



Shaping Tomorrow's Built Environment Today

MINUTES

REF-CPCC
January 21, 2024
Marriott Marquis
Chicago, IL

MEMBERS PRESENT:

Steve Kujak, *Chair*
Doug Scott, *Vice-Chair*
Roberto Aguilo
Andrew Beall
Don Brandt, *Consultant*
Didier Coulomb
Nicole Dunbar
Dustin Lilya
Apichit Lumlertpongpana
Richie Mittal, *BOD EX-O*
Kashif Nawaz
Bruce Nelson
Ashish Rakheja, *Coordinating Officer*
Xudong Wang

MEMBERS NOT PRESENT:

Ayman Eltalouny
Roddam Anish Simha
Harshal Surange

ASHRAE STAFF:

Donna Daniel
Steve Hammerling
Amber Thomas

GUESTS:

Omar Abdelaziz
Yosr Allouche
Andreas Antzoulatos
Adnan Ayub
Steve Comstock
Wade Conlan
Jim Curlin
Brian Fricke
Charles Hon
Zehui Hong
Craig Jacobson
Morgan Leehey
Krishna Mitra
George Organos
Michael Petersen
Nilesh Purohit
Chris Seeton
Travis Thompson
Robert Tucker
Shitong Zha

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DRAFT

MOTIONS

No.	Motion	Status
1	that DRSC recommend to Tech Council that they appoint the following members to the <i>Refrigerants and their Responsible Use</i> position document (PD) committee	PASSED
2	That REF-CPCC form subcommittee to create title, purpose and scope (TPS) and chair recommendation for an ASHRAE position document related to Sustainable Cold Chain	PASSED

ACTION ITEMS – 2024 Winter Meeting

No.	Responsibility	Action Item	Status
1	Brandt/Scott	to develop proposal chapter RBCs for REF-CPCC to consider in Indianapolis.	
2	Kujak	Form subcommittee to draft TPS for a PD on Sustainable Cold Chain	
3	REF-CPCC	Brandt noted the subcommittee would help organize a roundtable and asked members to email any ideas	
4	Subcommittee Chairs	Hold virtual meetings ahead of the next main committee meeting	

LIST OF ATTACHMENTS

No.	Attachment
A	MBOs
B	UNEP/ASHRAE Partnership Presentation
C	HVAC subcommittee notes
D	Cold Chain & R in ASHRAE subcommittee notes
E	Bi-Annual Refrigeration Technology Report update
F	BOD Ex-O PEAC Presentation

LIST OF ACRONYMS

AHJ	Authority Having Jurisdiction	IIAR	International Institute of Ammonia Refrigeration
AI	Action Item	IIR	International Institute of Refrigeration
ALI	ASHRAE Learning Institute	IoR	Institute of Refrigeration
AMORTS	Assistant Manager Research & Technical Services	MBO	Management by Objectives
ASHRAE	American Society of Heating, Refrigerating and Air-conditioning Engineers	MTG	Multi-disciplinary Task Group
BOD	Board of Directors	PD	Position Document
CNV	Chair Not Voting	PI	Principle Investigator

CO	Coordinating Officer	PMS	Project Monitoring Subcommittee
CTTC	Chapter Technology Transfer Committee	REF	Refrigeration Committee
DL	Distinguished Lecturer	RFI	Request for Information
DOE	Department of Energy	ROB	Rules of the Board
DRSC	Document Review SubCommittee	RP	Research Project
EPA	Environmental Protection Agency	RTOC	Refrigeration Technical Options Committee
Ex-O	Ex-Officio	RVC	Regional Vice Chair
		SSPC	Standing Standard Project Committee
GCCA	Global Cold Chain Alliance	SY	Society Year
GRMI	Global Refrigerant Management Initiative	TC	Technical Committee
GWP	Global Warming Potential	UN	United Nations
HVAC&R	Heating, Ventilation, Air Conditioning & Refrigeration	UNEP	United Nations Environment Programme

DRAFT

1. CALL TO ORDER

Chair Steve Kujak called the meeting to order at just after 8:00 AM.

2. WELCOME

A. Introduction

Members and guests in attendance introduced themselves.

B. Announcements

In preparation of development of ASHRAE's next strategic plan (2025-28), contracted consultants will attend the 2024 Winter Conference in Chicago to begin to gather insight on the value of ASHRAE to its members and to observe operations.

3. ASHRAE CODE OF ETHICS COMMITMENT

In this and all other ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, inclusiveness, and respect for others, which exemplify our core values of excellence, commitment, integrity, collaboration, volunteerism, and diversity, and we shall avoid all real or perceived conflicts of interests.

(Code of Ethics: <https://www.ashrae.org/about/governance/code-of-ethics>)

(Core Values: <https://www.ashrae.org/https://www.ashrae.org/about/ashrae-s-core-valuesabout/ashrae-s-core-values>)

4. QUORUM DETERMINATION

Quorum was confirmed with 11 of 14 voting members attending. Three non-voting members and three ASHRAE staff were present as well.

5. REVIEW OF AGENDA

No changes were suggested to the meeting agenda sent ahead of meeting.

6. MINUTES

A. Minutes from the Fall virtual meeting and Annual Meeting in Tampa were unavailable for formal consideration

7. ACTION ITEM REVIEW

Action Items for this meeting would be tracked and listed in minutes.

8. LIAISON REPORTS

A. GCCA – Don Brandt

Attended the GCCA conference for second time. He noted a lot of interest in CO2 and 1234ze as refrigerants, but less talk of ammonia. GCCA had a recent change in leadership. This time they had a roundtable at beginning of sessions, and then report given by roundtable chair

ASHRAE CRC does roundtable set up, bring in 3-5 nonmembers in HBAC, "What can ASHRAE do for you?"

It was asked how REF-CPCC should engage more on the members side, perhaps inviting RBCs to this meeting. It was noted many chapters don't have RBC. REF-CPCC may wish to suggest to the DRCs that they should have a RBC. REF-CPCC can encourage engagement from a program standpoint as well.

Action Item #1 (Brandt, Scott) to develop proposal chapter RBCs for REF-CPCC to consider in Indianapolis

B. IIAR – Eric Smith or alternate

Smith was not present at the start of this report so Scott summarized.

IIAR has updated MOU with ASHRAE, there's a separate fund for research and to co-fund projects and do their own. There has been a lot of discussion on sustainability, collaboration with ASHRAE, and in CO2 including a standard.

ASHRAE to work closer with IIAR if they are going to go all natural

IIAR has talked about a safety standard for use of hydrocarbon refrigerants. IIAR has a substantial body of work and has moved quickly.

Owners need guidance on ammonia, CO2 and hydrocarbons. The MOU will help define the boundaries of IIAR and ASHRAE, who should support what efforts and how.

C. IIR – Didier Coulomb

Elected successor for next October. IIR is discussing strategy for the next 4 years and is working with UNEP.

D. CTTC

No report

E. Others

No other reports were given

9. CHAIR'S REPORT – Kujak

A. Review Committee Roster

Kujak noted many members are falling off committee on July 1:2024:

- Mr Stephen Kujak
- Douglas C Scott (unless he rolls to Chair)
- Prof Roberto R Aguilo, PE
- Mr Didier Coulomb
- Nicole Dunbar
- Mr Ayman Taha Hussein Eltalouny
- Dr Kashif Nawaz, PhD
- Mr. Donald L Brandt (consultant)

REF-CPCC leadership to work with BOD Ex-Officio to identify candidates to replace these members on committee.

B. SY 23-24 MBOs – Review

An update on committee MBOs (**Attachment A**) would be reported to Operations Subcommittee of Tech Council on Tuesday morning.

C. Review and Motion to approve Refrigerants and their Responsible Use PD Committee – Lilya

- (1) It is moved (DL) and seconded (BN) that that DRSC recommend to Tech Council that they appoint the following members to the Refrigerants and their Responsible Use position document (PD) committee:

<u>Name</u>	<u>Company</u>	<u>Expertise</u>	<u>ASHRAE PD Balance Category</u>
Dustin Lilya (Chair)	DC Engineering	Commercial Refrigeration Application	User/General
Douglas Scott	Claudius Lynne	Industrial Refrigeration Application	User/General
Helen Walter Terrioni	Trane	Equipment OEM	General
Gary Schrift	IIAR	Standards Organization	Public
Ayman Hussein Eltalouny	UNEP	Governmental / International Organization	Public
Joshua Hughes	Chemours	Refrigerant Manufacturer	Producer
Chris Seeton	Koura	Refrigerant Manufacturer	Producer
Samual Yana Motta	ORNL	National Laboratory	Public

BACKGROUND: This revision was authorized at the 2023 Annual Meeting with Dustin Lilya as chair. Lilya developed this list of PD members for REF-CPCC consideration. The committee is balanced according to ASHRAE PD rules and all have confirmed their willingness to participate. There are eight voting members but it is expected that TC 3.1 and other experts in ASHRAE and outside of ASHRAE would participate in the revision process.

MOTION 1 PASSED: 12-0-0 CNV

It was suggested that IIAR members review this PD as well. It was suggested an OEM from the low temperature refrigeration side be involved as well.

D. Need for other Position Documents

REF-CPCC suggested exploring a proposal for a new ASHRAE PD on the Sustainable Cold Chain.

- (2) It was moved (DS) and seconded (DL) that REF-CPCC form subcommittee to create title, purpose and scope (TPS) and chair recommendation for an ASHRAE position document related to Sustainable Cold Chain

MOTION 2 PASSED: 11-0-0 CNV

Action Item #2 (Kujak) – Form subcommittee to draft TPS for a PD on

Sustainable Cold Chain

E. Discussion on Milton Garland Award revision to website and application process

Updates to the award information on the website (www.ashrae.org/communities/committees/standing-committees/refrigeration-committee) were made in February. There were no nominations this year for the Milt Garland Award

1. UNEP - Jim Curlin

Jim Curlin presented a powerpoint (**Attachment B**) to the committee. Focus included 1) areas of UNEP ASHRAE mutual interest and development of joint products requiring refrigeration expertise and 2) report from ASHRAE UNEP liaison meeting.

F. World Refrigeration Day Promotion (WRD)

This event is celebrated June 26th every year

10. REF Subcommittee Reports:

10.1 Program & Research - Chair: [Nawaz](#) – Members: [Wang, Omar, Fricke](#)

No motions or actions were reported.

Regarding research, there are several activities happening in the TCs, new research projects proposed and activities that will be beneficial to this committee including activity from TC 1.3, 1.5 and multiple TCs in Sections 8 and 10. It was noted REF-CPCC can help fill research gaps with ideas, but should bring to TCs where possible for them to develop.

There were numerous sessions of interest on refrigeration topics in Chicago including at least three sessions.

10.2 HVAC – Chair: [Brandt](#) – Members: [Omar, Kujak](#)

Notes from HVAC subcommittee are included as **Attachment C**. Brandt noted the subcommittee would help organize a roundtable and asked members to email any ideas (**Action Item #3**).

10.3 Cold Chain & R in ASHRAE – Chair: [Surange](#) – Members: [Sanders, Aquilo, Fricke, Scott, Petersen, Nelson](#).

Chair Surange was not in attendance but notes from HVAC subcommittee are included as **Attachment D**.

10.4 Bi-Annual Refrigeration Technology Report – Chair: [Beall](#) – Members: [Lilya, Kujak](#)

Notes from this subcommittee are included as **Attachment E**. Aim is to publish report at Annual Meeting. The original purpose of biannual technology report was to inform emerging technologies outside the US, tie back to where ASHRAE resources can help other technologies. There's a lot of expanding economies that don't have access to the same technology, so what are they using?

Hopefully ASHRAE can then provide resources and help to fill gaps.

The report is expected to be about 10 pages, relatively high level with a broad scoping of emerging technologies across the world.

10.5 Awards – Chair: [Apichit](#) – Members: [Lim, Aguilo](#)

There were no submissions for the award this year. Apichit can work with staff to update roster.

11. The Advancing Technology of “H” in ASHRAE

There was a discussion on how REF-CPCC can support this effort. We are seeking member input on if we need more focus on TCs or a strategic plan around this?

It was noted that ASHRAE is dealing with heat pumps, there is a lot of research into cold climate heat pumps, and various organizations are looking into these heat pumps. The ASHRAE Decarbonization Task Force is writing a retrofit guide.

12. ASHRAE Guide for Sustainable Refrigerated Facilities and Refrigeration System

Scott led a discussion on a potential 2nd Edition of this publication. What can be done that may be more effective than a \$250 book in the bookstore? Scott has met with Publications Staff. It was suggested that the book be updated with collaboration with IIAR and TC 10.2. The objective is to develop updates, expand usability of electronic tools from original work, and modifications to enable a course set with much greater user uptake than only a book provides.

This can be kept as a recurring agenda item.

13. Refrigeration Technology Report Put Together by Martin Dieryckx –Lilya

This was discussed earlier in agenda item 10.4.

14. BOD/Tech Council Reports

A. BOD EX-Officio – Mittal

No formal report was given but the PEAC presentation is included as **Attachment F**.

B. Coordinating Officer – Rakheja

No report from CO.

15. Next Meeting(s)

REF-CPCC will consider a spring 2024 meeting. Subcommittees were asked to hold virtual meetings ahead of the main committee meeting (**Action Item #4**).

16. Adjournment

The Meeting of the REF-CPCC was adjourned at 11:48 AM CST.

Technology Council

REF-CPCC

Description	Metric
(how do we determine s	
Work with partnership organizations to identify and implement collaboration opportunities to promote HVAC&R	
Update and Revision Liason List and Roles/Responsibilities for the Committee Liasons	
Awards Committee - Promotion of Award	

REF-CPCC and Subcommittee Activity and Participation	
ASHRAE Position Document - Refrigerants and Their Responsible Use	
Bi-Annual Refrigeration Technology Report	
Continue to work with World Refrigeration Day Organization to promote and support WRD on June 26, 2023	

Chair:
Vice-chair:

Presidential Init. #	SP Init #	SP Goal #	Completion % / Date
uccess?)			%
	1,2	1	25%
	3,4	3	50%
		2,3	0%

	3		50%
			25%
			25%
			50%

Steve Kujak

Doug Scott

Financial Assist Req'd?	Comments/Activities supporting MBO	
		1
NONE	A. IIAR/UNEP ALREADY PARTNERING Develop/Report on opportunities with other Organizations (GCCA, IOR, etc) Update: Discussions with IIAR/UNEP/GCCA happening. Working toward expanding toward IOR	x
NONE	A. Define Liasons for each technical committee and document responsibility and expectations B. Assign Liasons prior to Winter Meeting and ask to attend relevent TC and Program Subcommittee meetings Update: Underway	
NONE	A. Update ASHRAE website's application requirement to align with expectation of applicants for Milton Garland award B. Submissions Required by May 1st for consideration C. Committee to meet and solicit applications where appropriate in Feb 2024 Update: Subcommittee responsible working toward update	

NONE	<ul style="list-style-type: none"> A. ID leads and members for revised subcommittee participation B. Subcommittee's to meet twice annually C. Develop a process to allow REF-CPCC (non voting) members to receive communications D. Develop process to communicate to Regional and Chapter refrigeration chairs on REF-CPCC activities E. Prepare draft review of changes to ROB/MOP required for updated structure prior to Winter Meeting 	
NONE	<ul style="list-style-type: none"> A. Identify a lead REF - CPCC member and review team to update report B. Develop a draft revision of position document prior to Summer Meeting 2024 C. Distribute to appropriate TC's for review D. Complete update by Winter Meeting 2025 	
NONE	<ul style="list-style-type: none"> A. Identify a lead REF - CPCC member and review team to update report B. Develop and Prepare Technology Report prior to Summer Meeting 2024 C. Provide Report to CTCC and promote distribution at the chapter level 	
NONE	<ul style="list-style-type: none"> A. Reach out proactively to WRD Committee in January 2024 B. Offer Support for WRD Events on Jun 26 - 2024 C. Develop/Consider Speaker or other presentation for event 	

Strategic Plan Talley

Initiative #			Goal 1		Goal 2			Goal 3	
2	3	4	a	b	a	b	c	a	b
x			x						
	x	x							x
					x			x	

	x								
		x		x	x				
		x		x	x				
					x	x	x		
1	2	3	1	2	4	1	1	1	1

c

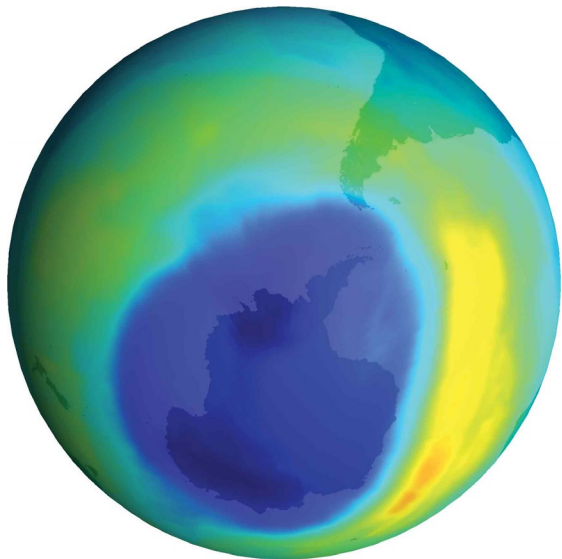
0	TOTALS



OzonAction

Fulfilling UNEP's mandate as an
Implementing Agency
of the Montreal Protocol
Multilateral Fund

Jim Curlin, Head of OzonAction
UNEP Law Division, Paris



Contents

1. OzonAction & RACHP sector objectives
2. Cooperation with ASHRAE
3. Challenges for RACHP in developing countries

OZONACTION & RACHP SECTOR OBJECTIVES



Multilateral Fund

for the
Implementation of
the Montreal Protocol



- Montreal Protocol's financial mechanism, established 1991
- Protects human health & environment through **ozone layer recovery & mitigating climate change**
- Helps developing countries meet their compliance obligations
- Reduces controlled substances through:
 - Transferring alternative technology
 - Supporting National Ozone Units (NOUs)
 - Developing regulatory frameworks
 - Training & certifying technicians
 - Advancing energy-efficient technologies
 - Strengthening customs and enforcement
- Delivered via four Implementing Agencies -- UNEP, UNDP, UNIDO, World Bank -- & bilateral agencies
- End 2023, Parties replenished Fund for 2024-2026 period at record US\$ 965 million
- Montreal Protocol is only international treaty that deals with refrigerants

\$ 4.7 billion
grant funding

9,400
approved projects

148
developing countries assisted

Substantial Support for Refrigerant Transition in Developing Countries



HCFC support
2010-2023

4,651

enterprises assisted

802

training institutions/centers
implementing training
programmes

265,969

technicians and trainers trained

133

certification systems for
technicians under development
and/or implementation

232

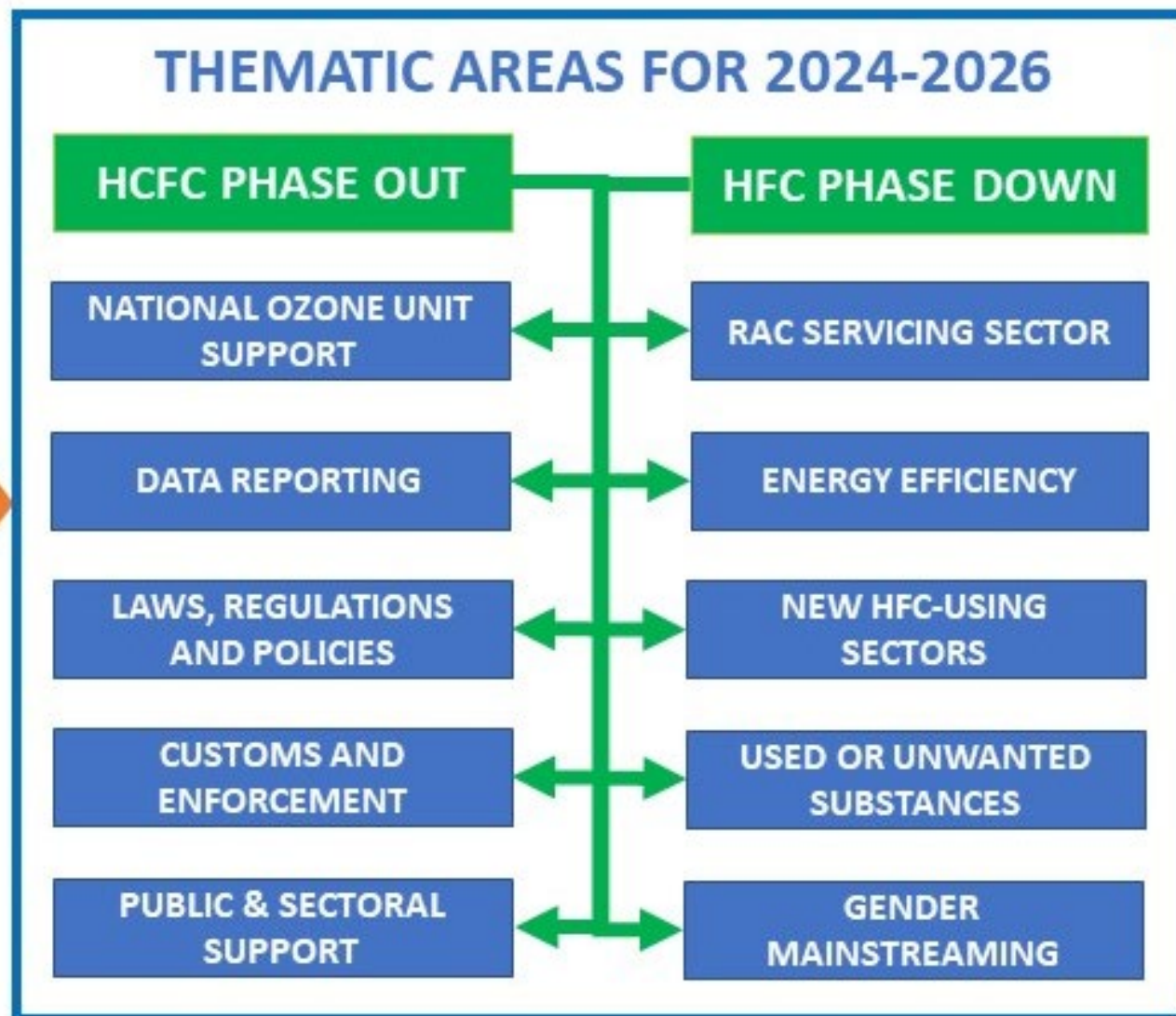
recovery and recycling
programmes

OzonAction



- Part of UN Environment Programme (UNEP)
- Responsible for fulfilling UNEP's mandate as an Implementing Agency of the Montreal Protocol's Multilateral Fund (since 1991)
- Assist 148 developing countries
- Strengthen the capacity of governments (National Ozone Units) & industry in those countries to elaborate & enforce policies & make informed decisions about alternative technologies needed to implement this treaty

Our mission: Enable developing countries to meet and sustain their compliance obligations under the Montreal Protocol



Broad objectives in RAC sector

Ensuring timely & smooth introduction of new low-GWP refrigerants & equipment based on national needs

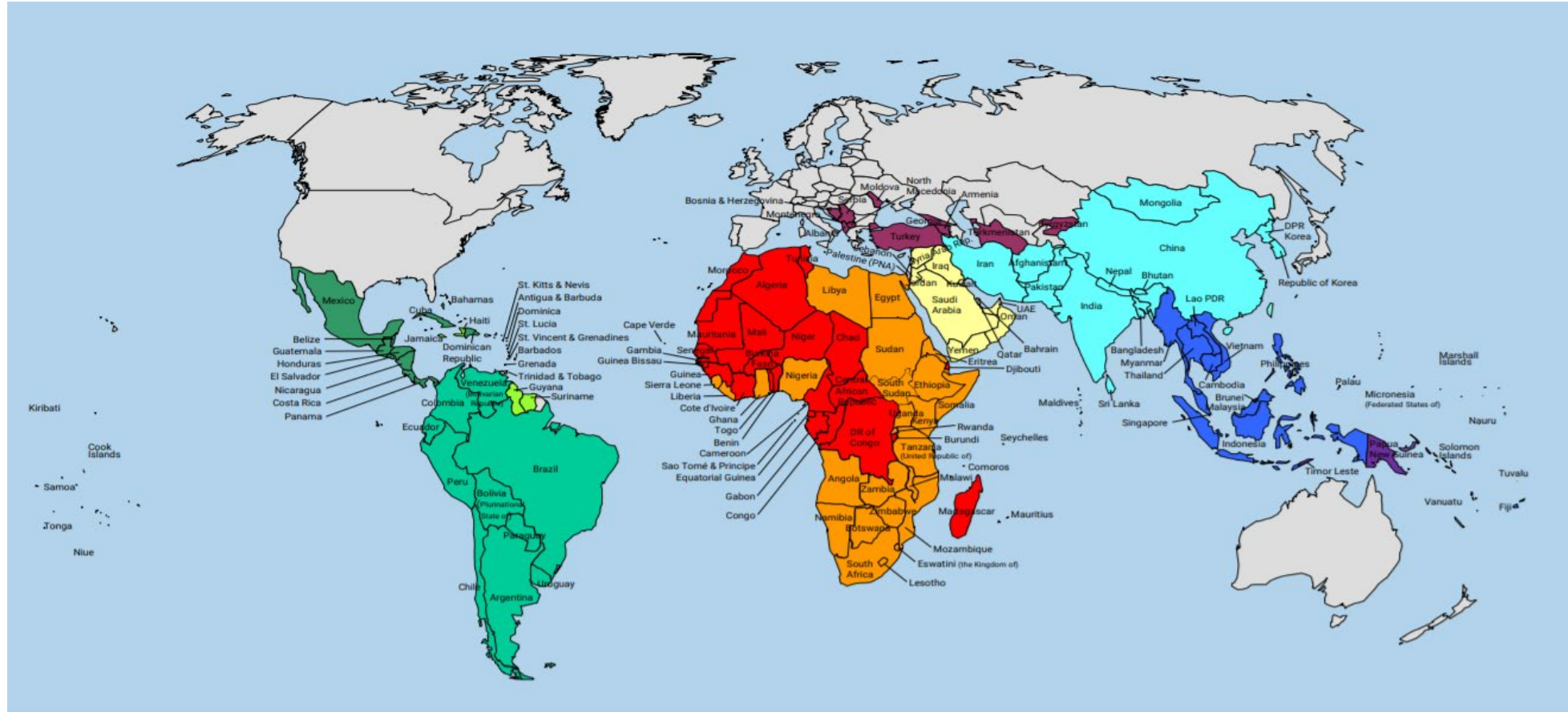
Reducing consumption & emissions of refrigerants into the atmosphere

Ensuring safety in relation to flammability and/or toxicity of refrigerants being phased in

Reducing energy consumption based on technology choice & on well-maintained & serviced equipment

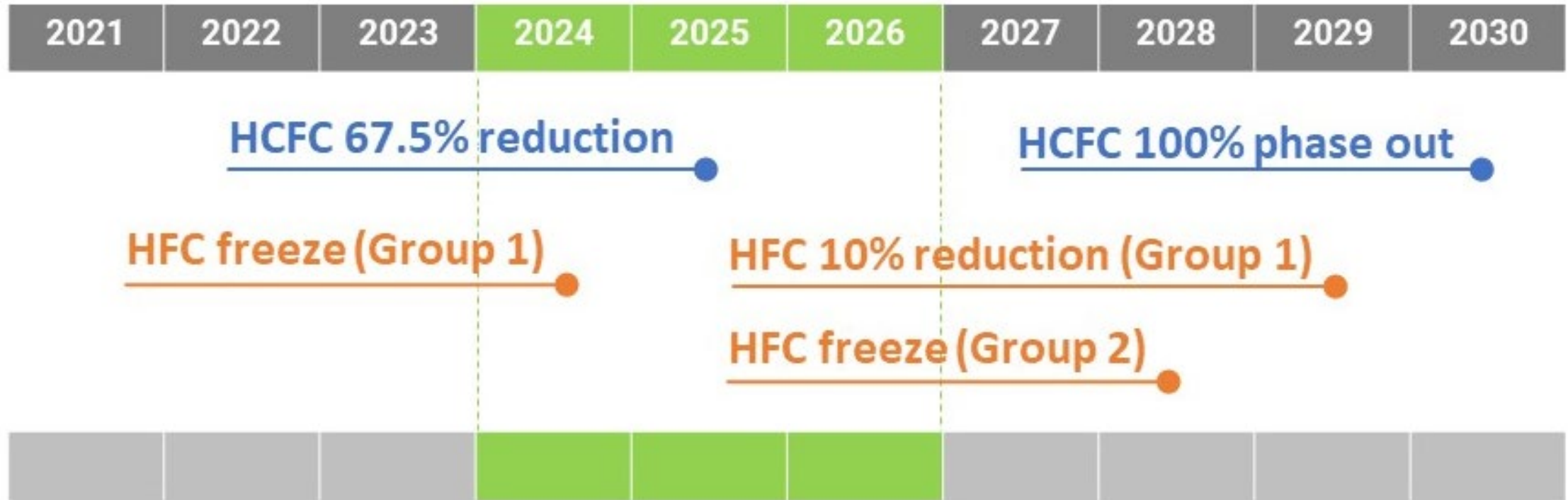
COMPLIANCE WITH INTERNATIONAL OBLIGATIONS UNDER MONTREAL PROTOCOL & PARIS AGREEMENT

Members of UNEP's Regional Networks



- | | | | | |
|-----------------|-----------------------|--------------------|------------|--------------------------|
| South America | Caribbean | Anglophone Africa | West Asia | South East Asia |
| Central America | Europe & Central Asia | Francophone Africa | South Asia | Pacific Island Countries |

Developing country Montreal Protocol targets



COOPERATION WITH ASHRAE

RAC partnerships for achieving Montreal Protocol objectives



abrava



ACAIRE



AHRI



AREA



AREMA



ASHRAE



U3-ARC



ATF



BFS



CHEAA



EPEE



FAIAR



GFCCC



REHVA



IIR



IOR



ISHRAE



JRAIA



MAC Partners Europe



Refrigerants Australia



WRD Secretariat

UNEP-ASHRAE Partnership



- UNEP-ASHRAE memorandum of understanding for cooperation on the refrigeration and air conditioning sector
- First MOU signed 2007, second in 2019 – 17 years of partnership!
- Relates to cooperation on various aspects of Montreal Protocol:
 - promotion of low-GWP refrigerants & energy efficient technology
 - capacity building
 - information exchange
 - conferences, training & workshops
 - information products and services
- Implemented through bi-annual work plans since 2012
- Led by Senior Officers of both organisations
- Monitored by UNEP-ASHRAE Liaison Committee

2022-2023 ASHRAE/UNEP Action Plan

eLearning

Updates on new refrigerants designation factsheet

Refrigerant Management University Course

Assessing RAC Plant Sustainability Technical Guide

Joint events conferences

UNEP-ASHRAE web portal

Women in Cooling and INWIC

Innovation Award

World Refrigeration Day

Low GWP Refrigerants

Flammability & Safety

Building Sector

Cold Chain

CHALLENGES FOR RACHP IN DEVELOPING COUNTRIES

Challenges : Management & policy

- Undertaking **parallel and integrated HCFC phase out & HFC phase down** (integrated approaches to refrigerant management)
- Collecting & analysing **data on HFC consumption** sectors (understanding national market)
- Updating **legislation, regulatory, and policy frameworks** to address Kigali Amendment issues including new refrigerants
- Understanding & promoting **standards and codes** related to alternative technologies
- Need for sound technical sector expertise to inform decision making (**organized voice of RACHP** sector/associations often lacking or under-resourced)
- Developing & implementing **Kigali Implementation Plans** (KIPs) underway & operational

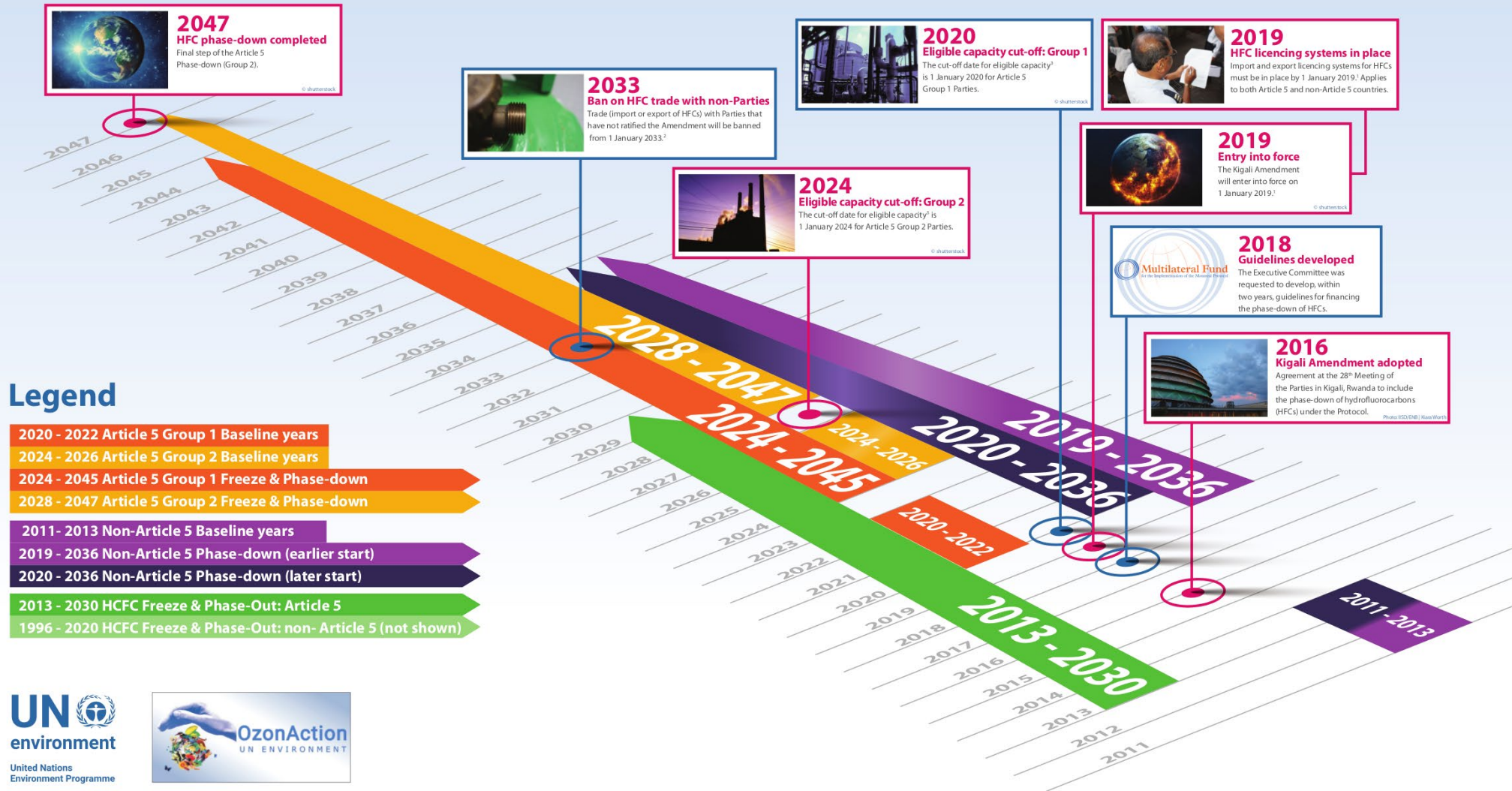
Challenges : RAC servicing sector

- **Access and affordability** of new refrigerants and equipment/slow market penetration
- **Flammable refrigerants** becoming more popular but servicing sector not fully prepared
- **Counterfeit/contaminated** refrigerants
- Extending, systematizing & updating **training of technicians** : best practices, safety, use and emission reduction
- Establishing & improving the quality of **technician certification** programmes
- Professionalizing the RAC workforce including **gender mainstreaming**
- Managing environmentally-responsible **disposal and end of life** for both refrigerants and equipment
- Enabling the **informed selection** of refrigerants & technology based on latest information
- Promoting **standards and codes**
- Dealing with **blends**
- **Recovering, recycling and reclaiming** refrigerants
- Addressing new HFC-using sector: **mobile air conditioning** (MAC)

Challenges : Energy efficiency

- **Awareness-raising** at all levels about need for energy efficiency & its benefits
- Updating of **training materials** to promote energy efficiency of existing RAC equipment through best installation and servicing practices & delivering that training
- Strengthening **certification schemes** to include energy efficiency
- Linking Montreal Protocol programs to **Minimum Energy Performance Standards** (MEPs) and labelling systems to achieve Kigali Amendment objectives
- Developing or adjusting **standards, policies & regulations** aimed at maintaining/enhancing energy efficiency of existing & new RAC equipment
- Fostering **collaboration** between NOUs and energy efficiency authorities
- Designing & implementing activities to **maintain energy efficiency** in refrigeration servicing sector, while introducing alternatives to HCFCs with low/zero GWP & for maintaining energy efficiency
- **Pilot projects** to maintain and/or enhance energy efficiency in the context of HFC phase-down

The Path from Kigali: HFC Phase-Down Timeline



Legend

- 2020 - 2022 Article 5 Group 1 Baseline years
- 2024 - 2026 Article 5 Group 2 Baseline years
- 2024 - 2045 Article 5 Group 1 Freeze & Phase-down
- 2028 - 2047 Article 5 Group 2 Freeze & Phase-down
- 2011 - 2013 Non-Article 5 Baseline years
- 2019 - 2036 Non-Article 5 Phase-down (earlier start)
- 2020 - 2036 Non-Article 5 Phase-down (later start)
- 2013 - 2030 HCFC Freeze & Phase-Out: Article 5
- 1996 - 2020 HCFC Freeze & Phase-Out: non-Article 5 (not shown)



...is an Implementing Agency of the Montreal Protocol's Multilateral Fund. OzonAction is working with 147 developing countries providing interconnected and mutually-supporting Compliance Assistance Services and project support to assist them meeting their current commitments under the Protocol. OzonAction is now working with these countries to jointly attain the ambitious achievements in climate protection promised by the Kigali Amendment. To find out more about OzonAction and to access our materials, tools and publications, including those on the Kigali Amendment and related issues, please visit our website: www.unep.org/ozonaction or contact us at: ozonaction@unep.org

Kigali Amendment

The Parties to the *Montreal Protocol on Substances that Deplete the Ozone Layer* reached agreement at their 28th Meeting of the Parties in October 2016 in Kigali, Rwanda to include the phase-down of hydrofluorocarbons under the Protocol.

Hydrofluorocarbons (HFCs)

...are commonly-used alternatives to ozone depleting substances (ODS). While not ozone depleting, HFCs are greenhouse gases which can have high or very high global warming potentials.

Country Groups

The Montreal Protocol Parties are split into four Kigali Amendment groups:

Article 5, Group 1:
Article 5, Group 2:
Non-Article 5, earlier start:
Non-Article 5, later start:

The majority of Article 5 Parties.
Bahrain, India, Iran, Iraq, Kuwait, Oman, Pakistan, Qatar, Saudi Arabia, United Arab Emirates
Most non-Article 5 countries
Belarus, the Russian Federation, Kazakhstan, Tajikistan, and Uzbekistan

¹ The Kigali Amendment has reached the minimum number of ratifications required to enter into force on 1 January 2019.

² ...or when Article 4 of the Protocol has been ratified by 70 countries - whichever is later.

³ The date after which any new manufacturing capacity producing or consuming HFCs is not eligible for funding under Multilateral Fund.

N.B. HFC baseline calculations also include a percentage of HCFC baseline production/consumption



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**NOTES FROM
HVAC SUB COMMITTEE OF REFRIGERATION COMMITTEE**

**Thursday, Oct 5, 2023
9:00AM – 10:00 AM EDT**

1. Call to Order and Roll Call – Attendees Steve, Nicole, Omar and Don
2. Define our Function as HVAC Comfort: Heating, Cooling, Dehumidification, Humidification, Air Filtration, and Ventilation.
3. Focus on Heat Pumps both Air Source and Water Source. Look at ways to use condenser recovered heat.
4. Can we get temperatures as high as 180 F to retrofit into existing heating systems?
5. Cascade Refrigeration Systems for temperatures above 180 F.
6. New Low temperature Air Source Heat Pumps will be in the HVAC Market soon as part of the Decarbonization effort.

7. Adjourn - Brandt

Notes for Ref-CPCC Cold Chain Subcommittee meeting (virtual meet) – 20th Dec 2023

Chair – Harshal Surange

Subcommittee Participants : Khashif Nawab, Bruce Nelson, Roberto Aguilo, , Didier Coulomb, Anish Simha, Ayman Eltalouny, Doug Scott, Michael Petersen,

Could not manage attending : Apichit Ipana, Dustin Lilya, Michael Saunders,

Staff Liaison: **Steve Hammerling**

1. Meeting was called to order by Chair Harshal Surange
2. Round of introductions was carried out as per standard practice

Points of Discussion :

3. Inclusion of R in ASHRAE and related inclusions of scope
 - a. Didier was past Chair of this sub-committee and gave his views on the same
 - b. He said that the committee initially also discussed Issues related to heat pumps and AC, along with Refrigerants
 - c. His submission was that he was not very clear as to what exactly was to be done as a part of the committee, and hence he suggested the merger which was approved by Ref-CPCC during last meeting.
4. Discussion on PD on Sustainable Cold Chain
 - a. Didier : Sustainable Cold Chain is one of the most important issues reg climate change It is complementary to Global Cooling Pledge adopted at COP 28 recently. ASHRAE has unique role to play considering its stature and position
 - b. The PD should contribute ASHRAE's position on best practices , technology selection, etc. He also felt that if ASHRAE does take up this PD, they should do it in association with UNPE and IIR so as to avoid duplication.
 - c. It should have an overarching technical direction
 - d. One session on food & cold chain in COP 28
 - e. Move a motion in Chicago to ask Tech council to create this PD. The cold chain subcommittee (Ref-CPCC) help in the next steps as required.
 - f. The document can also brief about Phase down of HFCs and energy efficiency issues
 - g. **AI #1** : Draft a motion for the same to be taken up at the Chicago meeting.
5. Brainstorming on new ideas for subcommittee activities
 - a. Trainings : Topics suggested for trainings
 - i. Basic standardisation like heat load sheets for tropical conditions
 - ii. Familiarising people with various components of Cold Chain Industry
 - iii. Global trends of sustainability and reducing food waste

- b. Definition of Sus CC
 - AI#2 (completed) : Global Cooling Pledge : Didier will send document to Subcommittee members
6. Update from UNEP Activities on Cold Chain – Ayman
 - a. Informed about a document on Sustainable Cold Chain document released in 2022 / 23 from Cool Coalition
 - b. Informed about the Status Report on Global Food Cold Chain
 - c. Informed about a conference conducted in South East Asia on Cold Chain Technologies in Offshore Marine Centers
 - d. Ayman mentioned that GIZ wanted to organise an event for reefers, and had asked IIR to participate. Harshal, RAL Ref Chair, mentioned about an idea that such an event, along with Marine Industry can be taken up in the developing economies in Region at Large. This event can be a collaborative effort and can be explored in RAL during further discussions.
7. Update from IIR on Cold Chain activities – Didier
 - a. IIR was Present in COP 28
 - b. He informed about various Youtube videos from UNEP which can be seen and are prepared in association with IIR
 - c. IIR finished a COP book / guide on walk-in cold rooms financed by World Bank, It is available online free of charge
 - d. Discussing with world bank on how to promote this book
 - e. Part of some projects : Called Enough - How to reach a Carbon Neutral Cold Chain by 2050 in Europe
 - f. Publication of various Informatory Notes such as the carbon impact of the cold chain, soon the same to be done for stationary air conditioning
8. Update on other Major events :
 - a. Roberto informed about the ASHRAE Mexico Expo being done in association with ASHRAE Mexico Chapter in Mexico City
 - b. Harshal informed about the Conference held in Bangladesh by ASHRAE RAL in association with GCCA and supported by the Bangladesh Trade Facilitation Project on 31st May and 1st June 2023. Attended by 250+ delegates on both days.
9. Mike Peterson, Bruce Nelson asked for putting together the links etc mentioned in the meeting for the benefit of the subcommittee members.
10. Doug Scott mentioned about the possible use of Basecamp as a mode of information sharing as well.
11. Meeting was adjourned by Chair Harshal Surange after thanking all for their efforts and all that they do for ASHRAE.

REFRIGERATION TECHNOLOGY REPORT

REPORT STATUS Winter meeting 2022

1.Introduction:

1.1 Purpose

This report aims to give a high-level view of technologies applied in the refrigeration circuit of equipment in the different regions of the world and for different product groups.

This report can be used to evaluate where the ASHRAE handbooks and training sessions may need to be updated related to the explanation of technologies. Through this method the ASHRAE handbooks and trainings can remain the top reference on global level.

As a total the report can be used to do a high-level gap analysis between product groups and regions in the world. The report will not give an analysis of the accessibility of the technology.

1.2 Scope of the report

The report will mention technologies applied in the refrigeration circuit. This will consist mainly a high-level description of the components (e.g. scroll compressor) or high level reference of the specific refrigerant circuit (e.g. reversible circuit; 2 stage compression).

The report may refer briefly to the specific applications but will not elaborate on the application.

The report will be based on public available information or information disclosed for publication by ASHRAE.

1.3 Frequency of the report

The report will be published every 2 years.

1.4 Outline

The report will include technologies that are representing a substantial part of the business in one or more regions of the world and are considered as being permanent. The committee members have to judge about the permanent character of the technology considering at least following characteristics:

- Technologies should be continuously commercialised for at least 2 years.
- Technologies that are only applied in demonstration projects are not considered as a substantial part of the business.
- It will not include 'not in kind' technology nor proprietary information that is not disclosed to ASHRAE for publication.

The report can show the balance or unbalance of technologies that are driving the market.

Where there are specific drivers for the technology known these can be clarified in the report.

The report will be split up in product groups and regions as needed to show specific differences.

Besides the main distribution of the regions and product groups sub divisions may be created where a specific situation requires this.

The report may include a Gap analysis with the handbook and ASHRAE Applicable Performance Testing Standards. This will be made in cooperation with the sub chairs of Handbooks.

	1.4.2	SRM and brushless DC motor				?	o	o	o		
	1.4.3										
SZ RR GK MD	2	Condensers									
		Fans and fan motors									
SZ GK MD	3	Evaporators									
MD GK SZ	4	Expansion devices									
		Capillary tube									
		Manual expansion device									
		Thermostatic expansion device									
		Electronic expansion device									
		Suction gas controlled									
		Discharge temperature controlled									
GK MD SZ	5	Specific devices									
		Ejectors			o	o	o				
		Suction gas pressure controls									
		Hot gas bypass									
		4 way valves									
		Defrost control technologies									
		Refrigerants pumps									
AO	6	Absorption									
MD RR	7	Refrigerants									

Frequency of meeting:

Every month : timing 1st Thursday after excom CPCC meeting for 1 hour.

2 Progress January 2022

2.1 Table

Technology		Group			Region				ASHRAE reference	
N°	description	C	P	CC	US	EU	CN	JP	handbook	other
1	Compressors									
1.1	Hermetic									
1.1.1	Reciprocating	o	o	o	o	o	o	o	HVAC S&E chptr 38	
1.1.2	Scroll	o	o	o	o	o	o	o	HVAC S&E chptr 38	
1.1.3	Rotary	o		o	o	o	o	o	HVAC S&E chptr 38	
1.1.4	Swing	o		o	?	o	o	o	No information found	
1.1.5	Suction gas cooled motor	o	?	o	?	o	o	o	HVAC S&E chptr 38	
1.1.6	Discharge gas cooled motor	o		o	?	o	o	o	HVAC S&E chptr 38	
1.2	Semi hermetic								HVAC S&E chptr 38	
1.2.1	Reciprocating								HVAC S&E chptr 38	
1.2.2	Twin screw								HVAC S&E chptr 38	
1.2.3	Single screw								HVAC S&E chptr 38	
1.2.4	Open drive								HVAC S&E chptr 38	
1.3	Capacity control technology								HVAC S&E chptr 38	
1.3.1	Digital scroll								No information found	
1.3.2	Invertor								HVAC S&E chptr 38	
1.4	Motor type									
1.4.1	Asynchronous motor								HVAC S&E chptr 38	
1.4.2	SRM and brushless DC motor				?	o	o	o	HVAC S&E chptr 38	
1.4.3	Centrifugal								HVAC S&E chptr 38	
2	Condensers	o	o	o	o	o	o	o	HVAC S&E chptr 39	
2.1	Water cooled condensers	o	o	o	o	o	o	o	HVAC S&E chptr 39	
	Shell and coil condensers	o	o	o	o	o	o	o	HVAC S&E chptr 39	
	Tube-in-tube condensers	o	o	o	o	o	o	o	HVAC S&E chptr 39	
	Brazed-Plate and Plate and Frame condensers	o	o	o	o	o	o	o	HVAC S&E chptr 39	
2.2	Air-cooled condensers	o	o	o	o	o	o	o	HVAC S&E chptr 39	
	Plate and Fin condensers	o	o	o	o	o	o	o	HVAC S&E chptr 39	
	Integral-Fin condensers	o	o	o	o	o	o	o	HVAC S&E chptr 39	
	Microchannel condensers	o	o	o	o	o	o	o	HVAC S&E chptr 39	
2.3	Evaporative condenser	o	o	o	o	o	o	o	HVAC S&E chptr 40	
2.4	Cooling towers	o	o	o	o	o	o	o	HVAC S&E chptr 40	
	Direct- contact cooling towers	o	o	o	o	o	o	o	HVAC S&E chptr 40	
	Indirect-contact cooling towers	o	o	o	o	o	o	o	HVAC S&E chptr 40	
	Hybrid closed-circuit cooling towers	o	o	o	o	o	o	o	HVAC S&E chptr 40	
	Fluid coolers	o	o	o	o	o	o	o	HVAC S&E chptr 40	
2.5	fans and fan motors	o	o	o	o	o	o	o	HVAC S&E chptr 21&45	

Technology		Group			Region				ASHRAE reference	
N°	description	C	P	CC	US	EU	CN	JP	handbook	other
6	Absorption									
	Triple effects chilled water evaporators circuits, LiBr-H2O.									
	Chilled Water circuits f sub-zer evaporators for LiBr-H2O									
7	Refrigerants									
	properties	o	o	o	o	o	o	o	Fundamentals chptr 29	
	environmental properties	o	o	o	o	o	o	o	Fundamentals chptr 29	
	performance	o	o	o	o	o	o	o	Fundamentals chptr 29	
	safety	o	o	o	o	o	o	o	Fundamentals chptr 29	
	leak detection	o	o	o	o	o	o	o	Fundamentals chptr 29	
	compatibility								Fundamentals chptr 29	
	thermophysical properties	o	o	o	o	o	o	o	Fundamentals chptr 30	
	sustainability									
	montreal protocol (MOP)	o	o	o	o	o	o	o	Fundamentals chptr 34	
	MOP kigali agreement	o	o	o		o			No information found	
8	Systems									
	comfort AC									
	packaged units			o	o	o	o	o		
	split			o	o	o	o	o		
	multi			o	o	o	o	o		
	VRF			o	o	o	o	o		
	Chillers			o	o	o	o	o		
	hydronic heat pumps (hp)			o	o	o	o	o		
	ground/ water source hp			o	o	o	o	o		
	air source hp			o	o	o	o	o		
	water heating heatpump (whp)			o	?	o	o	o		
	ground/water source			o	?	?	?	?		
	air source hp			o	?	o	o	o		

Source of information for

ASHRAE reference

Fundamentals 2021

HVAC systems and equipment 2020

HVAC applications 2019

Refrigeration 2018

2.2 Analysis of the situation

The handbooks contain a lot of information much wider than the table has provided.

The input from the TC's will be essential to complete the tables.

On the other hand it has been seen that some information is missing. For this we need to contact the TC's as well.

From the missing information it can be found that this is mostly related to technology that is used outside the USA.

Based on this last finding it may be an option to set up a meeting with international associations in order to get their cooperation to indicate further missing items but also to provide possible sources in order to complete the information in the handbooks.

For this following actions are considered and need to be further discussed in the team.

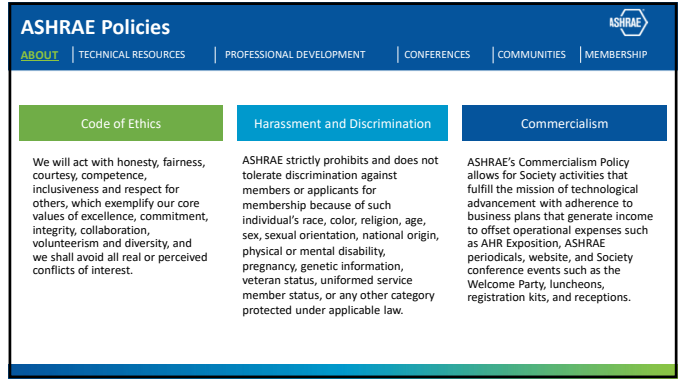
- a) Get in contact with the relevant TC's and see if they are interested to complete the table in cooperation with this REF-CPCC subcommittee.
- b) Reach out to the international associations in ASHRAE to ask their cooperation for completion of the information. This can be done via the TC's.

2.3 Next step

Confirmation of the full committee REF-CPCC to decide to continue this action or not.



1



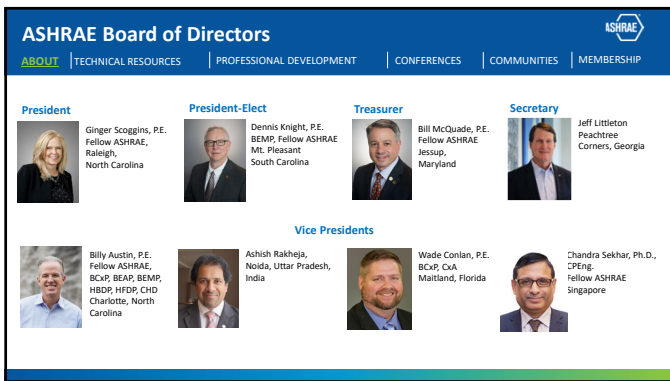
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4












5



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ASHRAE Directors at Large

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 Doug Cochrane, P.Eng. Mississauga, Ontario, Canada	 Blake Ellis, P.E. Overland Park, Kansas	 Dru Crawley, Ph.D., BEMP Washington, D.C.
 Corey Metzger, P.E. Ames, Iowa	 Art Gesler Colleyville, Texas	 Wei Sun, P.E. Ann Arbor, Michigan
 Kishor Khankari, Ph.D. Ann Arbor, Michigan	 Luke Leung, P.E., BEMP Clarendon Hills, Illinois	 Heather Schopplein-Anderson, P.E. San Jose, California

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LETTERS & TESTIMONY



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Research: Supporting ASHRAE's Mission

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Society Year 2022-2023

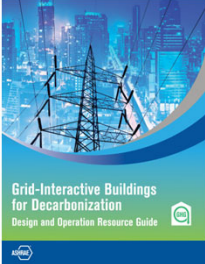
 \$800,000 Raised for Endowments	Research Promotion Campaign Total \$2.7M <i>(Research, YEA, AI, Scholarships, General)</i>
 \$298,750 Awarded through 76 Scholarships	 Within the RP Campaign \$2M Raised for Research
 \$50,000 Raised by College of Fellows and Life Members Club	 \$1M Given by ASHRAE Regions, Chapters and Sections

More than 4,000 contributions from Members, Organizations and other Associations

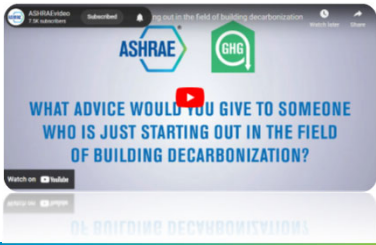
9

Task Force for Building Decarbonization

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Grid-Interactive Buildings for Decarbonization
Design and Operation Resource Guide




WHAT ADVICE WOULD YOU GIVE TO SOMEONE WHO IS JUST STARTING OUT IN THE FIELD OF BUILDING DECARBONIZATION?

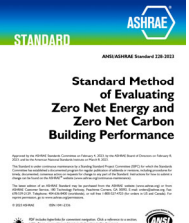
10

Standards

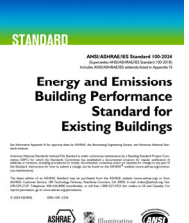
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ASHRAE Standard 154-2012
Control of Infectious Aerosols



ASHRAE Standard 218-2012
Standard Method of Evaluating Zero Net Energy and Zero Net Carbon Building Performance

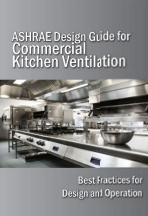


ASHRAE Standard 189-2014
Energy and Emissions Building Performance Standard for Existing Buildings


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ASHRAE Bookstore

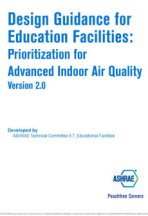
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ASHRAE Design Guide for Commercial Kitchen Ventilation
Best Practices for Design and Operation



Lucy Goes Green Book Signing!
ASHRAE Bookstore at the Marriott Marquis, Sunday, Jan. 21 at 9:00 AM.



Design Guidance for Education Facilities: Prioritization for Advanced Indoor Air Quality Version 2.0

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 eLearning
FUNDAMENTALS: HVAC SYSTEMS (I-P)

New Course
 STANDARD
Control of Infectious Aerosols

New Certification
DECARBONIZATION CDP CERTIFIED PROFESSIONAL

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2024 Topical Conferences

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- Madrid, April 17-19
2024 ASHRAE International Conference on Building Decarbonization
- Indianapolis, June 24-26
2024 ASHRAE Conference for Integrated Design, Construction & Operations
- Chicago, September 26-27
Women in ASHRAE Leadership Symposium
- New York City, October 21-23
2024 ASHRAE Decarbonization Conference: Decarbonizing Existing Tall Buildings
- Beirut, October 3-4
The Sixth International Conference on Efficient Building Design

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Events & Conferences: Tradeshows

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AHR Chicago

Meet and Greet with President Ginger Scoggins
 3:00 -4:00 PM | Monday, Jan 22
 ASHRAE Booth S6810

ASHRAE at Industry Events

cmpx Canadian Mechanical & Plumbing Exposition
 Toronto, ON | March 20-24
 Visit ASHRAE at Booth 646

ACREX India 2024
 New Delhi, India | Feb. 15-17

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Get Involved with Committees & Chapters

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Find Committees and Nominate Yourself or Others

- FEB 2024** February: Nominations for appointed committees are due **February 16, 2024**.
- JUN 2024** June: Speak with your committee ExO/CO if your current appointment/elected position ends to be nominated for another.
- SEP 2024** September: Nominations for elected positions are due. (Publications & Education Council, Tech Council, RAC, TAC, Standards, Handbook, Nominating)

Find Chapter Information Using the Chapters Map

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- eLearning Course**: 95+ to choose from
- ASHRAE Standard or Guideline**: 100+ to choose from
- ASHRAE Handbook**: PDF version of the most recent
- Handbook Online**: 4 most recent
- ASHRAE Certification Exam Study Guide**: 3 to choose from

Honors & Awards

The following award nominations have a **May 1** deadline:
 Fellow | Honorary Member | ASHRAE Hall of Fame | F. Paul Anderson Award
 ASHRAE Pioneers of the Industry | ASHRAE Award for Distinguished Public Service

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Asked to make a statement
on behalf of ASHRAE?

Please send all media
inquiries to
publicrelations@ashrae.org
before responding to
members of the press.

Thank you!
Questions or Comments?