliminary TEAP draft report (subject to further review, comments and possible changes) suggests several possible designations:

-Very Low GWP <100
- Low GWP 100-300
- Intermediate GWP 300-1,000
-High GWP >1,000

RDII.4 He continued by discussing alternatives for HCFC-22. R- 410A is promoted as an alternative for unitary AC. But its GWP of 2,120 has no advantage over HCFC-22. R-404A is the best alternative for commercial refrigeration, but has a GWP of 3,900. R-134a is a reasonable alternative in some sectors, although its GWP is relatively high. Overall, a Total Equivalent Warming Impact (TEWI) or a Life Cycle Climate Performance (LCCP) calculation is important. Natural refrigerants have low GWP advantages, provided flammability and toxicity

can be addressed. HFOs could be alternatives, but no direct replacements are known for high pressure applications of HCFCs and HFCs. Furthermore, HFO costs are unknown.

RDII.5 In summary, HFCs are suitable alternatives, but some Parties have now designated them as transitional. Natural refrigerants are technically suitable and continue to be developed, and unsaturated HFCs may potentially become available.

RDII.6 **Mike Jeffs** – OORG Technical Expert for Foams – He noted that rigid polyurethane (PU) insulating foam is used in building and appliance insulation and extruded polystyrene (XPS) and polyisocyanurate (PIR) foams is used in building insulation. XPS has had major recent significant growth rates in India and China. Polyurethane Expanded Elastomers are used in integral skin foams for automotive and furniture applications. Hydrocarbon blowing agents (mainly pentane and cyclopentane) can be used in all applications except Spray Foam. State of the art hydrocarbon systems meet all standard requirements and production rates are acceptable. HFCs, with high GWPs, are also available in all market sectors.

RDII.7 Future options to replace HCFCs or hydrocarbons (HCs) include methyl formate and low GWP HFCs (HFOs). Methyl formate has a minimum stable density that is rather high and there may be flammability and licensing concerns. Low GWP HFCs availability and operating cost impact is mostly unknown at this time.

RDII.8 A5(1) country's require proven technical suitability, low capital cost (a concern with HCs), low operating costs, and only one more transition. HC plant conversions may be uneconomical, particularly for small and medium enterprises (SMEs). HFC lifespan is a concern and they have high operating costs. Licensing and technical suitability are still questions for methyl formate.

RDII.9 **Questions/Discussions**: These were good assessments of where the market is today. Both presentations listed high operating costs for HFCs. Why? For foams, it's a factor of the BA itself; the higher density requires more BA and potentially other chemicals. The current market price for HFC-245fa increases operating costs by 40%, HFC-365mfc by up to double. Refrigeration operating costs are higher than HCFC baselines for HFCs, but not significantly; a better characterization is a moderate increase. Industry tends to think of operating costs as the cost to operate the equipment, whereas under the MP operating costs are defined differently. Is there a need to address a standard definition?

RDII.10 What is the safety record for handling HCs? Using HCs in foam, there is an issue related to flammability in production, although an excellent safety record exists since 1993. Significant improvements in the past 5 years have made flammability of end products less of an issue.

RD III. Setting the Stage

RDIII.1 **Presentation** Mack McFarland - DuPont, Jeff Moe – Trane. They noted that the global market has changed dramatically from twenty years ago when most fluorochemical

production and equipment manufacturing occurred in developed countries. Today, A5(1) countries are also large producers of fluorochemicals and other alternatives. The pace of economic growth has accelerated and is very rapid in developing countries. Critically, GWP has increased as a concern globally. And both government and non-government pressures to increase energy efficiency has shifted in the past decade.

RDIII.2 Application solution criteria have expanded to include ODP, GWP, energy efficiency, safety, cost and application "fit." Timelines for new technologies must include fluid R&D and commercialization, equipment solutions, regulatory approvals and servicing practices.

RDIII.3 "Sustainable fluids" must address both environmental stewardship and customer value. CO_2 and ammonia were readily available 100 years ago, but fluorocarbon development made them preferable as safe, energy efficient alternatives. Ozone depletion and climate science increased the need for low/no ODP and GWP chemicals. The issue isn't "natural refrigerants" versus fluorocarbons, but rather environmental stewardship and customer value satisfying all the various societally-driven criteria.

RDIII.4 A single alternative is not necessarily best for all applications. CO_2, ammonia and hydrocarbons can and are being used, but are limited in some applications. Critically, energy efficiency drives the applications' environmental impact.

RDIII.5 At least two decades have been required so far to meet the ODS phase-out in the United States, and the phase-out will span at least two more. A5(1) countries are just commencing their final phase-out, ending with HCFC phase out in 2040.

RDIII.6 That schedule has allowed time to develop new alternatives. Today, between 6 and 13 years are required from initiation, to fluid regulatory approval and finally to commercialization of acceptable alternatives in new equipment. Possibilities are emerging in some areas, although a full suite of commercial alternatives will take more than a decade.

RDIII.7 Global fluorocarbon consumption has declined dramatically from when CFCs were the substances in major use, through HCFC use and into HFC use. As important, various market sectors no longer use fluorocarbons and have phased them out entirely.

RDIII.8 Various unfettered HCFC and HFC demand scenarios were demonstrated, projecting global needs through 2026. Correspondingly, various reduction alternatives were demonstrated for developed countries, but significant unknowns for A5(1) countries make projection impossible today.

RDIII.9 **Discussion.** Could HCs be transitional chemicals if new low GWP alternatives provide improved energy efficiency and lower LCCP?

RDIV. Foam Blowing

RDIV.1 **Presentation** - The group noted that extruded polystyrene has converted from CFC-12 to HCFC-142b and HCFC-22 and, in developed countries to HFC-134a and HFC-152a. Polyisocyanurate foam converted from CFC-11 and today uses hydrocarbons. Polyurethane foam used CFC-11 and converted first to HCFC-141b with some HCFC-22 and water blown, and at least today in developed countries, uses HFC-245fa, HFC-365mfc, some HFC-134a, some water and some hydrocarbons.

RDIV.2 The fluorocarbon blowing agent market size has also shrunk to about half the volume used with CFCs. But the key criteria have actually increased to go beyond insulation value and to include: non-flammability, dimensional stability, adhesion, cost to use, and capital investment.

RDIV.3 Clearly a single alternative does not meet the market sector demand today. But the drive to energy efficiency requires superior insulating performance. HFCs have been critical to the developed country phase-out of HCFCs and are expected to be an important contributor for A5(1) country phase out as well. It is expected that new, low-GWP alternative transitions will not require significant capital investment, unlike transitions to some current alternatives. Developers of new alternatives are confident such low-GWP chemicals will be available in the next decade. But a variety of alternatives will always be available. Next generation fluorocarbons may be the best alternative for spray foam. Markets will transition away from fluorocarbons as HCFCs transition to HFCs (cost will filter applications).

RDIV.4 **Roundtable** – Will VOC regulations eventually impact A5(1) countries and if so should the MP design today to address that concern?

RDIV.5 In foam blowing, all alternatives are "in-kind" regardless of the blowing agent. Many large A5(1) country phase-out plans are being based on the foam sector. Many of them believe HCs are the best alternative. This roundtable discussion suggests otherwise.

RDIV.6 Are HFCs inevitable when going away from HCFCs? Yes – up to 2015. Options will be both HCs and HFCs. If new HFO alternatives have higher thermal efficiency there will be a shift from HCs. Since CFC use, we have lost 30-40% efficiency.

RDIV.7 What is the safe use record of HCs in A5(1)? OORG respone – HCs used in manufactured refrigerators have an excellent safety record. Significant funding for training has been provided for Bank projects. The Bank does not compromise on safety when HCs are chosen.

RDIV.8 The overall objective is to reduce the carbon footprint, as well as eliminating ozone depleting substances. In non-A5(1) there was a natural transition away from fluorocarbons for economic and technical reasons. Across-the-board restrictions on HFCs may be misguided since those applications using HFCs are delivering benefits not achievable by other alternatives. The major concern comprises SMEs in A5(1) countries. All fluorocarbon producers present have announced they are actively developing alternatives. None have announced a specific timeline for commercial availability. The timeline is not unreasonable with respect to the need.

RDIV.9 It is very important to communicate to A5(1) countries that there are no final solutions because the drive to more energy efficient foam will continue forever. A better message is that progress is ongoing and there will always be transitions. The Bank must address obligations under the MP, and then move to the climate change issue.

RDIV.10 The outstanding question is what is the best mechanism to convey appropriate and timely information on emerging technologies?

RDV. Commercial and Transport Refrigeration

RDV.1 **Presentation** – The presenters noted the need to minimize total energy consumption throughout this sector. The varied demands of individual applications require safe and sustainable refrigerants, refrigerants that can meet the varied operating conditions and equipment, and economics for both installation and maintenance over the systems lifetime. New alternatives must match or exceed like-for-like energy efficiency profiles as much as possible. Energy use in applications is critical, with fuel used in transport and electricity use the appropriate measures. CO_2 can be a good alternative where ambient conditions are cooler outside; but there are efficiency problems to overcome in warmer environments. Sustainability in the top priority and should include: 1) non-ODP 2) maximize energy efficiency 3) GWP (how low?).

RDV.2 Safety concerns for these applications include flammability (potential ignition sources, proximity of people, size of charge and explosion for), toxicity (short and long term, exposure), and pressure (doesn't prohibit use, but servicing personnel need to be aware and trained).

RDV.3 The operating environment is so varied that no one single solution applies everywhere. Some smaller charges of HCs are not a problem, but system performance must be matched with each operating condition. Field erection and service, and oil compatibility need to also be considered.

RDV.4 The Value Chain needs to be considered, throughout the chain of commerce and needs to include end-of-life and reclamation. The full economics of installation and lifetime maintenance costs need to be included.

RDV.5 Sanyo gave an overview of their CO_2 business in both heating and cooling applications.

RDV.6 Refrigerant choice is a critical factor due to increasing energy costs and availability in all countries. Increasing demand will make energy needs more critical over the next decade. Application specific tradeoffs are much more distinct, requiring fluid choices meeting unique segment needs.

RDV.7 **Roundtable** – It was noted that the private sector needs to generate value to fund new development activities. Also, reclamation is becoming more difficult due to the wide variety of chemicals that must be handled. But fluorochemicals have additional value since they can be

recovered at end of life, perhaps easier than many other alternatives. It was noted that HCs can be vented in Europe (subject to VOC regulations). Europe has the "F Gas" regulation that controls emissions. Containment in A5(1) countries is more difficult, despite being important for all refrigerants. Current best CO_2 technology in air-conditioning systems is comparable to existing fluorocarbon technology. It is important that when comparing various refrigerant technologies that "Best Available" is compared to "Best Available". The total full impact of an application also needs to be considered, not just those impacts associated with the stand alone application. This is critical since the key issue is the appropriate technology and not the specific refrigerant.

RDVI. Industrial Refrigeration

RDVI.1 **Presentation** This area covers large plants, including pharmaceutical and chemical plants that exist in climates with significantly varying temperatures. All known refrigerants are used. Services are rendered to meat and poultry, process, food and beverage, cold storage and distribution, dairy, marine and leisure industries, over US$6 billion total. Systems are typically field erected and include drying, freezing and cooling.

RDVI.2 Ammonia has been used for many years and may be the "Original Refrigerant." It is inexpensive and leaks are readily discernable. Many and significant government regulations exist. Ammonia is not ideal for centrifugal chillers and is considered flammable. However, 90% of northern European chillers use ammonia. Few domestic US ammonia chillers exist and the capital cost is 2-2.5 times higher than HFC chillers. However, ammonia is extensively used in the food and beverage industries and is inexpensive. A5(1) countries need to ensure they have an appropriate regulatory base and that sufficient training is in place.

RDVI.3 CO_2 refrigeration systems date to the late 1800's. In cascade systems, CO_2 can be used in low temperature applications but with additional power consumption over two stage ammonia systems. High pressure equipment is required. CO_2 won't condense at ambient temperatures above 88^oF. In some low temperature applications, it can be the best alternative. Energy consumption accounts for 80% of environmental impact, 20% due to leakage (unless recovered at end-of-life).

RDVI.4 Hydrocarbons are used in process industries and in applications where other flammables are handled.

RDVI.5 R-404a and R-410a HFC blends are acceptable alternatives for R-22. But blends may change over time and R-410a operates at higher pressure. Some other R-400 series blends may work in smaller systems. R-507 is the best alternative for industrial refrigeration systems with flooded evaporators, but energy consumption can be 13-20% worse than R-22. Even after maximizing efficiency, energy consumption is 5-10% worse than R-22. R-507 is a well accepted replacement in supermarkets.

RDVI.6 **Roundtable** – Regulatory pressure or code requirements may mandate that the refrigerant be kept in the "engine" room and brine, or another fluid, be circulated in a secondary

loop. However, many of the applications only use primary loops. It is difficult to measure incremental costs and the corresponding paybacks and it is difficult to draw general conclusions since applications are very specific and individual. The bulk of low temperature applications uses ammonia in developed countries.

RDVI.7 The Bank has been asked to evaluate alternatives other than HFCs and HCFCs for chillers. High density developing country populations may be a problem for ammonia, but cold storage can easily be located outside population areas.

RDVI.8 The Bank and the other Implementing Agencies are helping countries phase out HCFCs. Those activities are based on information that is currently available. UNEP has 98 HCFC Phase out Management Plans (HPMPs) under development. The Bank, UNDP, UNIDO also are developing HPMPs for developing countries. A key question is how to provide strategies to developing countries without knowing the direction of technologies. This could result in developing country programs heading differently than where developed country industry is heading. Plans for developing countries will be set in stone in the next 12-18 months for the first phase of developing country phase downs.

RDVII. Stationary Air-conditioning

RDVII.1 **Presentation** Presenters noted the same variety of criteria requirements as the previous market sectors. They emphasized the timeline required for development of new alternatives and the need for practical approaches including performance, sustainability, safety, economics and matching design criteria. Practical approaches require explicitly addressing all the components noted above. Performance relates to both the system capacity and the corresponding energy consumption. LCCP is an appropriate evaluation tool. For sustainability, the team noted the major impact of indirect emissions, particularly since these systems do not leak significantly. Flammability and toxicity relate to risks and the associated risk management that vary between duct and ductless systems. Flammability also is both a code and standards issue. Proper design with the proper refrigerant should minimize environmental impact but requires considering component and equipment selections, pressures, leaks and charge size. And finally, if the total cost (equipment, refrigerant and operating & maintenance costs) of ownership is too high, a given alternative may not be an appropriate societal solution. High energy consuming appliances may continue to operate if the replacement system cost is too high. Much of this equipment is installed for 10-25-30 years. During their lifetime, energy usage dominates the climate impact. This suggests different applications could use different GWP refrigerants. Only about 25% of the customers actually evaluate life cycle cost, as opposed to focusing on first cost.

RDVII.2 A wide range of capabilities exist in the service sector, varying significantly by country. Currently, no single refrigerant is perfect for all applications, requiring tradeoffs. Selection of appropriate refrigerants and technologies will require flexibility to maximize environmental performance and acceptable risks and affordability.

RDVII.3 Multilateral Fund (MLF) project approvals should require best practice to minimize leaks, including fits. Furthermore, MLF funding could reward use of charge-minimizing technology, leak checking and/or maintenance programs. Higher levels of energy efficiency could also be rewarded. The focus should be on the entire system performance, not just components.

RDVII.4 A Delonghi paper on propane use in household air-conditioning was noted.

RDVII.5 **Roundtable –** There is no global standardized certification program for equipment. How much HCFC-22 could be replaced with propane? About 90% of HCFC-22 is used in room A/C and the percentage is increasing. Currently, 19 million propane units are produced per year and many are portable A/C systems.

RDVII.6 In between 7-12 months, developing countries have to make a technology choice for the first phase of HCFC controls. UNEP noted possible CDM credits for energy efficiency options in developing countries. It doesn't seem reasonable to make one final choice. Globally, accelerating technology change is the character of these industries. Developing countries should be encouraged to increase their ability to adapt to change.

RDVII.7 There is a final solution under the MP that will phase out ODS, but then other solutions might be more appropriate considering other environmental issues. The Bank is looking for ways beyond the least cost option. It now has a US$6 billion fund for climate change and technology.

RDVII.8 Unprecedented technology change and turnover will be required to address climate change. Air-conditioning will need to examine both charge size and volume. But industry cannot create technology out of shear will alone. Industry understands the need, but the technology is not there, as yet. For the vast portion of technologies, there are no good alternatives to HFCs. Developing countries will have to use HFCs to meet their 10% goal.

RDVII.9 The Bank was asked what goes in to an HPMP plan? (Response found in RDVII.18, below.) The current alternatives meet the goals of the MP. But other environmental factors will come into play in the future. The Bank will not stop at just addressing HPMPs – it is also doing low carbon studies to factor in energy strategies. The Bank will publish a report next month on how to blend all these various strategies.

RDVII.10 UNEP noted that technology will evolve and Parties need to incorporate new developments. Only 1 HPMP has been formally submitted to the MLF. Today, countries are unsure and want to wait for technology evolution. It was noted that China targeted room air-conditioning as part of its commitment to reductions under the Copenhagen Accords.

RDVII.11 Developing countries do not want to compromise safety, nor do the Implementing Agencies. IEC standards are used in India and many other A5(1) countries.

RDVII.12 Highly efficient products may not use the lowest GWP refrigerant compared to other alternatives, but may have the best environmental result. Selection based on GWP alone is an erroneous premise.

RDVII.13 Is risk assessment part of the criteria for funding projects? It was suggested that a quantifiable risk assessment should be done for any HPMP.

RDVII.14 Developing countries are in a tough situation. It's not as difficult to meet the HCFC phase-out targets because alternatives exist. Some of the segments above noted promise for some new alternatives. In other areas, the required attributes do not have explicit new solutions. Ultimately, it is a question of timing.

RDVII.15 The Facilitator noted it was a political decision to make HCFC reductions. During CFC reduction and phase-out, Parties knew where the technology choices were and could meet the requirements.

RDVII.16 OORG member Kuijpers noted that 18 developing countries can use foam market reductions to meet their commitments. 120 countries must reduce in HCFC-22 service or refrigeration systems making HPMPs very difficult. He provided the following summary (2006-2007 data) after the meeting:

1	Country (China) HCFC >20,000 ODP tonnes
5	Countries 800-1,400 tonnes ODP each
12	Countries 100-300 ODP tonnes each (total 2,000 tonnes)
18	total countries with both foam and refrigeration
34	Countries with some foam consumption 0-30 ODP tonnes Plus countries with some refrigeration 0-50 ODP tonnes (About 1,300 ODP tones total)
90	Countries with HCFC-22 servicing consumption only (0-8 ODP tonnes)

RDVII.17 HFCs will continue to be available as alternatives. For purposes of ODS phase-out HFCs will still be used for the next 20-30 years.

RDVII.18 The Bank noted the basic development of the HPMP, which prompted several questions about the process. Individual enterprises make their own choices.

RDVII.19 UNEP noted they are trying to provide information since informed choice is the critical issue.

RDVII.20 The Bank noted that each country will make its own technology decisions.

VIII. Rapporteur's Summary - The Rapporteur noted that all alternatives will be required to meet the HCFC freeze and 10% phase down schedules agreed by the Parties.
He noted a draft report will be provided for comment to all participants.

IX. Meeting Close - The three cosponsors thanked all participants for their contributions and noted the need to continue the dialogue between the Bank, UNEP and industry.