Technology and Economic Assessment Panel

Progress of work and key issues emerging from 2018 Assessment Reports
<table>
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<tr>
<th>Name</th>
<th>Country</th>
<th>Position</th>
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</thead>
<tbody>
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Decision XXVII/6 requests TEAP reports to consider,

a) Impact of the phase-out of ODS on sustainable development;

b) Technical progress in the production and consumption sectors in the transition to alternatives and practices that eliminate or minimize emissions of ODS in consideration of factors stipulated in the Vienna Convention;

c) Technically and economically feasible choices for reduction and elimination of ODS in all relevant sectors;

d) Status of banks containing ODS and their alternatives, including those maintained for essential and critical uses, and options for handling them;

e) Accounting for production and consumption for various applications and relevant sources of ODS and their alternatives;
Timeline

• TOC Assessment Reports – 31 December 2018

• TEAP Assessment Report – 41st OEWG

• Synthesis Report – 31st MOP
TOC ASSESSMENT REPORTS 2018 – EMERGING MESSAGES
Foams

• Availability of zero ODP/low GWP blowing agents

• Significant improvements in the development and availability of additives, co-blowing agents, equipment and formulations are enabling the successful commercialisation of foams containing zero ODP/low GWP blowing agents.

• Blowing agent conversions are underway in Europe and other non-A5 parties. F-gas regulations have accelerated conversions.

• FTOC has been unable to gather details on specific product availability, because companies keep information confidential.
• FTOC is aware of the marketing of CFC-11 for use in foams on the internet and through other means.

• The FTOC 2018 Assessment Report will provide a summary of the technical feasibility of reverting to CFC-11 in foam blowing.
  – Initial CFC-11 conversion to HCFC-141b required significant adjustments to the formulation because of the solvent properties of HCFC-141b.
  – In contrast, switching back to CFC-11 from HCFC-141b would require minimal adjustment of the formulation.
  – However, the substitution of CFC-11 into hydrocarbon or HFC formulations is more difficult.
Halons, HCFCs and High-GWP HFC Alternatives

• Last month, a new low-GWP blend was announced for total flooding
  – Blend of two existing low-GWP agents: FK-5-1-12 and HCFO-1233zd(E)
  – Will yet be several years before market impact can be assessed

• Military Systems:
  – For new designs, there are virtually no applications where a halon must be used although there are many applications where there are no low-GWP alternatives
  – In legacy (existing) designs, there are applications where neither a suitable halon nor high-GWP HFC alternative exists for retrofit

• Oil and Gas Operations:
  – Halon 1301 is only required to support long-term legacy facilities
  – All new facilities are halon-free but depending upon the climate (i.e., low temperature), might require HFC-23, a very high-GWP HFC
Halon and HFC Fire Extinguishant Banks

• The estimated size of the global halon banks from the HTOC model at the end of 2018 are (metric tonnes):
  – halon 1301: 37,750; halon 1211: 24,000; halon 2402: 6,750.
  – The HTOC model uses expert opinion on emission rates of various end uses, by region

• Estimated emissions derived from atmospheric measurements:
  • For halon 1301, while within uncertainty, are higher than the HTOC model, providing a significantly smaller bank
  • For halon 1211 are consistently higher than the HTOC model since 2002, providing a significantly smaller bank
  • For halon 2402, while within uncertainty, are less than the HTOC model, providing a somewhat larger bank
Halon and HFC Fire Extinguishant Banks 2

• HFC-227ea: (the main high-GWP alternative to halon 1301)
  – Estimated annual emissions from fire protection applications in 2018 are 3,400 metric tonnes
  – The global bank is estimated to be 130,000 metric tonnes at the end of 2018 (assuming a global average annual emission rate of 2.5%)
  – Higher emission rates would provide a resulting smaller bank

• Owing to the continued global demand from long-term applications, the HTOC continues to recommend that destruction of fire extinguishants should be considered only as a last resort, i.e., only if they are too contaminated to be recycled/reclaimed to an acceptable purity
Halons – Civil Aviation

• A halon 1211 alternative (2-BTP) in portable extinguishers is being used on aircraft coming off the production line
• Last week, new progress was announced in the testing of a proprietary blend to replace halon 1301 in cargo bays
• Re-testing of a halon 1301 replacement in engine nacelles is ongoing
• HTOC has serious concerns on the long term availability of halon 1301 for Civil Aviation and other long-term uses, beyond the early 2030s
  – The annual rate of halon 1301 emissions in civil aviation may be substantially greater than previous estimates
  – The majority of the halon 1301 bank is unlikely to be available for civil aviation use
  – The available amount of halon 1301 will not be sufficient for all long-term applications (e.g., civil aviation, oil & gas, and military use)
CFC MDIs have been phased out. Affordable alternatives are available worldwide.

- 800 million inhalers used annually: average 50:50 HFC MDI vs. DPI, with large regional variability.
- HFC-134a is the major MDI propellant. New propellants with lower GWP are in early development.
- A reduction in carbon footprint could be made by switching to DPIs, avoiding inhalers using HFC-227ea, and using only MDIs with low volumes of HFC-134a propellant.
Aerosols and Sterilants

• The global use of HCFCs in aerosols and sterilants is relatively very small, with a range of alternatives available.
  – Many aerosol propellants have migrated to flammable hydrocarbons and dimethyl ether, esp. for consumer aerosols.
  – Non-flammable, non-toxic HFCs are used in aerosols when flammability or toxicity is a consideration.
  – HFCs are also used where emissions of volatile organic compounds are controlled.
Chemical Uses

- **Solvents**: A range of alternatives are available for HCFCs.
  - Non-A5 use of CFCs and HCFCs for solvent cleaning has ceased, with exception of aerospace/military applications
  - A5 HCFC use for solvent cleaning has declined.
- **Process agents**: ODS quantities have decreased.
- **LAUs**: Global production of ODS is relatively small (approx. 150 tonnes).
- **Feedstock**: Use of ODS grew significantly between 1990 and 2011, and since then has fluctuated around a mean total of 116,000 tonnes/year.
- **Other chemicals**: Emissions of CFC-11, carbon tetrachloride, very short lived substances (dichloromethane and dichloroethane) are discussed in the assessment report.
- **Destruction**: Since 1996, over 300,000 tonnes of ODS have been destroyed. Many non-A5 parties mandate destruction of waste HFCs.
Methyl Bromide – Phase-out of controlled uses

• MB phase-out for controlled uses has been achieved in nearly all countries, however an unknown level of stocks are still being used.

• MBTOC is also aware of marketing of MB on the internet without apparent restriction for controlled uses.

• Reportedly less than 290 t (0.5% of the global baseline) was used in 2017 under ‘critical use exemptions’ of the Protocol.

• Alternatives for virtually all controlled uses are now available and have been adopted.
**Methyl Bromide – QPS uses**

- **Consumption:**
  - In 2017, ~10,000 tonnes of MB was used for QPS.
  - In 2017, 6 non-A5 (34%) and 41 A5 (66%) parties reported MB consumption for QPS uses.
  - Aggregated Use: Asia 55%; USA + NZ + Australia + Israel 30%; Latin America & Caribbean 10%; Africa 5%; Europe 0%.
  - In the past 10 years, QPS consumption has more than doubled in some parties. This could relate to increased trade, threats from quarantine pests, and/or incorrect classification of QPS uses.

- **Emissions:**
  - The key factor impacting global emissions (7,500 t per year) is the use of MB for QPS.
  - QPS MB uses are highly emissive, however advances in recapture and destruction technologies can substantially reduce emissions.
  - Some parties are enforcing mandatory recapture of QPS MB.
Methyl Bromide – Challenges for Sustainable Agriculture

• Chemical fumigants are increasingly being restricted because of health and safety concerns and their impact on the environment.

• Sustainable agriculture goals need to be considered to ensure that IPM programs, which combine cultural, biological, mechanical and chemical control methods, are being considered as the future options to replace MB, and other fumigant chemicals.

• Safer technologies for the environment (soil solarization, resistant plants, soilless culture) and safer disinfestation products need to be considered.
Refrigeration, Air Conditioning and Heat Pumps

• In non-A5 parties, the HCFC phase-out is almost complete and it is progressing in A5 parties.

• In A5 parties, HCFC-22 consumption in RACHP is decreasing and HCFCs will soon be used in RACHP servicing only.

• Low GWP solutions are becoming increasingly available for many RACHP applications.

• Current concerns in some A5 parties with availability and costs of HFO refrigerants.

• Review of safety standards for the use of flammable refrigerants is progressing.

• RACHP technology, such as CO$_2$ ejectors, microchannel HX, etc. is rapidly evolving.
Refrigeration, Air Conditioning and Heat Pumps (2)

- Energy (electricity) consumption for RACHP has been increasing globally due to the substantial growth in equipment numbers especially in A5 parties.
- 2016 annual sales of ACs estimated as 135 million units and 1.6 billion ACs were in use (IEA, 2018).
- There are growing concerns with the efficiency of RACHP systems aimed at reducing energy consumption and at delivering cooling/heating in a more sustainable way.
- An integrated approach is needed for low GWP solutions including energy efficiency, flammability, toxicity, servicing.
TEAP 2018 Assessment Report

- Executive summaries of TOC Assessment Reports and key messages and/or challenges emerging
- Cross-cutting issues – energy efficiency, sustainability, CFC-11
- Organizational Planning
- Coordination with SAP and EEAP on Synthesis Report