Workshop on safety standards relevant to the safe use of low global-warming-potential (GWP) alternatives
Bangkok, 10 July 2017

Concept note and provisional programme (final)

The workshop on safety standards relevant to the safe use of low global-warming-potential (GWP) alternatives to hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs) is convened in accordance with decision XXVIII/4 taken by the parties to the Montreal Protocol on Substances that Deplete the Ozone Layer at their Twenty-Eighth Meeting held in Kigali (10-15 October 2016). In paragraph 2 of the decision, the parties requested the Secretariat “to organise a workshop on safety standards relevant to the safe use of low GWP alternatives, back-to-back with the thirty-ninth meeting of the Open-ended Working Group, within existing resources.”

The parties, while taking this decision, recognised “the importance of the timely updating of international standards for flammable low global-warming-potential (GWP) refrigerants” and supported “the promotion of actions that allow for the safe market introduction, manufacturing, operation, maintenance and handling of zero GWP and low GWP refrigerants that are alternatives to hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs).” They also expressed support for “the timely revision of relevant standards in a manner that is technology-neutral to enable the safe use and market penetration of low GWP alternatives” (decision XXVIII/4).

The workshop will provide an opportunity for informed discussions on technical and policy aspects related to the safe use of flammable refrigerants as alternatives in the refrigeration, air conditioning and heat pump (RACHP) sectors. The workshop focuses only on one aspect of safety standards: flammability. It does not cover toxicity or high pressure because the existing standards are widely considered suitable when applied to low GWP refrigerants. It also focuses mainly on issues related to the setting of standards; it does not extensively address the safe handling of flammable refrigerants by technicians.

The workshop will involve wide stakeholder participation, including representatives of standards organizations, industries, institutions, associations and technical experts. Overview speakers and panellists will provide technical and policy clarifications on the process of setting and revising standards. The conclusions of the workshop will be presented for further consideration and discussion by the parties.
Concept note

I. Background

RACHP systems constitute around 80 per cent of the total consumption of HFCs in equipment and products (in non-Article 5 and Article 5 parties). HFCs are to be phased down under the Kigali Amendment. Most HFCs currently used in RACHP systems are non-flammable and non-toxic, but they have relatively high GWP.s. Many of the lower GWP alternatives have some degree of flammability and a few are toxic. Many existing safety standards were written when industry predominantly used non-flammable and non-toxic refrigerants. Some existing safety standards limit the widespread use of flammable refrigerants. They put restrictions to the amounts of flammable refrigerants charged into RACHP equipment, thus limiting the capacity or the size of the equipment that can use them. While safety standards are in principle voluntary, many countries take these standards and transcribe them into national law, making them mandatory and underlining their importance worldwide.

Experience and technical knowledge related to flammability and toxicity risks in RACHP equipment have evolved over recent years, leading to the introduction of new system designs. These can make the use of flammable and/or toxic refrigerants safe and minimise risks for a certain range of equipment. The revision of safety standards is important to reflect technical progress. However, this revision is generally a time-consum ing process, involving many stakeholders and requiring significant data, technical knowledge as well as risk assessments. Being aware of the standards procedures as well as the revision process, looking at past and recent experience can help stakeholders understand how to widen the range of RACHP equipment that use flammable refrigerants. Achieving the HFC phase-down laid out in the Kigali Amendment will be facilitated if safety standards are adapted to technological progress and if wider use of climate-friendly alternatives is allowed wherever it is safe to do so.

II. Objectives

The objectives of the workshop are:

a. to identify the safety standards that are of most relevance to the implementation of the Montreal Protocol and its Kigali Amendment, and to clarify which appropriate changes to these safety standards would allow for broader use of lower GWP alternatives;
b. to understand the process of developing safety standards at international, regional and national levels and the evolution or revision of safety standards for all different types of refrigerants, including flammable ones, as a response to state-of-the-art knowledge and experience;
c. to raise awareness among stakeholders, including standard organisations, of the impending HFC phase-down through the Montreal Protocol and the linkages to the introduction of low GWP refrigerant technologies in most commonly used RACHP applications.

The workshop will focus on the following issues:

- working procedures of the safety standards organizations;
- the international safety standards that are relevant to the application of lower GWP alternatives in the RACHP sectors;
- the current status of the revision of international safety standards including the progress made for 2different refrigerant categories (e.g. lower flammability, A2L and higher flammability, A3) and what remains to be done. The discussion will address how the procedures to revise standards are impacted by industrial and technological developments and participation of stakeholders;
- examples of national legislation or regulations and safety standards and how they are related to the international standards. The discussion will also shed light on harmonization of national standards, legislation and/or regulations with new international standards;
- how could safety standards and their possible revisions concerning the use of flammable lower GWP alternatives support the implementation of the Kigali Amendment.
III. Briefing material

Briefing notes will be made available before the workshop to summarize factual information related to safety standards issues. They have been prepared by the Secretariat with the assistance of experts and peer reviewed by members of Technology and Economic Assessment Panel and its Task Force on safety standards, which was established in response to decision XXVIII/4. The briefing notes and their content are by no means exhaustive. The Secretariat welcomes any suggestions the parties may have on further topics related to safety standards, on which they would like to see briefing notes.

IV. Format

The workshop will be structured as follows:

- **Session I**: Overview of the international safety standards of greatest importance to the Montreal Protocol and its Kigali Amendment and the process for developing and revising the standards.
- **Session II**: Identifying limitations to the uptake of lower GWP alternatives that could be addressed with changes to existing international safety standards.
- **Session III**: Relationship between international and national safety standards.
- **Session IV**: How stakeholders can work together to maximise the opportunities for the safe use of lower GWP alternatives.
- **Session V**: Concluding remarks

Each session will be supported by a facilitator and a rapporteur.

Sessions I and III will each comprise presentations of eight minutes, followed by brief discussions among the presenters and the audience.

Sessions II and IV will each comprise two overview presentations of eight minutes by selected presenters and introductory remarks of three minutes or less by each of the panellists. A facilitator will then encourage discussions among the audience, the panellists and the overview speakers.

The rapporteurs of sessions I to IV will record key discussion points for feedback in the concluding session V, which will briefly summarize the results at the end of the workshop. The summary of the workshop results will be forwarded to the thirty-ninth meeting of the Open-ended Working Group for the consideration of the parties.

Parties are encouraged to invite national representatives of relevant industries, enterprises and their associations, as well as technical experts involved in safety standards in their countries to participate in the workshop and contribute actively to the discussion.

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Provisional programme

Monday, 10 July

9.00 a.m. – 9.05 a.m. Opening of the workshop
Welcome and introduction of the workshop’s objectives, Tina Birmpili, Executive Secretary, Ozone Secretariat

9.05 a.m. - 10.25 a.m. Session I: Overview of the international safety standards of greatest importance to the Montreal Protocol and its Kigali Amendment and the process for developing and revising the standards

Session I addresses the safety standards and the working procedures of safety standards organisations. There are international standards organizations (e.g. ISO, IEC) which set standards for RACHP equipment. Staff of the international standards organizations support the expert work done in Technical Committees and Working Groups. The presenters will touch upon the following issues:

- purpose of safety standards and principles underpinning them;
- how Technical Committees and Working Groups reach agreement on safety standards;
- selection of experts on the Technical Committees and Working Groups;
- the most important RACHP safety standards;
- the status of the standards IEC-60335-2-40, IEC-60335-2-89 and ISO 5149 on higher and lower flammability refrigerants and the revisions being undertaken;
- the technical data required to enable standards committees to revise and modify existing standards;
- the timelines for the revision process of different international safety standards;
- whether safety standards can be considered technology stoppers or technology stimulators.

Facilitator: Chandra Bhushan, CSE, India
Rapporteur: Helen Walter-Terrinoni, Chemours, USA

Presentations (8 mins each)

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<td>ISO safety standards: Supporting progress in technology</td>
<td>Kolin Low, International Organisation for Standardisation (ISO), Regional Engagement, Asia Manager</td>
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<td>Importance of IEC 60079 and ISO/IEC 80079 series standards on flammable gases and progress of IEC TC31</td>
<td>Neil Dennis, AECOM, Australia</td>
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<td>Progress and main issues in SC61D, the IEC 60335-2-40 Committee related to A2L and on A2/A3 refrigerants in air-conditioning</td>
<td>Matthias Meier, Matthias Meier consultancy, Germany</td>
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<td>Progress in SC61C, the IEC 60335-2-89 Committee on commercial refrigeration applications</td>
<td>Asbjørn Vonsild, Vonsild consulting, Denmark</td>
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<td>Safety standard developments within ASHRAE 15 and ISO 5149</td>
<td>Marek Zgliczynski, Embraco, Italy</td>
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<td>The link between safety standards and legislation: how do they impact the implementation of legislation and the choice of technologies by manufacturers</td>
<td>Andrea Voigt, The European Partnership for Energy and the Environment, (EPEE)</td>
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10.00 a.m. – 10.25 a.m. Clarification questions / discussion
10.25 a.m. – 10.45 a.m. Coffee break
International standardization and national development and implementation of safety standards are both long and slow processes. The timeframe and processes for updating standards can impact the development of alternative technologies. The facilitator will focus on the following issues related to the international safety standards:

- What are the limitations to the application of A2L lower flammability refrigerants?
- What are the limitations to the application of A3 higher flammability refrigerants?
- Are there other important limitations (e.g. related to toxicity or high pressure)?
- Is it possible to develop in parallel a risk assessment approach with an appropriate safety standards development in order to create a more flexible system?
- Are there any experiences with using flammable refrigerants more widely than permitted by current ISO or IEC standards?
- How do the risk levels inherent in the RACHP safety standards compare with the risks in other equipment or product standards?

**Facilitator:** Stephan Sicars, UNIDO

**Rapporteur:** Viraj Vithoontien, World Bank

### Overview presentations (8 mins each)

- **What are the challenges related to RACHP safety standards; what are the limitations of current safety standards and how they can be overcome.**
  - Karim Amrane, *Air-Conditioning, Heating and Refrigeration Institute (AHRI), USA*

- **What are the challenges related to RACHP safety standards; what are the limitations of current safety standards and how they can be overcome.**
  - Torben Funder-Kristensen, *Danfoss, Denmark*

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**Brief introductory remarks by the panellists (3 mins each or less) and discussion**

- Recap of process and main challenges encountered in standardisation process and revision of safety standards related to flammable low GWP refrigerants, Martin Dieryckx, *Daikin Europe, Belgium*

- Experience of industry in the USA with the standardisation process and standards related to flammable low GWP refrigerants, James Wolf, *Ingersoll Rand, USA*

- Status of research for safety standards organizations establishing a more robust fact base about the properties and use of flammable refrigerants, Omar Abdelaziz, *Oak Ridge National Laboratory, Dept. of Energy, USA*

- Impact of safety standards on the development of air conditioners – an Indian perspective, Abhijit Acharekar, *Godrej, India*

- Challenges faced in the development of A3 RAC in China, Tingxun Li, *Sun Yat-sen University / Midea, China*

- ISO NWI 20854 development of a reefer containers’ safety standard for the use of flammable refrigerants, status and challenges for the intermodal maritime industry, Holger Koenig, *on behalf of Maersk Container Industry, ref-tech engineering, Germany*

- Challenges in adoption of low GWP flammable refrigerants in the RAC sector in India, Jitendra Bhambure, *Blue Star, Refrigeration and Air-Conditioning Manufacturers Association (RAMA), India*

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**1.30 p.m. – 2.30 p.m.**

### Lunch
2.30 p.m. – 3.40 p.m.  **Session III: Relationship between international and national safety standards**

Some countries adopt the international safety standards directly while others develop national or regional safety standards and regulations that are adjusted to their own domestic situation. Sometimes, these standards are stricter than the international safety standards. In other cases, national or regional safety standards refer to superseded international standards and it can take a number of years for harmonization revisions to be completed. The national implementation of safety standards into laws can be considered a policy instrument. On the other hand, national implementation is needed to prescribe acceptable procedures in manufacturing, handling, servicing and maintenance of RACHP equipment. In this session, case studies from countries and regions will be presented. The issues to be addressed by the presenters include:

- countries with sometimes stricter national standards, legislation and/or regulations than existing international safety standards;
- the development and adjustment of national safety standards;
- the time difference between the setting of safety standards at the international level versus the national level, including for their harmonization;
- the implications for the market accessibility of goods in the RACHP sectors.

**Facilitator:** Chandra Bhushan, CSE, India

**Rapporteur:** Maher Mousa, MHM Engineering, Saudi Arabia

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<td>Flammability issues and risk assessment related to domestic safety standards in China</td>
<td>Yanwei Dou, Chinese Household Electrical Applications Association (CHEAA)</td>
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<td>CEN standardisation work on refrigerating systems, especially standard EN 378</td>
<td>Carsten Hoch, TÜV SÜD Industrie Service GmbH, Germany</td>
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<td>Impact of international safety standards on UL safety standards in the USA</td>
<td>Brian Rodgers, Underwriters Laboratories, USA</td>
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<td>Impact of international safety standards on national standards and domestic policy related to A2L refrigerants</td>
<td>Aroon Eamsuyera, Federation of Thai Industries, Thailand</td>
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<td>Impact of international safety standards on domestic safety standards in the Middle-East</td>
<td>Alaa Olama, Olama consultants, Egypt</td>
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<td>Impact of international safety standards on domestic safety standards in Brazil</td>
<td>Tomaz Cleto, Yawatz Engenharia Lda, Brazil</td>
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3.20 p.m. – 3.40 p.m.  **Clarification questions / discussion**

3.40 p.m. – 4.00 p.m.  **Coffee break**
4.00 p.m. – 6.30 p.m.  
**Session IV: How stakeholders can work together to maximise the opportunities for the safe use of lower GWP alternatives.**

A review of the lower GWP alternatives currently available to replace HCFCs and HFCs shows that for certain applications, flammable refrigerants may need to be adopted to achieve the phase-down targets of the Kigali Amendment. When CFCs were being phased out, a similar step was required. For example, most of the aerosol sector and a large part of the domestic refrigeration sector switched from using non-flammable CFCs to hydrocarbons. Currently, the proportion of the RACHP sector that can use either A2L (lower flammability) or A3 (higher flammability) refrigerants is limited by concerns over safe operation. However, manufacturers cannot introduce new products if international or national safety standards limit their application. Key stakeholders (including policy makers, safety standards organizations, industry experts, research institutes and academia) need to work together to review safety standards and to complete the process and remove any unnecessary limitations in a timely and effective way. The main questions to be addressed by the facilitator include:

- How can the development and revision of safety standards interact with national and regional legislation or regulations?
- Is the involvement of Article 5 experts in the development of international standards important for the development of standards in their own countries?
- How can experts from Article 5 parties participate in the development of international standards?
- When governments design regulations that go further than or are different from international safety standards, how do standard organizations and industries reconcile such processes?
- How can stakeholders work together to facilitate a global phase-down of high GWP HFCs?

**Facilitator:** Ray Gluckman, Gluckman consulting, UK  
**Rapporteur:** Shamila Nair-Bedouelle, OzonAction, United Nations Environment Programme

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<td>Safety standards as a means of implementing industrial policies for the use of lower GWP alternatives</td>
<td>Kevin Fay, <em>Alliance for Responsible Atmospheric Policy, USA</em></td>
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<tr>
<td>How can countries / experts maximise opportunities for the safe use of lower GWP alternatives through the IEC.</td>
<td>Gabriela Ehrlich, <em>International Electrotechnical Commission (IEC)</em></td>
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**Brief introductory remarks by the panellists (3 mins each or less) and discussion**

- The role of safety standards in implementing a European Union wide phase-down of HFCs, Arno Kaschl, *European Commission, EU*
- How safety standards are interacting with the US regulations, Cindy Newberg, *US Environmental Protection Agency*
- How standards are interacting with the Japanese regulations, Tetsuji Okada, *Japan Refrigeration and Air-Conditioning Industry Association (JRAIA), Japan*
- How training can be facilitated by standards: EN 13313 standard, worked on by ISO by translating it to an ISO standard, Karsten Beermann, *IKKE, Germany*
- The environmental perspective in setting standards, Thomas Willson, *European Environmental Citizens Organisation for Standardisation (ECOS)*
- How developing country standards are interacting with domestic legislation, Shengchun Liu, *Tianjin University of Commerce, China*
- How developing country standards are interacting with domestic legislation, Mohammad Khalid Siddiq, *Pakistan Standards and Quality Control Authority, Ministry of Science and Technology, Pakistan*
6:30 p.m. – 7.00 p.m.  Session V: Concluding remarks

**Facilitator:** Stephan Sicars

**Rapporteurs of Sessions I to IV** to present brief concluding remarks from their sessions and facilitator to close the workshop

Session I, II, III and IV (5 mins per speaker)

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7:00 p.m.  **Closure of the workshop**

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1. IEC 60079 – Explosive atmospheres
2. ISO/IEC 80079 – Explosive atmospheres
3. IEC TC 31 – Equipment for explosive atmospheres (TC: Technical Committee)
4. SC61D – Appliances for air-conditioning for household and similar purposes (SC: Sub-Committee)
5. IEC 60335-2-40 – Safety of household and similar electrical appliances (electrical heat pumps, air-conditioners and dehumidifiers)
6. SC61C – Safety of refrigeration appliances for household and commercial use (SC: Sub-Committee)
7. IEC 60335-2-89 – Safety of household and similar electrical appliances (commercial refrigerating appliances with an incorporated or remote refrigerant unit or compressor)
8. ASHRAE 15 – Safety standard for refrigeration systems
9. ISO 5149 – Refrigerating systems and heat pumps – Safety and environmental requirements
10. ISO NWI 20854 – Thermal containers – Safety standard for refrigerating systems using flammable refrigerants – Requirements for design and operation
11. EN 378 – Refrigerating systems and heat pumps – Safety and environmental requirements
12. EN 13313 - Refrigerating systems and heat pumps – Competence of personnel