



Air Conditioning Sector - Overview and Trends

Stephen Yurek
President & CEO

For discussion today



- **Kigali Amendment**
- **What equipment is being manufactured and installed today**
- **Where the industry is going**
- **Challenges and opportunities**



AHRI Members Manufacture:



- **Residential and commercial central air conditioners, heat pumps, and components**
- **Residential and commercial furnaces, boilers, and components**
- **Residential and commercial water heaters and components**
- **Commercial refrigeration equipment and components**



AHRI is a Trade Association



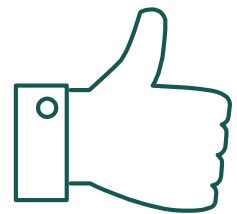
319:

Member Companies: Over 95% of all HVACR products manufactured and installed in North America; more than 70% of global products



102:

AHRI standards and guidelines in use across the globe



44:

AHRI Certification Programs: Nearly 900 participants representing over 70% of all HVACR products manufactured globally

Big Changes are Coming

- **High GWP refrigerants will be phased down on a global scale**
- **Drivers:**
 - Montreal Protocol – Kigali Amendment
 - Europe - F-gas regulations
 - U.S. – EPA, California
 - Canada
 - Japan
 - Australia

Kigali Amendment Phase Down Schedule

	A5 Group 1	A5 Group 2	A2
Baseline	2020-2022	2024-2026	2011-2013
Formula	Average HFC consumption	Average HFC consumption	Average HFC consumption
HCFC	65% baseline	65% baseline	15% baseline*
Freeze	2024	2028	-
1st step	2029 – 10%	2032 – 10%	2019 – 10%
2nd step	2035 – 30%	2037 – 20%	2024 – 40%
3rd step	2040 – 50%	2042 – 30%	2029 – 70%
4th step			2034 – 80%
Plateau	2045 – 80%	2047 – 85%	2036 – 85%

* For Belarus, Russian Federation, Kazakhstan, Tajikistan, Uzbekistan 25% HCFC component of baseline and different initial two steps (1) 5% reduction in 2020 and (2) 35% reduction in 2025

Notes:

1. Group 1: Article 5 parties not part of Group 2
2. Group 2: GCC, India, Iran, Iraq, Pakistan
3. Technology review in 2022 and every 5 years
4. Technology review 4-5 years before 2028 to consider the compliance deferral of 2 years from the freeze of 2028 of Article 5 Group 2 to address growth in relevant sectors above certain threshold.



Kigali is Merely the
Beginning

Industry is Committed to the Success of the
Kigali Amendment

We are moving forward

Today's Market – Air Conditioning

HFCs
HCFCs
Hydrocarbons

		Air Conditioning*			
		Residential			
Regions and Countries		Room A/C	Mini-splits	Multi-splits	Split A/C
		Europe	R410A/ R32	R410A/ R32	R410A/ R32
United States and Canada	R410A	R410A	R410A/ R407c	R410A	
Latin America	R22/ R410A	R22/ R410A	R22/ R410A	R22/ R410A	
Africa	R22/ R410A	R22/ R410A	R22/ R410A	R22/ R410A	
Middle East	R22	R22	R22/ R407c	R22	
China	R22/ R410A/ R32/ R290	R22/ R410A/ R290	R22/ R410A	R22	
India	R22/ R410A/ R32/ R290	R22/ R410A/ R32/ R290	R22/ R410A	R22/ R410A	
Japan	R410A/ R32	R410A/ R32	R410A/ R32	R410A	

*(Not an exhaustive list)

*Source: AHRI

Today's Market – Air Conditioning

HFCs
HCFCs
HFOs
CO2
HFC-HFO Blend

Air Conditioning*

		Commercial			Mobile A/C
		Chillers	VRF	Packaged A/C	MAC
Regions and Countries	Europe	R22/ R410A/ R407c/ R134a/ R513A/ 1233zd(E)	R410A	R22/ R410A/ R134a	R134a/ R1234yf/ R744
	United States and Canada	R22/ R410A/ R407c/ R134a/ R513A	R410A	R22/ R410A/ R134a	R134a/ R1234yf
	Latin America	R22/ R410A/ R134a	R22/ R410A	R22/ R410A	R134a
	Africa	R22/ R134a	R22/ R410A	R22/ R410A	R134a
	Middle East	R22/ R410A/ R134a	R410A	R22/ R410A	R134a
	China	R22/ R410A/ R134a	R410A	R22/ R410A/ R134a	R134a
	India	R22/ R410A/ R407c/ R134a	R410A	R22/ R410A	R134a
	Japan	R22/ R410A/ R134a/ R513A	R410A/ R32	R22/ R410A/ R134a	R134a/ R1234yf

*(Not an exhaustive list)

*Source:
AHRI

Challenges

- ❑ Regulatory and safety barriers must be adapted to allow the safe use of equipment using A2L and A3 refrigerants in homes and buildings
- ❑ Difference between available alternative refrigerants and equipment and commercially available refrigerants and equipment
- ❑ Knowledge on new technologies and refrigerants is limited for distributors, technicians, engineers, building owners, and consumers.



State of Safety Standards – Global View

2017

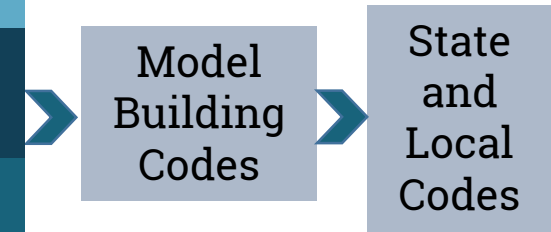
2021

2022+

United States

International

Refrigerant Classification	Usage Restriction	Application		
ASHRAE34 Refrigerant Designation & Safety Classification UL2182	ASHRAE15 Safety Standards for Refrigeration Systems 2015-2018	UL1995 Heating and Cooling Equipment 2014-2015	UL471 Commercial Refrigerators and Freezers 2015-2019	UL621 Ice Cream Makers 2015-2019
		UL60335-2-40 Heating and Cooling Equipment -2018	UL60335-2-89 Commercial Refrigeration -2018	
Refrigerant Classification	Usage Restriction	Application		
ISO817 Refrigerant Designation & Safety Classification (2013-2014)	ISO5149 Safety and Environmental Requirements, Phase 1 Phase 2 2014-2015	IEC60335-2-40 Heating and Cooling equipment 2015-2018	IEC60335-2-89 Commercial Refrigeration 2015-2019	IEC60335-2-24 Refrigerating appliances Ice and Ice Cream Makers 2015-2019



complete under revision

Source: Rajan Rajendran - Emerson



AHRI Flammable Refrigerant Research



Objective: Produce publicly available technical research data to support standards activities related to the use of A2L, A2, and A3 refrigerants

Joint Research
to support
ASHRAE 15
revisions

Summer 2017:
draft ASHRAE
15 completed
for Public
Review

Early 2018:
publication of the
updated ASHRAE 15
including 2L
refrigerants

Jan 2018:
2021 IMC: change
proposals are due

Reports available at: <http://ahrinet.org/arep.aspx>



Commercial Availability



Components (refrigerants, compressors, controls, valves, etc.)

- Design and testing of prototypes
- Regulatory approvals
- Retool and optimize manufacturing processes
- Production

Equipment

- Design and testing of prototypes
- Regulatory approvals
- Retool and optimize manufacturing processes
- Production
- Equipment certification

Distribution, Installation, Operation, and Maintenance

- Training (technicians, operators, building owners)
- Regulatory requirements for transportation, installation, and operation

Education and Training

- **Education and training is critically important**
 - ❑ Most alternatives are either flammable or mildly flammable
- **There are serious potential safety and efficiency issues with improper installation and maintenance**



Global Refrigerant Management Initiative

- Launched in September 2014 by AHRI, the Alliance for Responsible Atmospheric Policy, and ABRAVA (Brazil)



- Participation by refrigerant organizations in Australia, Canada, China*, Colombia, the EU, Japan, and Korea



*Observer

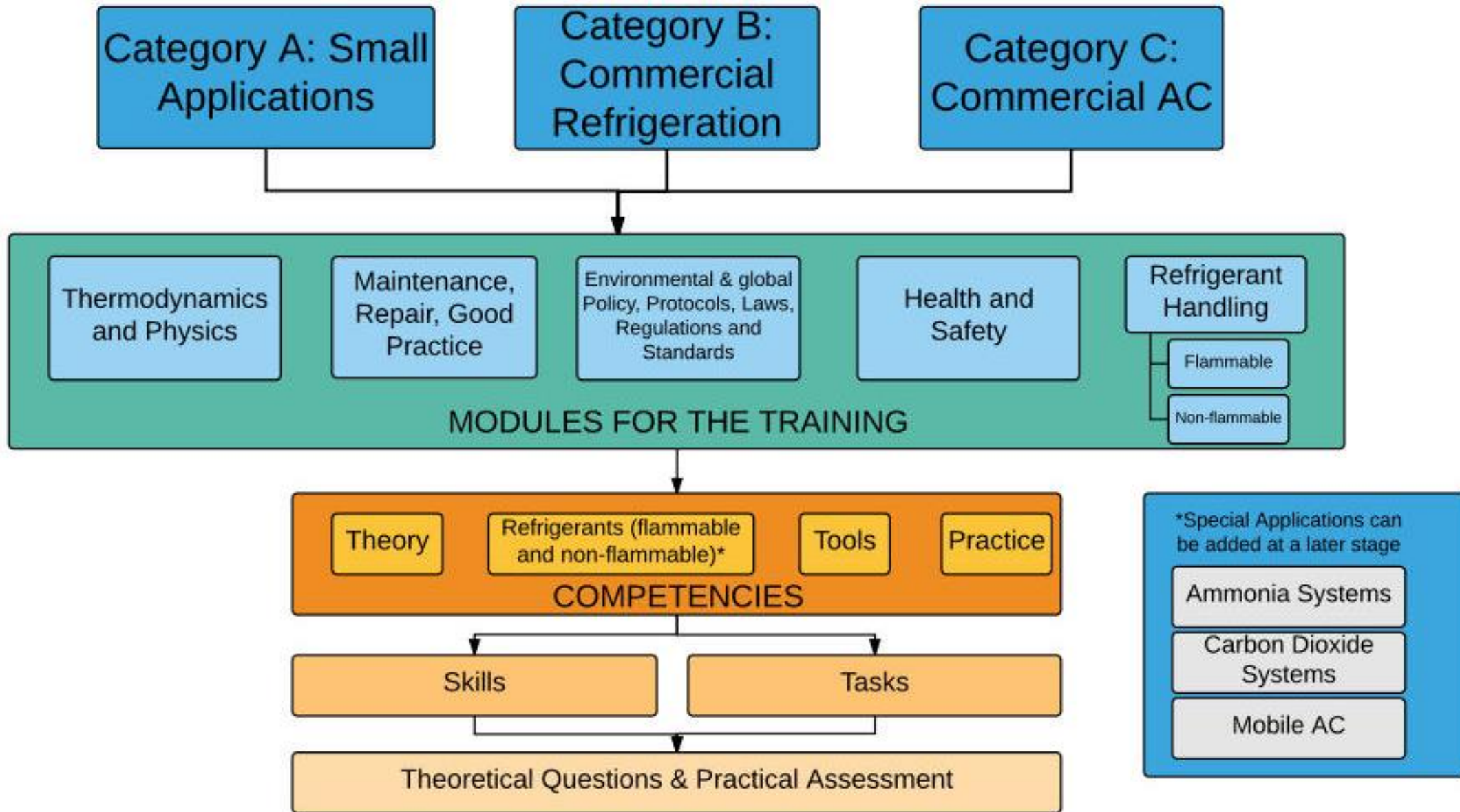


UNEP-AHRI Refrigerant Driver's License

- Provides a menu of training and testing materials for small applications, commercial air conditioning, commercial refrigeration, and large/medium enterprises
- Aims to ensure safe management of refrigerants, especially in Article 5 nations
- Creates a global network to support safe handling
- Details competencies and skills related to refrigerants handling, including flammable and non-flammable refrigerants



Proposed Refrigerant Driving License



For A-5 Countries, HCFC Phase-out just beginning

- Kigali Schedule does not require A-5 to lead technology adoption
- **Commercial Availability**
 - ❑ Move forward where you can – when you can
 - ❑ Otherwise use current technology until alternatives are commercially available
- **Improve refrigerant management**
- **Train technicians, engineers, building owners – especially regarding safety**

Global Industry/Government/NGO Collaboration is Key

We must work
together!

Deliberative with a Sense of
Urgency
Technically based
Safe and energy efficient