
Choosing the Right Low-GWP Refrigerant for Your Chiller Application

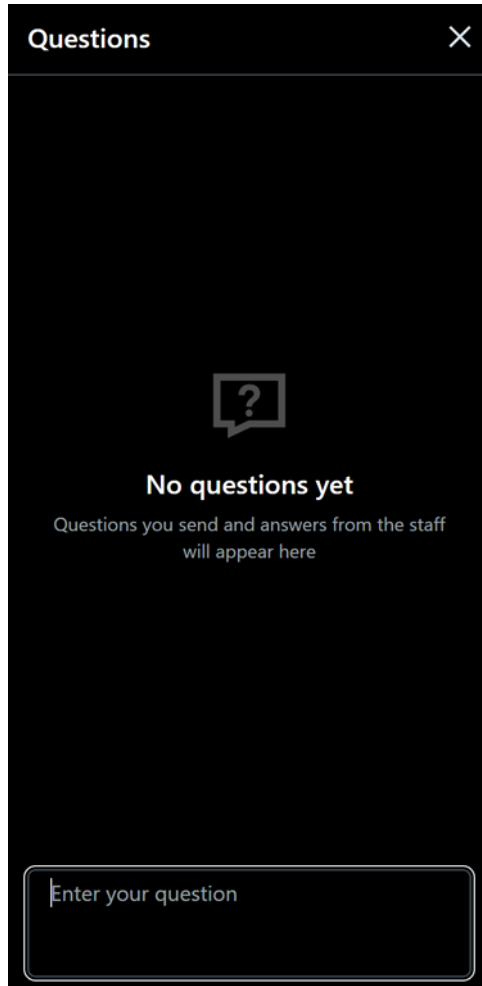
Tony Lundell
International Institute of All-Natural
Refrigeration
Keynote Speaker

The recording and slides of this webinar will be made available to attendees via email later today.

PDH Certificates will be e-mailed to attendees by within the next 2 days.

Sponsored by
**Johnson
Controls** 

Q&A Format



- Panelists will answer your questions during the Q&A session at the end of the Webinar.
- Please post your questions in the Questions Window in your GoToWebinar interface.
- Direct all questions to Best Practices Magazines

Sponsored by
Johnson Controls



Handouts

Johnson Controls

YORK Low-GWP refrigerants

Refrigerant	Model Capacity	GWP	Safety
R134a	YK 250-3000 YK-CP 2500-3500 YMA 100-375 YMA 150-500	631	A1
	YMA 100-375 YMA 150-500		
R1234ze	YK 250-2700 YK-CP 2500-3000 YMA 100-375 YMA 150-375	7	AZL
	YMA 100-375 YMA 150-375		
R1233zd	YK 200-2700 YK-CP 2000-3000 YMA 100-375 YMA 150-375	293	A1
	YMA 100-375 YMA 150-375		
R458B	YK 150-1600 YK-CP 1500-2000 YMA 100-375 YMA 150-375	4	A1
	YMA 100-375 YMA 150-375		
R458B	YK 400-2200 YK-CP 400-2200 YMA 100-375 YMA 150-375	466	AZL
	YMA 100-375 YMA 150-375		

BEST PRACTICES 2026 EXPO

OCTOBER 13-15 INDIANAPOLIS, IN
COMPRESSED AIR / VACUUM / COOLING

Sustainable, Safe & Reliable **ON-SITE UTILITIES** Powering Automation

"I'm looking to establish a strong network of some of the world's best compressed air experts, because we need some assistance writing best practices and refinery engineering practices. It all starts with first getting the right network of people."
- Raymond Knick, Utilities and Chemical Treatment Engineer, Phillips 66

"This was one of the best sales engineering workshops I've been to in the last several years. This was totally relevant information for industry."
- Nathan Ross, Sales Consultant, Middle Mechanical Services

Conference Training & Certification

- Sales Engineering Workshops
- Pneumatic Conveying Workshop
- Compressed Air Treasure Hunt Workshop
- Industrial Chilled Water Workshop
- Compressed Air Challenge Level 1

EXPO Pavilions

- Lack Collection Pavilion
- New Technology Pavilion

EXPO Networking

- Networking Event (Tuesday, Oct. 13, 8-30a)
- WOC Women's Networking Breakfast (Wednesday, Oct. 14)

Win \$1,000 Daily at EXPO!

Complete your Energy Treasure Hunt Challenge and stop 8 at the Best Practices Booth to win!

REGISTRATION FEES

REGISTRATION	Super Early Bird	Early Bird	Standard
Expo Hall	\$55	\$55	\$105
Full Conference	\$475	\$550	\$675
Single Day Conference	\$275	\$295	\$350

REGISTER NOW AT CABPEXPO.COM/REGISTRATION-2026

23 Compressed Air Distributor Sales Survey 26 Thought-Leader Predictions 10 20 Years of Case Studies

COMPRESSED AIR CHILLER & COOLING BEST PRACTICES

20th ANNIVERSARY ISSUE

6 Hoffman & Lamson and SSI Aeration on Food Processing

11 GlobalVac & Air Upgrades the Dalton Cardiovascular Research Center

The Magazine for Quality & Reliability in Energy-Efficient Blower & Vacuum Systems

BLOWER & VACUUM BEST PRACTICES

Food Production

AERATION BLOWER SYSTEMS

INDUSTRIAL VACUUM & BLOWER SYSTEMS

6 Hoffman & Lamson and SSI Aeration on Food Processing

11 GlobalVac & Air Upgrades the Dalton Cardiovascular Research Center

Disclaimer

All rights are reserved. The contents of this publication may not be reproduced in whole or in part without consent of Smith Onandia Communications LLC. Smith Onandia Communications LLC does not assume and hereby disclaims any liability to any person for any loss or damage caused by errors or omissions in the material contained herein, regardless of whether such errors result from negligence, accident, or any other cause whatsoever.

All materials presented are educational. Each system is unique and must be evaluated on its own merits.



Super Early Bird Rates Available Through
June 30

Register at **CABPEXPO.COM**



★ Stick around after the webinar for a chance to win a \$675 conference pass in our fun contest!

BEST PRACTICES

EXPO & CONFERENCE CABPEXPO.COM
COMPRESSED AIR / VACUUM / COOLING

Largest Compressed Air & Process Cooling EXPO in North America

Discover the latest product innovations, meet 80+ leading OEMs and connect with experts who can improve your plant's operations. Learn how to:

- ✓ Save energy and water
- ✓ Reduce product rejects
- ✓ Increase uptime
- ✓ Increase plant profitability

Oct. 13-15, 2026 | Indiana Convention Center | Indianapolis

Choosing the Right Low-GWP Refrigerant for Your Chiller Application

Introduction

Chiller & Cooling Best Practices® Magazine

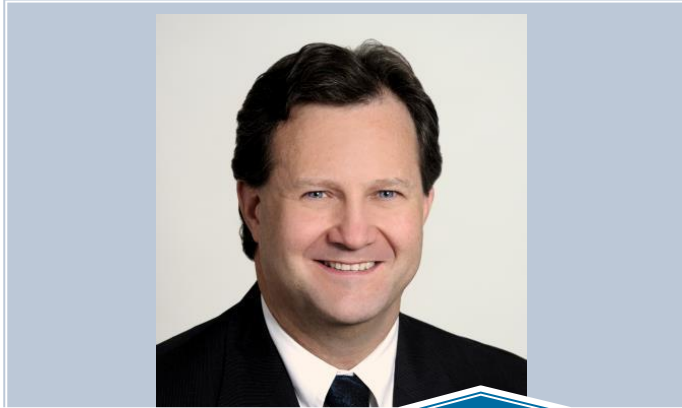


Sponsored by
Johnson Controls

CHILLER & COOLING
BEST PRACTICES
coolingbestpractices.com

BEST PRACTICES
EXPO & CONFERENCE CABPEXPO.COM
COMPRESSED AIR / VACUUM / COOLING

About the Speaker



Tony Lundell

International Institute of All-Natural
Refrigeration

- Senior Director of Standards and Safety at IIAR
- 40+ years in utilities, facilities, operations and engineering
- Leadership roles at Oscar Mayer, Sara Lee, Tropicana, Nestlé, NARA, and Americold
- Leads IIAR Standards, technical assistance, PSM/RMP work, ANR modules and industry presentations

Sponsored by
**Johnson
Controls**



Choosing the Right Low GWP refrigerant for your chiller application.

Choosing the Right Refrigerant

The choice of the refrigerant depends on several factors, including:

- Environmental Regulations
- Updated Standards & Codes
- System Compatibility (Valves, Oil, Sizing)
- Safety Considerations
- Market Availability (Refrigerant Supply Limit)

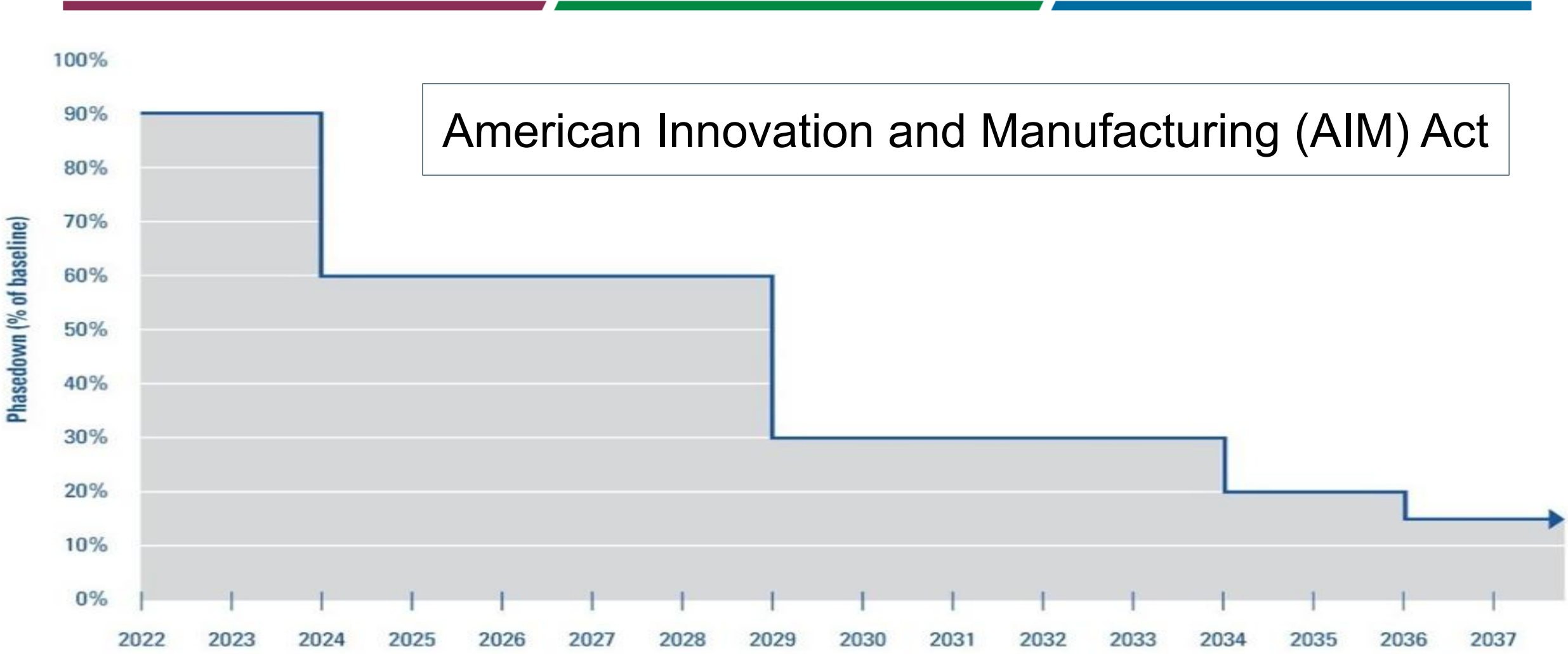
Authority Having Jurisdiction (AHJ)

Choosing the Right Low GWP refrigerant for your chiller application.

Safety Class
Safety Classification

Flammability	Higher Flammability	A3 R-290 Propane R-600a Isobutane	B3
	Lower Flammability	A2 R-152a	B2
		A2L* R-32 R-1234yf R-1234ze(E)	B2L* R-717 Ammonia
	No Flame Propagation	A1 R-22 R-134a R-410A R-1233zd(E) R-404A R-407C R-507A R-744 Carbon Dioxide	B1 R-123
		Lower Toxicity	Higher Toxicity
		Toxicity	

Choosing the Right Low GWP refrigerant for your chiller application.



Choosing the Right Low GWP refrigerant for your chiller application.

New York R-404A/R-507A Refrigerant Bans

New York state ban on the sale of bulk virgin R-404A and R-507A that was supposed to go into effect on March 3rd, 2026, was delayed by the courts while the legal challenge continues.

Another Transition?

Another refrigerant transition is not imminent. However, he said the industry will “constantly be looking at better solutions, better refrigerants, and better lubricants that will improve the efficiency, life expectancy, and performance of HVAC equipment.” In some applications, that could mean greater use of natural refrigerants such as CO₂, ammonia, or hydrocarbons like R-290 (propane) and R-600a (isobutane).

Choosing the Right Low GWP refrigerant for your chiller application.

New York Supermarket Transition Plans

New York state requires that supermarket chains transition all existing medium and large refrigerant-containing systems to refrigerants with a GWP <10 by 2035. However, companies that submit a transition plan form by 1/1/2027 can qualify for an additional five (5) years for the transaction.

What is the Catch?

You must apply for the extension in 2026 to take advantage of it in 2035.

Refrigerant	Chemical Name	Type	GWP 100	ODP	Glide		Compression Ratio	Boiling Point °F	Safety Class	Flammability	Toxicity	RCL ppm	LFL ppm	BHP/TR	Chillers (700 GWP)	IR<200lbs (300 GWP)	IR>200lbs (150 GWP)
R-1150	Ethlene	HC - Natural	3.7	0	0		NA	-155	A3	Yes	Lower		31,000	Supercritical			
R-12	Diclorodifloromethane	CFC	10600	1	0		5.58	-22	A1	No	Lower	18000		118%			
R-1234yf	2,3,3,3-Tetrafluoro-1-propene	HFO	4	0	0		5.87	-20.9	A2L	Yes	Lower	16000	62000	122%			
R-1234ze(E)	trans-1,3,3,3-Tetrafluor-1-propene	HFO	7	0	0		6.9	-2.2	A2L	Yes	Lower	16000	65000	131%			
R-1270	Propene (Propylene)	HC - Natural	1.8	0	0		4.74	-54	A3	Yes	Lower	1000	27000	101%			
R-134a	1,1,1,2 Tetrofluoroethane	HFC	1430	0	0		6.65	-15	A1	No	Lower	50000		118%			
R-152a	1,1-Dfluoroethane	HFC	124	0	0		6.5.2	-12.5	A2L	Yes	Lower	12000	48000	115%			
R-170	Ethane	HC - Natural	5.5	0	0		3.86	-128.2	A3	Yes	Lower	7000	31000	148%			
R-22	clorodifluoromethane	HCFC	1900	0	0		5.47	-41	A1	No	Lower	59000		104%			
R-290	Propane	HC - Natural	3	0	0		11.67	-44	A3	Yes	Lower	5300	21000	105%			
R-32	difluoromethane	HFC	675	0	0		5.31	-62	A2L	Yes	Lower	36000	144000	107%			
R-404A	Blend: R143a-52% R-125 44% R-134a 4%	HFC	3922	0	1.2	0.7	5.19	-51.9	A1	No	Lower	130000		116%			
R-407A	Blend: R-225 40% R-134a 40% R-32 20%	HFC	2107	0	7.1	22.6	11.5	-49.4	A1	No	Lower	83000		128%			
R-407C	Blend: R-134a 52% R-125 25% R-32 23%	HFC	1774	0	7.5	9.8	5.42	-46.8	A1	No	Lower	81000		128%			
R-407F	Blend: R-134a 40% R-125 30% R-32 30%	HFC	1825	0	7.1	22.8	6.13	-51	A1	No	Lower	95000		127%			
R-410A	Blend: R-125 50% R-32 50%	HFC	2088	0	0.1	0.2	5.43	-60.9	A1	No	Lower	140000		110%			
R-448A	Blend: R-32 26% R-125 26% R-134a 21% R-1234yf 20% R-1234ze 7%	HFC/HFO Blend	1387	0	7.2	24.8	12.61	-50.6	A1	No	Lower	110000		128%			
R-449A	Blend: R-134a 26% R-1234yf 25% R-125 25% R-32 24%	HFC/HFO Blend	1397	0	6.9	7.2	11.65	-50.8	A1	No	Lower	100000		127%			
R-450A	Blend: R-1234ze 58% R-134a 42%	HFC/HFO Blend	547	0	1.1	1.1	NC	-10.1	A1	No	Lower	72000		125%			
R-452A	Blend: R-125 59% R-1234yf 30% R-32 11%	HFC/HFO Blend	2141	0	21	4.8	11.81	-52.6	A1	No	Lower	100000		127%			
R-452B	Blend: R-32 67% R-1234yf 26% R-125 7%	HFC/HFO Blend	676	0	0.3	1.3	5.16	-59.8	A2L	Yes	Lower	30000	119000	111%			
R-454A	Blend: R-1234yf 65% R-32 35%	HFC/HFO Blend	239	0	10.3	9.3	6.1	-55.1	A2L	Yes	Lower	16000	63000	239%			
R-454B	Blend: R-32 69% R-1234yf 31%	HFC/HFO Blend	467	0	2	1.6	4.21	-59.6	A2L	Yes	Lower	19000	77000	111%			
R-454C	Blend: R-1234yf 79% R-32 22%	HFC/HFO Blend	148	0	14.1	12.7	6.44	-50.8	A2L	Yes	Lower	19000	62000	134%			
R-455A	Blend: R-1234yf 76% R-32 22% R-744 3%	HFC/HFO Blend	146	0	22.9	18.3	6.75	-60.9	A2L	Yes	Lower	22000	118000	147%			
R-466A	Blend: R-32 49% R-1311 40% R-125 12%	CFC/HFC Blend	733	0	0.14	0.2		-61.1	A1	No	Lower	30000					
R-471A	Blend: R1234ze 79% R-1336mzz 17% R-227ea 4%	HFC/HFO Blend	148	0	0	0		1.5	A1	No	Lower	31000					
R-502	Blend: HFC 51% HCFC 49%	HFC/HCFC Blend	4657	0	0	0	9.8	-49	A1	No	Lower	73000		112%			
R-507A	Blend: R-125 50% R-143a 50%	HFC	3985	0	0	0	5.19	-52.1	A1	No	Lower	130000		114%			
R-513A	Blend: R1234yf 56% R-134a 44%	HFC/HFO Blend	631	0	0	0	6.09	-20.8	A1	No	Lower	72000		119%			
R-515B	Blend: R-1234ze 91% R-277ea 9%	HFC/HFO Blend	293	0	0	0		-2.3	A1	No	Lower	61000		131%			
R-600	Butane or N-Butane	HC - Natural	4	0	0	0	7.26	31	A3	Yes	Lower	1000	20000	163%			
R-600a	Isobutane	HC - Natural	3	0	0	0	6.38	11	A3	Yes	Lower	4000	16000	138%			
R-717	Ammonia	Natural	0	0	0	0	7.04	-28	B2L	Yes	Higher	320	167000	100%			
R-744	Carbon Dioxide	Natural	1	0	0	0	3.97	-109	A1	No	Lower	30000		2-Stage Only			

Choosing the Right Low GWP refrigerant for your chiller application.

Refrigerant	Chemical Name	Type	GWP 100	ODP	Glide	Compression Ratio	Boiling Point °F	Safety Class	Flammability	Toxicity	RCL ppm	LFL ppm	BHP/TR	Chillers (700 GWP)	IR<200lbs (300 GWP)	IR>200lbs (150 GWP)
R-1150	Ethlene	HC - Natural	3.7	0	0	NA	-155	A3	Yes	Lower		31,000	Supercritical			
R-1234yf	2,3,3,3-Tetrafluoro-1-propene	HFO	4	0	0	5.87	-20.9	A2L	Yes	Lower	16000	62000	122%			
R-1234ze(E)	trans-1,3,3,3-Tetrafluor-1-propene	HFO	7	0	0	6.9	-2.2	A2L	Yes	Lower	16000	65000	131%			
R-1270	Propene (Propylene)	HC - Natural	1.8	0	0	4.74	-54	A3	Yes	Lower	1000	27000	101%			
R-152a	1,1-Difluoroethane	HFC	124	0	0	6.5.2	-12.5	A2L	Yes	Lower	12000	48000	115%			
R-170	Ethane	HC - Natural	5.5	0	0	3.86	-128.2	A3	Yes	Lower	7000	31000	148%			
R-290	Propane	HC - Natural	3	0	0	11.67	-44	A3	Yes	Lower	5300	21000	105%			
R-32	difluoromethane	HFC	675	0	0	5.31	-62	A2L	Yes	Lower	36000	144000	107%			
R-450A	Blend: R-1234ze 58% R-134a 42%	HFC/HFO Blend	547	0	1.1 1.1	NC	-10.1	A1	No	Lower	72000		125%			
R-452B	Blend: R-32 67% R-1234yf 26% R-125 7%	HFC/HFO Blend	676	0	0.3 1.3	5.16	-59.8	A2L	Yes	Lower	30000	119000	111%			
R-454A	Blend: R-1234yf 65% R-32 35%	HFC/HFO Blend	239	0	10.3 9.3	6.1	-55.1	A2L	Yes	Lower	16000	63000	239%			
R-454B	Blend: R-32 69% R-1234yf 31%	HFC/HFO Blend	467	0	2 1.6	4.21	-59.6	A2L	Yes	Lower	19000	77000	111%			
R-454C	Blend: R-1234yf 79% R-32 22%	HFC/HFO Blend	148	0	14.1 12.7	6.44	-50.8	A2L	Yes	Lower	19000	62000	134%			
R-455A	Blend: R-1234yf 76% R-32 22% R-744 3%	HFC/HFO Blend	146	0	22.9 18.3	6.75	-60.9	A2L	Yes	Lower	22000	118000	147%			
R-471A	Blend: R1234ze 79% R-1336mzz 17% R-227ea 4%	HFC/HFO Blend	148	0	0 0		1.5	A1	No	Lower	31000					
R-513A	Blend: R1234yf 56% R-134a 44%	HFC/HFO Blend	631	0	0 0	6.09	-20.8	A1	No	Lower	72000		119%			
R-515B	Blend: R-1234ze 91% R-277ea 9%	HFC/HFO Blend	293	0	0 0		-2.3	A1	No	Lower	61000		131%			
R-600	Butane or N-Butane	HC - Natural	4	0	0 0	7.26	31	A3	Yes	Lower	1000	20000	163%			
R-600a	Isobutane	HC - Natural	3	0	0 0	6.38	11	A3	Yes	Lower	4000	16000	138%			
R-717	Ammonia	Natural	0	0	0 0	7.04	-28	B2L	Yes	Higher	320	167000	100%			
R-744	Carbon Dioxide	Natural	1	0	0 0	3.97	-109	A1	No	Lower	30000		2-Stage Only			
														21	16	14

Choosing the Right Low GWP refrigerant for your chiller application.

Refrigerant Evaluator & Comparison Tool

Chillers (700 GWP): 21 Refrigerants

IR<200lbs (300 GWP): 16 Refrigerants

For Industrial Refrigeration (IR) Systems.

IR>200lbs (150 GWP): 14 Refrigerants

For Industrial Refrigeration (IR) Systems.

Choosing the Right Low GWP refrigerant for your chiller application.

IIARResources.com

REFRIGERANT EVALUATOR TOOL

Assess and compare all refrigerants, synthetic and **natural**, in one powerful tool.



CHEMICAL
MAKE-UP



GWP
ODP



SAFETY CLASS



FLAMMABILITY



TOXICITY



COMPATIBILITY



THERMODYNAMIC
PROPERTIES



RELATIVE
EFFICIENCY

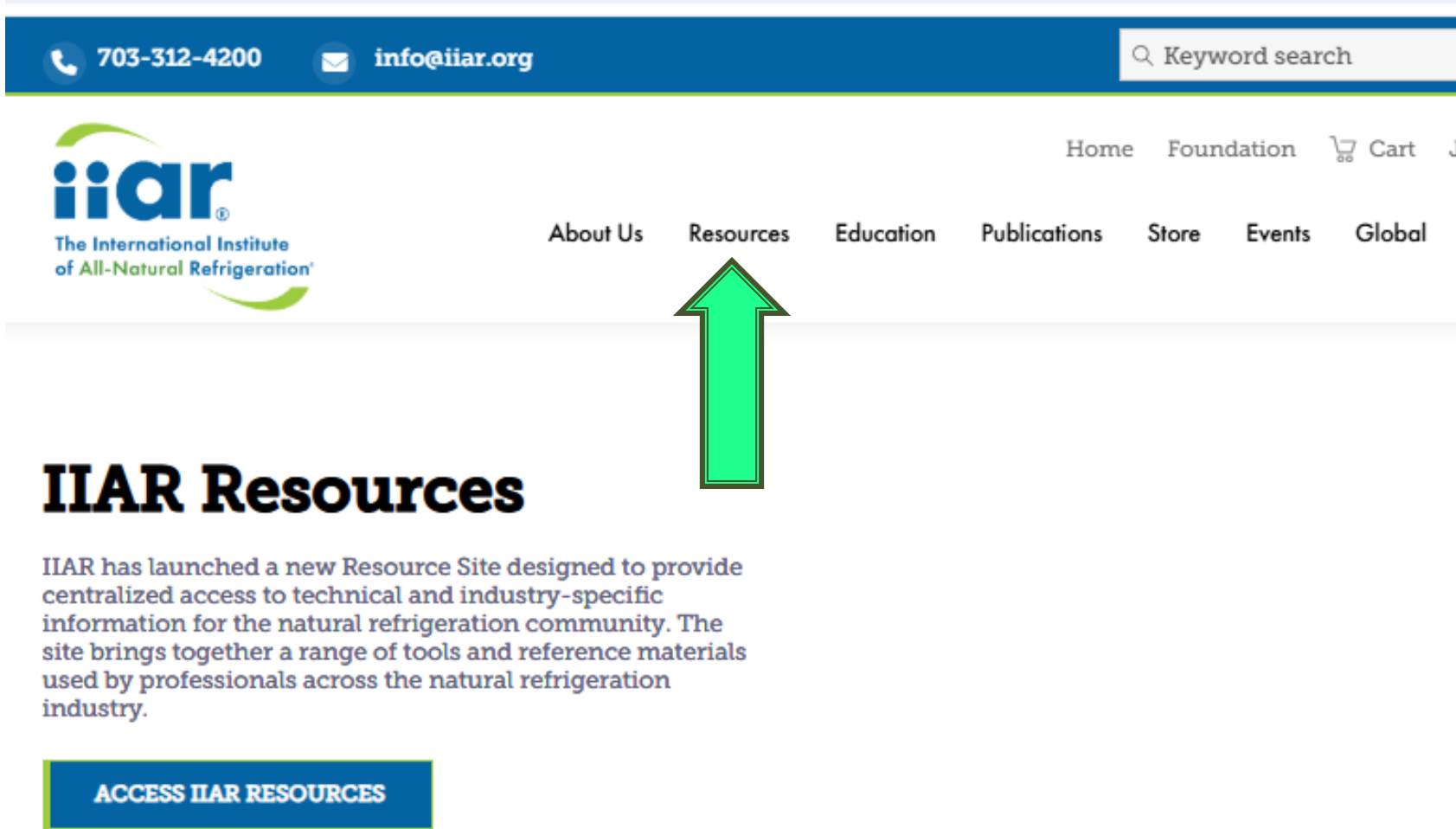


USA EPA SNAP
APPROVAL

Choosing the Right Low GWP refrigerant for your chiller application.



Choosing the Right Low GWP refrigerant for your chiller application.



The screenshot shows the top navigation bar of the IIAR website. It includes contact information (703-312-4200 and info@iiar.org), a search bar, and a main menu with items: Home, Foundation, Cart, About Us, Resources, Education, Publications, Store, Events, and Global. A green arrow points to the 'Resources' menu item. Below the navigation bar, the IIAR logo is displayed with the tagline 'The International Institute of All-Natural Refrigeration'. The main heading reads 'IIAR Resources', followed by a paragraph describing the new Resource Site. A blue button labeled 'ACCESS IIAR RESOURCES' is positioned at the bottom of the content area.

Choosing the Right Low GWP refrigerant for your chiller application.

The screenshot shows the IIAR website header with contact information (703-312-4200, info@iiar.org) and a search bar. The main navigation menu includes Home, Foundation, About Us, Resources, Education, Publications, Store, and Events. A dropdown menu is open under Resources, listing: Magazine, Natural Refrigeration Directory, Natural Refrigerant Tool, Natural Refrigerants Training Programs, Ammonia Refrigeration Global Standards and Regulations, Informational Papers & Videos on Natural Refrigerants, Natural Refrigeration Career Center, and Machinery Room Ventilation Analysis Tool. A large green arrow points from the 'IIAR Resources' heading to the dropdown menu. Below the heading is a paragraph about the Resource Site and a blue button labeled 'ACCESS IIAR RESOURCES'.

703-312-4200 info@iiar.org Keyword search

iiar
The International Institute
of All-Natural Refrigeration

Home Foundation

About Us Resources Education Publications Store Events

Magazine
Natural Refrigeration Directory
Natural Refrigerant Tool
Natural Refrigerants Training Programs
Ammonia Refrigeration Global Standards and Regulations
Informational Papers & Videos on Natural Refrigerants
Natural Refrigeration Career Center
Machinery Room Ventilation Analysis Tool

IIAR Resources

IIAR has launched a new Resource Site designed to provide centralized access to technical and industry-specific information for the natural refrigeration community. This site brings together a range of tools and reference materials used by professionals across the natural refrigeration industry.

[ACCESS IIAR RESOURCES](#)

Choosing the Right Low GWP refrigerant for your chiller application.



IIAR RESOURCES

Menu | ☰

[Refrigerant Evaluator Tool](#) [Refrigerant Comparison](#) [Frequently Asked Questions](#) [Important Information About This Tool](#)

Refrigerant Evaluator Tool

Assess and compare all refrigerants, synthetic and natural, by chemical make-up, GWP, ODP, safety class, flammability, toxicity, compatibility, thermodynamic properties, relative efficiency and USA EPA SNAP approval.

Use the assessment chart below or click the button to access the assessment in a new page.

[View Refrigerant Assessment](#)



Choosing the Right Low GWP refrigerant for your chiller application.

R-744 (Carbon Dioxide) | Low Side Condition: **-20F** | High Side Condition: **70F**

Type	Natural		100 / ODP	1	0
Glide	0	0	Comp	3.97	
PSIG	214.9	1050	Flammability *		
Boiling Point	-109 F		Toxicity ***		
Lubricants	POE		Safety Class ***	A1	
Compression Ratio	NA		RCL ***	30,000 ppm	
Lat. Heat of Vapor	129.61	30.74	LFL ***		
Compatability Issue			BHP/TR****	2-stage only	

Chillers (700 GWP)	IR<200lbs (300 GWP)	IR>200lbs (150 GWP)
Meet **	Meet **	Meet **
2025	2025	2025

SNAP APPROVALS

The EPA uses the Significant New Alternatives Policy (SNAP) to approve refrigerants for specific use. Refer to the Rule or Notice below for details.

CS Warehouse	Ice Skating Rink	Industrial Process AC	Industrial Refrigeration	Positive Displ. Chiller	Very Low Temp Refrig.	Centrifugal Chillers
SNAP N-24	SNAP N-31	NO	NO	SNAP N-31	SNAP N-02	SNAP N-31
Comm. Ice Maker	Refrig. Transport	Retail Food Refrig.	Non-Mech Heat Trnsfr	Non-Res. Dehumid.	Res. and Lt. Comm. AC	Self Cont Ice Maker
NO	SNAP N-29	SNAP N-24	SNAP N-24	NO	NO	NO

**Use at your own risk. Follow local AHJ compliance, and EPA general regulations: [SNAP link here](#)*

- ** Determination made based upon GWP and how it relates to the EPA Rule of 10/6/23 authorized under The American Innovation & Manufacturing (AIM) Act enacted on 12/27/20.
- *** Classifications determined in accordance with the ASHRAE 34 Standard.
- **** BHP/TR used for comparative purposes. It has been estimated using a typical industry mid-sized screw compressors (non-economized and without subcooling).

Choosing the Right Low GWP refrigerant for your chiller application.

R-744 (Carbon Dioxide)			Low Side Condition: -20F	High Side Condition: 70F
Component Makeup			Type Natural	GWP 100 / ODP 1 0
R-744	Natural	100%	Glide 0 0	Compression Ratio 3.97
			PSIG 214.9 1050	Flammability *** No
			Boiling Point -109 F	Toxicity *** Lower
Chemical Name			Lubricants POE	Safety Class *** A1
Carbon Dioxide			Compression Ratio NA	RCL *** 30,000 ppm
Chillers (700 GWP)	IR<200lbs (300 GWP)	IR>200lbs (150 GWP)	Lat. Heat of Vapor 129.61 30.74	LFL ***
Meet **	Meet **	Meet **	Compatability Issue	BHP/TR**** 2-stage only
2025	2025	2025		

SNAP APPROVALS

The EPA uses the Significant New Alternatives Policy (SNAP) to approve refrigerants for specific use. Refer to the Rule or Notice below for details.

CS Warehouse	Ice Skating Rink	Industrial Process AC	Industrial Refrigeration	Positive Displ. Chiller	Very Low Temp Refrig.	Centrifugal Chillers
SNAP N-24	SNAP N-31	NO	NO	SNAP N-31	SNAP N-02	SNAP N-31
Comm. Ice Maker	Refrig. Transport	Retail Food Refrig.	Non-Mech Heat Trnsfr	Non-Res. Dehumid.	Res. and Lt. Comm. AC	Self Cont Ice Maker
NO	SNAP N-29	SNAP N-24	SNAP N-24	NO	NO	NO

*Use at your own risk. Follow local AHJ compliance, and EPA general regulations: [SNAP link here](#)

- ** Determination made based upon GWP and how it relates to the EPA Rule of 10/6/23 authorized under The American Innovation & Manufacturing (AIM) Act enacted on 12/27/20.
- *** Classifications determined in accordance with the ASHRAE 34 Standard.
- **** BHP/TR used for comparative purposes. It has been estimated using a typical industry mid-sized screw compressors (non-economized and without subcooling).

Choosing the Right Low GWP refrigerant for your chiller application.

R-410A			Low Side Condition: -20F	High Side Condition: 70F
Component Makeup			Type HFC	GWP 100 / ODP 2088 / 0
R-125	HFC	50%	Glide 0.1 / 0.2	Compression Ratio 5.43
R-32	HFC	50%	PSIG 40 / 276	Flammability *** No
			Boiling Point -60.9 F	Toxicity *** Lower
Chemical Name			Lubricants POE	Safety Class *** A1
			Compression Ratio 10.88	RCL *** 140,000 ppm
Chillers (700 GWP)	IR<200lbs (300 GWP)	IR>200lbs (150 GWP)	Lat. Heat of Vapor 108.91 / 75.90	LFL ***
Ban **	Ban **	Ban **	Compatability Issue	BHP/TR**** 110%
2025	2025	2025		

SNAP APPROVALS						
The EPA uses the Significant New Alternatives Policy (SNAP) to approve refrigerants for specific use. Refer to the Rule or Notice below for details.						
CS Warehouse	Ice Skating Rink	Industrial Process AC	Industrial Refrigeration	Positive Displ. Chiller	Very Low Temp Refrig.	Centrifugal Chillers
SNAP N-17/HiGWP	SNAP N-17/HiGWP	NO	SNAP N-17/HiGWP	SNAP N-17/HiGWP	SNAP N-17/HiGWP	SNAP N-17/HiGWP
Comm. Ice Maker	Refrig. Transport	Retail Food Refrig.	Non-Mech Heat Trnsfr	Non-Res. Dehumid.	Res. and Lt. Comm. AC	Self Cont Ice Maker
SNAP N-17/HiGWP	SNAP N-17/HiGWP	SNAP N-17/HiGWP	SNAP N-17/HiGWP	NO	NO	NO

*Use at your own risk. Follow local AHJ compliance, and EPA general regulations: [SNAP link here](#)

- ** Determination made based upon GWP and how it relates to the EPA Rule of 10/6/23 authorized under The American Innovation & Manufacturing (AIM) Act enacted on 12/27/20.
- *** Classifications determined in accordance with the ASHRAE 34 Standard.
- **** BHP/TR used for comparative purposes. It has been estimated using a typical industry mid-sized screw compressors (non-economized and without subcooling).

Choosing the Right Low GWP refrigerant for your chiller application.



IIAR RESOURCES

Menu | ☰

[Refrigerant Evaluator Tool](#) [Refrigerant Comparison](#) [Frequently Asked Questions](#) [Important Information About This Tool](#)

Refrigerant Comparison

Understanding your refrigerant is important to evaluating constituent chemicals in your plant, the environmental impacts that these chemicals present, and the potential regulatory impacts that you might face today, or in the future. There are Natural refrigerants, HCFC's (most of which are already banned), HFC's (many of which are beginning to face regulatory bans), HFC/HFO Blends (often referred to as HFO blends which are blended with HFC's to reduce the GWP impact), and HFO refrigerants (newly designed refrigerants to meet lower GWP thresholds).

Below is a summary of the selected refrigerant at a given set of test conditions. This information is not intended to be used as a design guide but instead as a comprehensive overview of each refrigerant's relative properties.* For further explanations of each technical terminology below, please see the "FAQ" section of this webpage.

Use the assessment chart below or click the button to access the assessment in a new page.

[View Refrigerant Comparison](#)

Choosing the Right Low GWP refrigerant for your chiller application.

Refrigerant Temp: -20F	R-290 (Propane)	R-717 (Ammonia)	R-410A
Chemical Name	Propane	Ammonia	
BHP/TR @ 70CT 95CT 120CT	105% 108.4% 112.6%	100% 100% 100%	110.3% 120.3% 132.8%
GWP 100/ODP	3 0	0 0	2088 0
Flammability ***	Yes	Yes	No
Toxicity ***	Lower	Higher	Lower
Safety Class ***	A3	B2L	A1
RCL ***	5,300 ppm	320 ppm	140,000 ppm
LFL ***	21,000 ppm	167,000 ppm	
Glide	0	0	0.1
Lubricants	MO, AB	MO, PAO	POE
Type	Natural	Natural	HFC

*Use at your own risk. Follow local AHJ compliance, and EPA general regulations: [SNAP link here](#)

** Determination made based upon GWP and how it relates to the EPA Rule of 10/6/23 authorized under The American Innovation & Manufacturing (AIM) Act enacted on 12/27/20.

*** Classifications determined in accordance with the ASHRAE 34 Standard.

Choosing the Right Low GWP refrigerant for your chiller application.

Refrigerant Temp: -20F	R-1234ze(E)	R-717 (Ammonia)	R-410A
Chemical Name	trans-1,3,3,3-Tetrafluoro-1-propene	Ammonia	
BHP/TR @ 70CT 95CT 120CT	130.6% 128.6% 128.6%	100% 100% 100%	110.3% 120.3% 132.8%
GWP 100/ODP	7 0	0 0	2088 0
Flammability ***	Yes	Yes	No
Toxicity ***	Lower	Higher	Lower
Safety Class ***	A2L	B2L	A1
RCL ***	16,000 ppm	320 ppm	140,000 ppm
LFL ***	65,000 ppm	167,000 ppm	
Glide	0	0	0.1
Lubricants	POE	MO, PAO	POE
Type	HFO	Natural	HFC

**Use at your own risk. Follow local AHJ compliance, and EPA general regulations: [SNAP link here](#)*

*** Determination made based upon GWP and how it relates to the EPA Rule of 10/6/23 authorized under The American Innovation & Manufacturing (AIM) Act enacted on 12/27/20.*

**** Classifications determined in accordance with the ASHRAE 34 Standard.*

Choosing the Right Low GWP refrigerant for your chiller application.

Refrigerant Temp: -20F	R-513A	R-717 (Ammonia)	R-410A
Chemical Name		Ammonia	
BHP/TR @ 70CT 95CT 120CT	119.1% 119.8% 131.6%	100% 100% 100%	110.3% 120.3% 132.8%
GWP 100/ODP	631 0	0 0	2088 0
Flammability ***	No	Yes	No
Toxicity ***	Lower	Higher	Lower
Safety Class ***	A1	B2L	A1
RCL ***	72,000 ppm	320 ppm	140,000 ppm
LFL ***		167,000 ppm	
Glide	0	0	0.1
Lubricants	POE	MO, PAO	POE
Type	HFC/HFO Blend	Natural	HFC

*Use at your own risk. Follow local AHJ compliance, and EPA general regulations: [SNAP link here](#)

** Determination made based upon GWP and how it relates to the EPA Rule of 10/6/23 authorized under The American Innovation & Manufacturing (AIM) Act enacted on 12/27/20.

*** Classifications determined in accordance with the ASHRAE 34 Standard.

Choosing the Right Low GWP refrigerant for your chiller application.

Refrigerant Evaluator & Comparison Tool

Chillers (700 GWP): 21 Refrigerants

IR<200lbs (300 GWP): 16 Refrigerants

For Industrial Refrigeration (IR) Systems.

IR>200lbs (150 GWP): 14 Refrigerants

For Industrial Refrigeration (IR) Systems.

Choosing the Right Low GWP refrigerant for your chiller application.

Choosing the Right Refrigerant

The choice of the refrigerant depends on several factors, including:

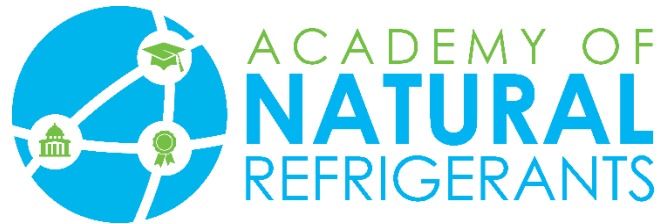
- Environmental Regulations
- Updated Standards & Codes
- System Compatibility (Valves, Oil, Sizing)
- Safety Considerations
- Market Availability (Refrigerant Supply Limit)

Authority Having Jurisdiction (AHJ)

Choosing the Right Low GWP refrigerant for your chiller application.

For questions regarding IAR educational products and services, please contact us at:

education@iiar.org



SAFE AND SUSTAINABLE USE OF NATURAL REFRIGERANTS

About the Speaker



Fred Berry
Johnson Controls

- Product Manager for Large Tonnage Chiller and Electronic Products at Johnson Controls
- With JCI since 1986; led OptiView controls and variable-speed drive development
- Oversees product and application requirements for York screw and centrifugal chillers

Sponsored by
Johnson Controls 



Choosing the Right Low GWP Refrigerant for Your Chiller Application

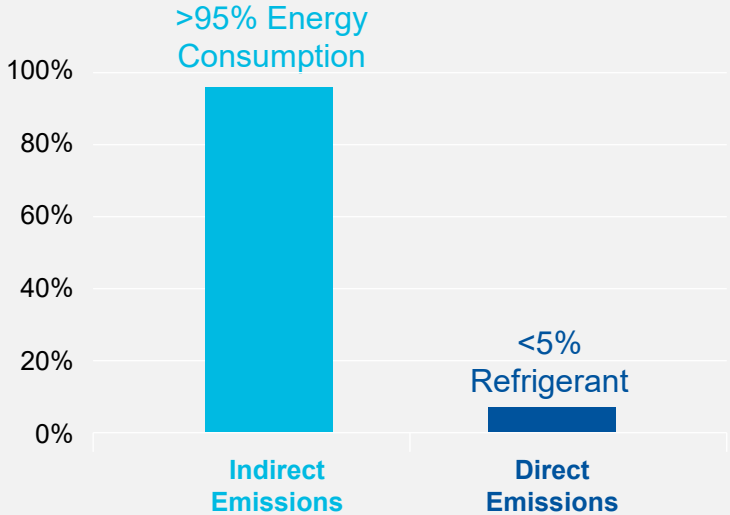
Regulatory Updates

HVAC Equipment Carbon Footprint

Chiller Carbon Footprint

- Refrigerant emissions are insignificant when compared to the indirect emissions from energy production needed to power HVAC equipment

Chiller CO₂ Emissions Footprint



Indirect Emissions

- Annual kWh used
- CO₂ emissions / kWh generated

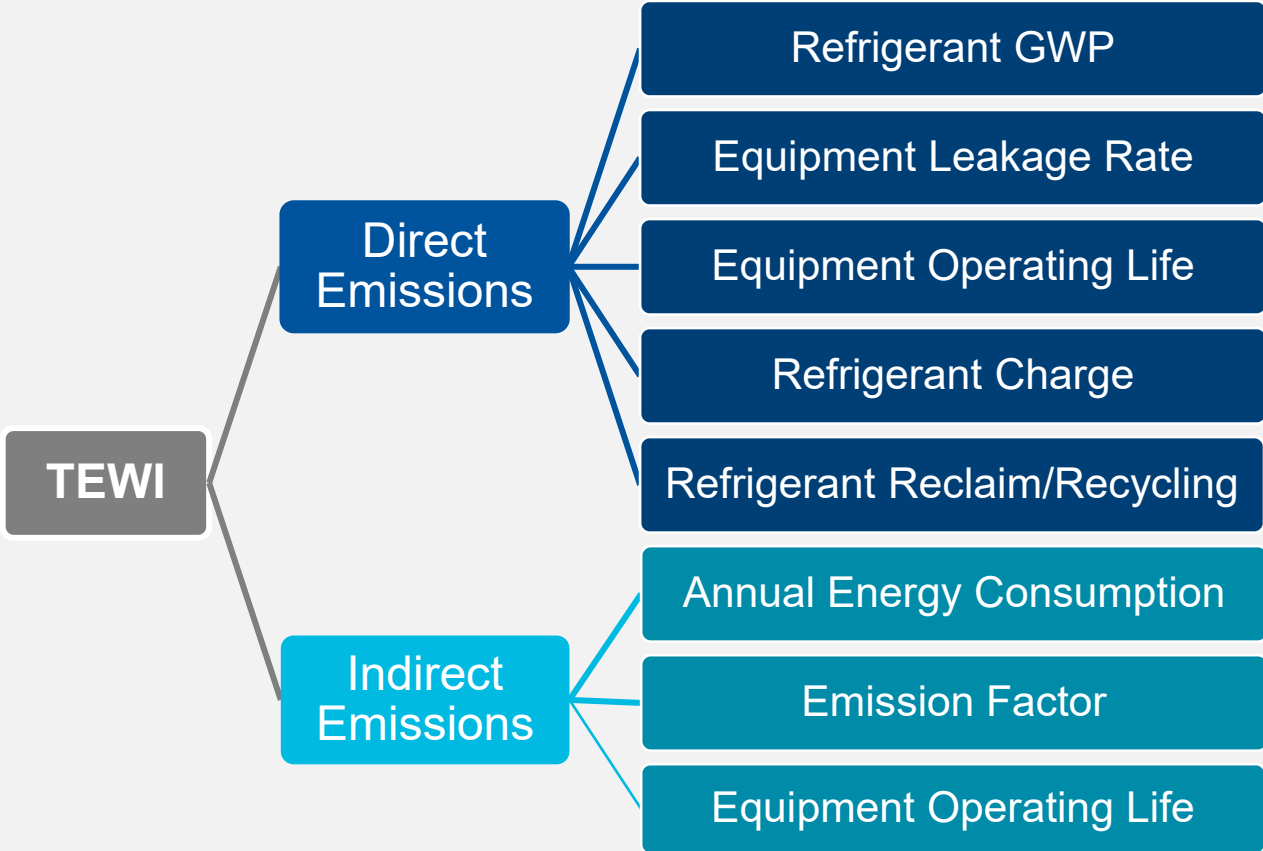
Direct Emissions

- Refrigerant leaks
- Escape during servicing
- Refrigerant not recovered at end-of-life

Energy Efficiency

has the greatest impact on chiller plant total cost of ownership and environmental impact

Calculating Carbon Footprint: Total Equivalent Warming Impact (TEWI)

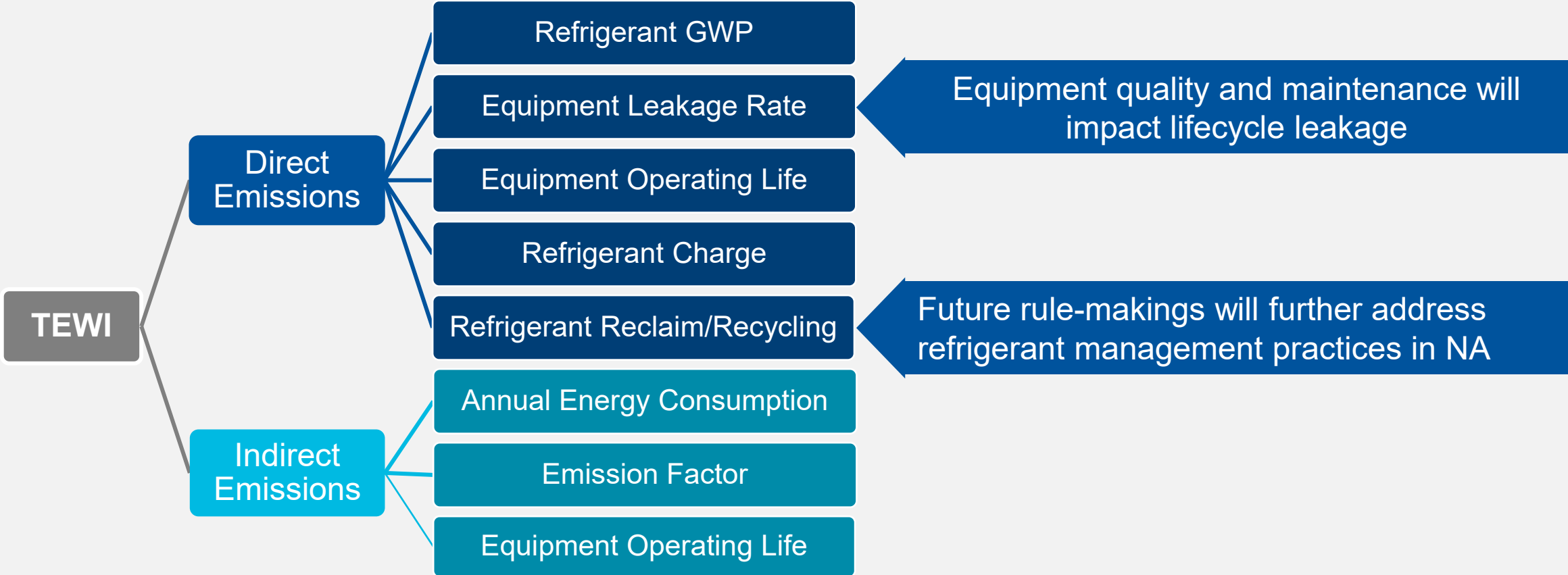


TEWI – Summary

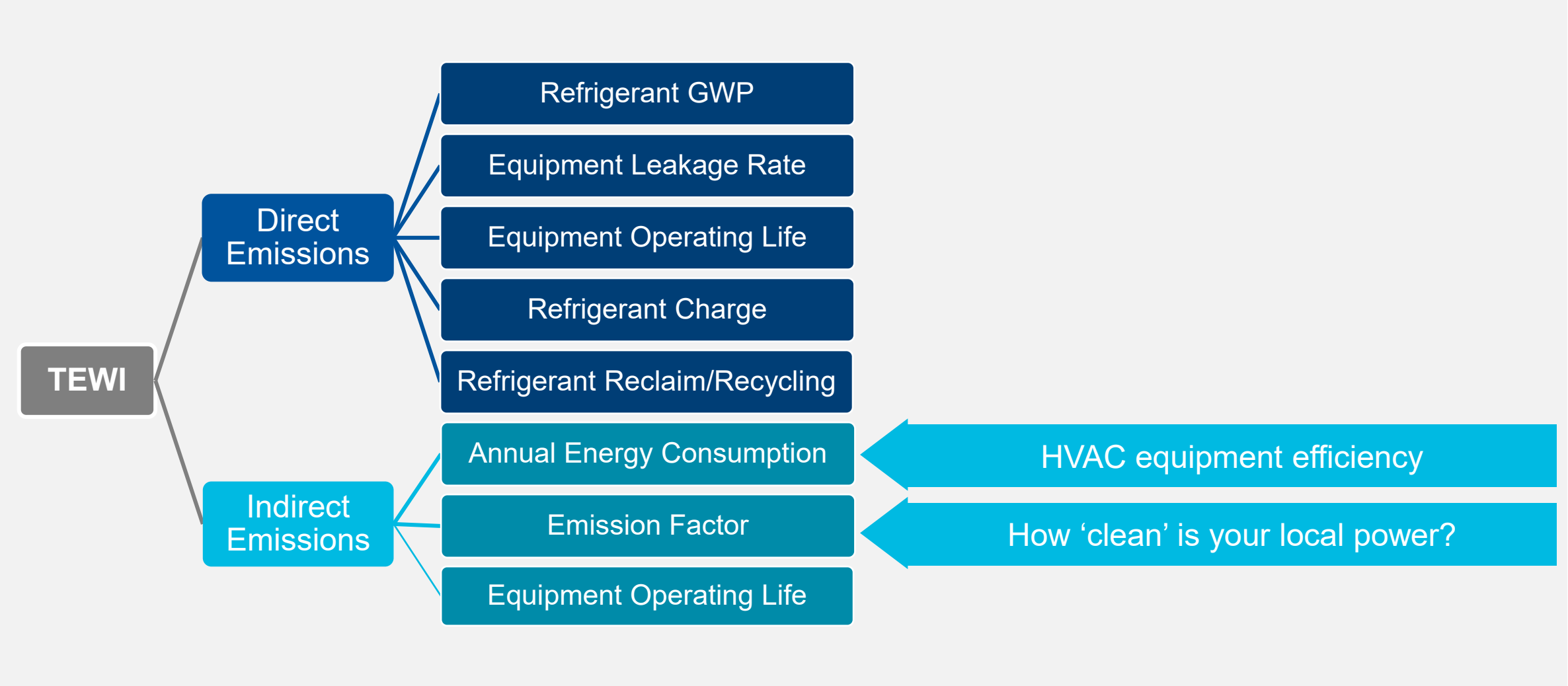
- Quantifies refrigerant impact on Global Warming in CO₂ equivalence
- **Direct Emissions** = refrigerant released from HVAC equipment to the earth’s atmosphere
- **Indirect Emissions** = CO₂ emissions from the generation of electricity to operate HVAC equipment

$$\text{TEWI} = \text{Direct Emissions} + \text{Indirect Emissions}$$

Calculating Carbon Footprint: Total Equivalent Warming Impact (TEWI)








Calculating Carbon Footprint: Total Equivalent Warming Impact (TEWI)



North America Regulations and Legislation

Climate protection regulations and policies

Ozone Protection	 Montreal Protocol	<ul style="list-style-type: none">• Sets complete phase-out schedule for fluids with Ozone Depletion Potential (ODP) > 0• Bans the use of CFC and HCFC refrigerants including R-22 and R-123• Globally ratified in 1987		
Global Warming Protection	 Kigali Amendment to the Montreal Protocol	 U.S. EPA SNAP Rules	 State Level Climate Legislation	 United States Climate Alliance



Climate Protection Regulations

Montreal Protocol

- Ratified in 1987 – addresses Ozone depleting substances

Kigali Amendment

- Targets HFCs and GWP (85% reduction by 2047*)

EPA SNAP Rules (US Only)

- Publishes acceptable and unacceptable refrigerants by end-use

AIM Act (US only)

- HFC phase-**down** and sector-based mandates
- No new chillers with GWP > 700 after 1/1/2025

Paris Accord

- Limits global warming to <2°C (preferably <1.5°C) by end of century
- Canada ratified in 2016
- The United States formally rejoined on February 19, 2021

* 85% HFC reduction by 2036 for Developed Countries, including CAN and USA

Kigali Amendment Ratification

Support for Kigali Amendment Ratification

- U.S. HVACR industry is pushing for Kigali Amendment ratification
 - Letter sent to President Trump in May 2018
 - Alliance for Responsible Atmospheric Policy (ARAP)
 - Air Conditioning Heating and Refrigeration Institute (AHRI)
 - Signed by 32 leading HVACR and refrigerant companies
- Ratification is vital for U.S. jobs, economy, and trade
 - S.2754 - American Innovation and Manufacturing Act of 2019
 - H.R.5544 American Innovation and Manufacturing Leadership Act of 2020
- Align United States with global HFC phase-down efforts
 - Provide unified legislation for the country
 - Prevent fragmented state-level regulations



Implementation of Kigali Amendment required ratification by 20 countries

- 81 countries have ratified as of September 2019
- HFC Phase-down schedules begin January 1, 2019
- Countries that do not ratify by 2033 are subject to trade provisions

© 2020 Johnson Controls. All rights reserved.

Kigali Amendment to the Montreal Protocol

- Targets HFC refrigerants and Global Warming Potential (GWP) level of refrigerants
- Defines a 15 year phase-**down** schedule of HFCs through 2036
 - Includes phase-down of R-134a and R-410A
- Impacts Chiller, Ducted Systems, Industrial Refrigeration and VRF new products
- The United States must ratify before 2033 for international cooperation
- JCI fully supports Kigali Amendment ratification



S.2754 – The American Innovation and Manufacturing (AIM) Act

AIM Act (United States only)

- Included in the December 2020 Omnibus / COVID Stimulus Bill
- Grants the U.S. Environmental Protection Agency (EPA) authority to regulate refrigerants on GWP value – not just on Ozone Depletion Potential (ODP) value
- Specifically addresses HFC refrigerants
- **Aligns with the Kigali Amendment's 15 year HFC phase-down schedule**
- **Allows for sector-based limitations**
- Allows the EPA to address Service Practices
 - Refrigerant Recovery and Reclaim
- Kigali Amendment Ratification is still needed to gain international influence

The AIM Act
S.2754 – The American Innovation and Manufacturing Act of 2019

Description of the AIM Act

The AIM Act provides a highly limited and discrete grant of authority to EPA to phase down HFCs. The Act cannot be used for any purpose other than phasing down HFCs.

The AIM Act was prepared with substantial input from experts and others in industry and the environmental community with significant experience with Title VI programs, with the common goal of ensuring an effective and efficient HFC phase down.

The AIM Act supports a transition to next generation refrigerant technologies in 3 primary ways:

- 1. HFC production**
HFC production and consumption is phased down over a 15-year period via a closed allowance allocation and trading program. This provides for an orderly and market- and consumer-friendly transition from HFCs.
- 2. EPA authorization**
EPA is authorized to establish standards for the management of HFCs used as refrigerants, such as in equipment servicing and repair, and for the recovery of "used" HFCs for purification and resale, known as reclaim. This helps ensure an adequate supply of HFCs for servicing existing equipment.
- 3. Sector-based use restrictions**
EPA can establish sector-based use restrictions, as a way to facilitate transitions to next generation refrigerant technologies. These restrictions would complement the broader production and consumption phase down, aiding sectors able to transition more quickly away from HFCs and providing more flexibility for those sectors in need of more time to complete a transition.

Consumer Benefits

American consumers will benefit from the transition from HFCs to more environmentally friendly, more efficient cooling, refrigeration, and air conditioning products and equipment.

As with previous technology transitions, existing consumer equipment would not be impacted by the HFC phase down. HFCs will remain available for servicing existing equipment, as was the case for prior transitions from older refrigerants, such as CFCs, without harm to consumers.

Existing equipment not impacted

Visit www.AIMforJobs.org

Background

The AIM Act authorizes the U.S. Environmental Protection Agency (EPA) to regulate a group of about 20 substances known as HFCs.

HFCs are widely used as refrigerants, solvents, fire suppressants, foam blowing agents, aerosols, propellants, and various other applications.

HFCs were developed and commercialized as substitutes for chemicals that deplete the stratospheric ozone layer. Those ozone-depleting substances were phased out under Title VI of the Clean Air Act.

The AIM Act is based on the Title VI standards, which allowed the market to transition to next generation technologies in a way that protected the environment while supporting U.S. industry's commercial objectives and the needs of consumers – a "win-win-win" approach.

Visit www.AIMforJobs.org

of 2019

In HFCs, the AIM Act will:

- Create 33,000 new manufacturing jobs and sustain 138,400 existing jobs between now and 2027.
- Increase direct manufacturing output by \$12.5 billion, and total direct and indirect manufacturing output by \$38.8 billion between now and 2027.
- Improve the U.S. trade balance in equipment and chemicals by \$12.5 billion.

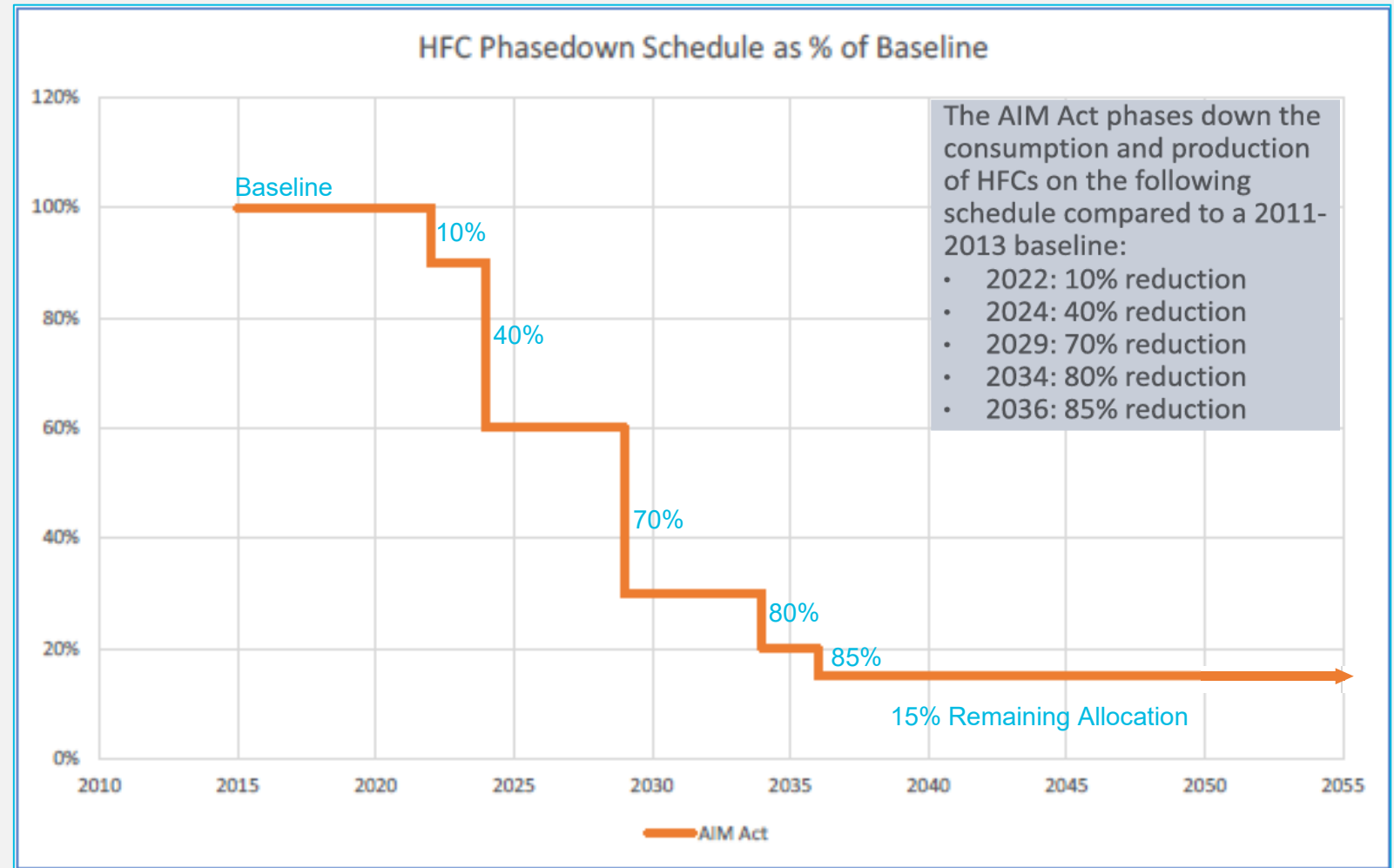
AIM Act summary:
https://ahrinet.org/App_Content/ahri/files/Resources/AHRI_AIM_Act-one_pager.pdf



S.2754 – The American Innovation and Manufacturing (AIM) Act

AIM Act (United States only)

- HFC phase-down, not out
- HFC Baseline from 2011-2013 HFC levels
- 15% remaining at 2036 will remain indefinitely or until EPA takes additional action
- Note: The Montreal Protocol completely eliminated refrigerants with ODP > 0 (including R-22 and R-123)





S.2754 – The American Innovation and Manufacturing (AIM) Act

AIM Act (United States only)

- Sector based mandates will drive earlier reductions
 - Ex: SNAP listings

Sector-Based Mandates – R-410A (GWP = 2088)

- No NEW chillers built after January 1, 2025
- No NEW Unitary AC Systems built after January 1, 2025
- Unitary AC Systems built before 1/1/2025 can be installed until 1/1/2026
- VRF >5 tons, built and installed until 1/1/2026

- **Johnson Controls' answer: R-454B (GWP = 466)**
 - 77% lower GWP compared to R-410A
 - Refrigerant Safety classification = A2L (mildly flammable)



S.2754 – The American Innovation and Manufacturing (AIM) Act

AIM Act (United States only)

- Sector based mandates will drive earlier reductions
 - Ex: SNAP listings

Sector-Based Mandates – R-134a (GWP = 1430)

- No NEW chillers built after January 1, 2025
- **Johnson Controls' answer: R-513A (GWP = 631)**
 - 60% lower GWP compared to R-134a
 - Refrigerant Safety classification = A1
 - **Best Option = R-134a → R-513A retrofit available if required**
- Other chillers use ultra-low GWP R-1233zd
 - GWP = 4.5
 - Capacity range 150 to 1500 tons



S.2754 – The American Innovation and Manufacturing (AIM) Act

AIM Act (United States only)

- Sector based mandates will drive earlier reductions
 - Ex: SNAP listings

Exceptions & Extensions

- **Process/Industrial with 134a**
 - No NEW chillers built after January 1, 2026
- **Data Center with 134a**
 - No NEW chillers built after January 1, 2027

Three factors to reduce HVAC equipment carbon footprint

1

Design, specify or buy high efficiency chiller equipment and systems

2

Maintain equipment for ultimate performance and leak prevention

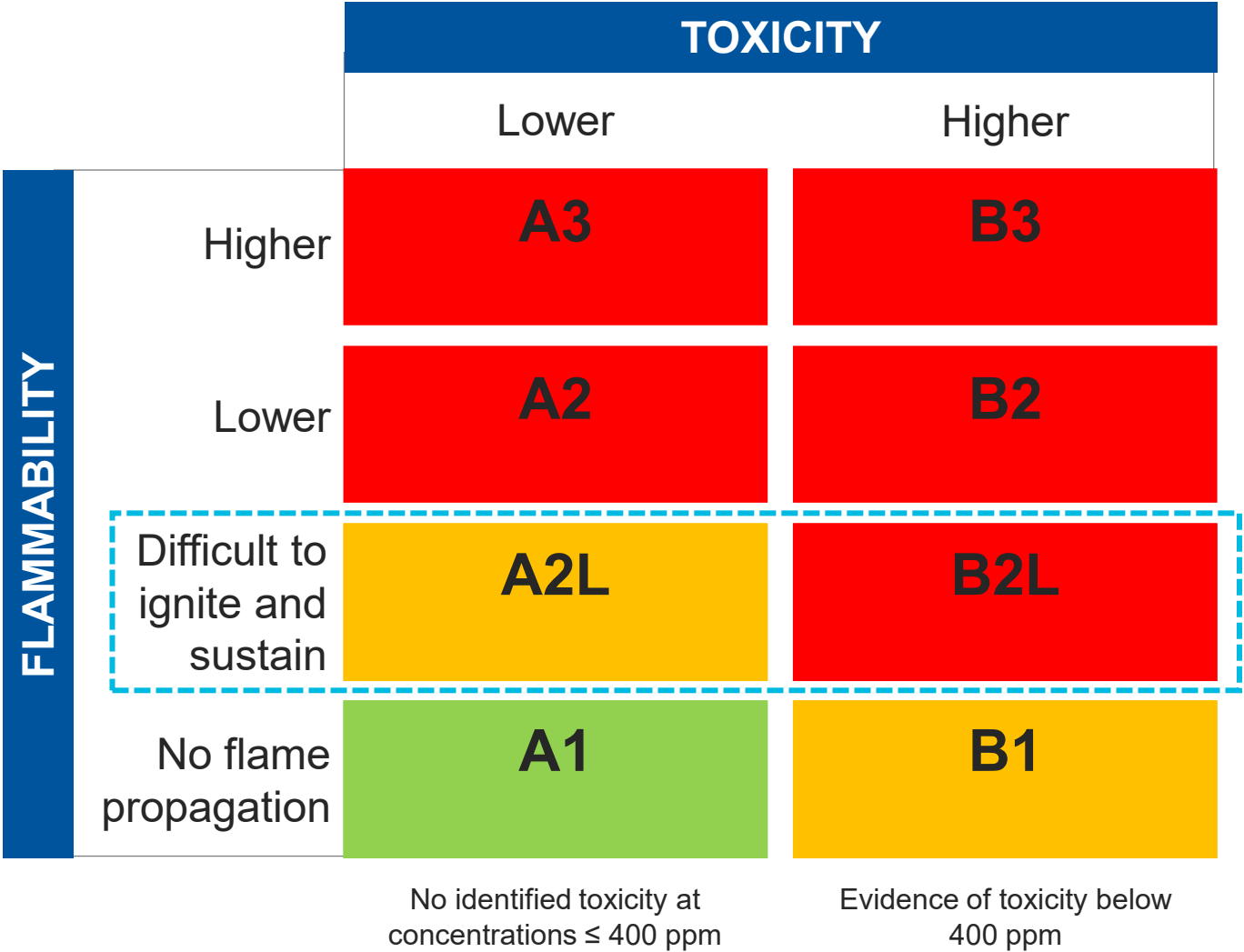
3

Choose sustainable refrigerants

Alternative Refrigerants Choices

Refrigerant Classifications – Safety

Designation		Classification
HCFC	R-22 <small>ODP > 0</small>	A1
HCFC	R-123 <small>ODP > 0</small>	B1
HFC	R-410A	A1
HFC	R-134a	A1
HFC	R-32	A2L
Blend	R-514A	B1
Blend	R-513A	A1
Blend	R-454B	A2L
HFO	R-1233zd	A1
HFO	R-1234ze	A2L



Refrigerant Comparison

	Low Pressure Centrifugal (vs. R-123)	
	R-1233zd	R-514A
GWP	✓ 4.5	✓ 2
Toxicity Classification	✓ Low	✗ Higher
Flammability Classification	✓ None	✓ None
Efficiency	✓ Highest	✗ Lower
Capacity	✓ High	✗ Lower
Cost	✗ Higher	✗ High
Footprint	✗ Largest	✗ Largest
Refrigerant Producers (global)	✓ Multiple	✗ One
Chiller Manufacturers (global)	✓ Multiple	✗ One
Adjacent Industry Use	✓ Foam Blowing	✗ None

GWP values are per the Fourth Assessment Report (AR4) of the IPCC

Refrigerant Comparison

	Low Pressure Centrifugal (vs. R-123)		Medium Pressure Centrifugal and Screw (vs. R-134a)		
	R-1233zd	R-514A	R-515B	R-513A	R-1234ze
GWP	✓ 4.5	✓ 2	✓ 293	✓ 631	✓ 7
Toxicity Classification	✓ Low	✗ Higher	✓ Low	✓ Low	✓ Low
Flammability Classification	✓ None	✓ None	✓ None	✓ None	✗ Mild
Efficiency	✓ Highest	✗ Lower	✗ Lower	✗ Lower	✗ Lower
Capacity	✓ High	✗ Lower	✓ Lower	✓ Similar	✗ Lower
Cost	✗ Higher	✗ High	✗ Higher	✗ Higher	✗ Higher
Footprint	✗ Largest	✗ Largest	✗ Larger	✓ Smaller	✗ Larger
Refrigerant Producers (global)	✓ Multiple	✗ One	✗ One	✓ Multiple	✗ One
Chiller Manufacturers (global)	✓ Multiple	✗ One	✓ Multiple	✓ Multiple	✓ Multiple
Adjacent Industry Use	✓ Foam Blowing	✗ None	✓ Industrial and Commercial Refrigeration	✓ Industrial and Commercial Refrigeration	✓ Heat Pumps, Vending machines, Refrigerators

Refrigerant Comparison

	Low Pressure Centrifugal (vs. R-123)		Medium Pressure Centrifugal and Screw (vs. R-134a)			High Pressure Scroll (vs. R-410A)	
	R-1233zd	R-514A	R-515B	R-513A	R-1234ze	R-454B	R-32
GWP	✓ 4.5	✓ 2	✓ 293	✓ 631	✓ 7	✓ 466	✓ 675
Toxicity Classification	✓ Low	✗ Higher	✓ Low	✓ Low	✓ Low	✓ Low	✓ Low
Flammability Classification	✓ None	✓ None	✓ None	✓ None	✗ Mild	✗ Mild	✗ Mild
Efficiency	✓ Highest	✗ Lower	✗ Lower	✗ Lower	✗ Lower	✓ High	✓ High
Capacity	✓ High	✗ Lower	✓ Lower	✓ Similar	✗ Lower	✓ High	✓ High
Cost	✗ Higher	✗ High	✗ Higher	✗ Higher	✗ Higher	✗ Higher	✗ Higher
Footprint	✗ Largest	✗ Largest	✗ Larger	✓ Smaller	✗ Larger	✓ Smaller	✓ Smaller
Refrigerant Producers (global)	✓ Multiple	✗ One	✗ One	✓ Multiple	✗ One	✓ Multiple	✗ One
Chiller Manufacturers (global)	✓ Multiple	✗ One	✓ Multiple	✓ Multiple	✓ Multiple	✓ Multiple	✓ Multiple
Adjacent Industry Use	✓ Foam Blowing	✗ None	✓ Industrial and Commercial Refrigeration	✓ Industrial and Commercial Refrigeration	✓ Heat Pumps, Vending machines, Refrigerators	✓ Heat Pumps, Vending machines, Refrigerators	

Three factors to reduce HVAC equipment carbon footprint.



Design, specify or buy high efficiency chiller equipment and systems



Maintain equipment for ultimate performance and leak prevention



Choose sustainable refrigerants



Thank You!

Best Practices EXPO Contest

Win a FREE \$675 Full Conference Pass!

Best Practices 2026 Expo & Conference

Open to factory personnel, manufacturers' reps, distributors, utility programs, mechanical contractors, and engineers

Submit your poll answer to qualify.
Winners notified Monday!

Which refrigerant safety class indicates no flame propagation and lower toxicity?

A

- A1

B

- A3

C

- B2L

Choosing the Right Low-GWP Refrigerant for Your Chiller Application

Q&A

Please submit any questions through the Question Window on your GoToWebinar interface, directing them to Compressed Air Best Practices Magazine. Our panelists will do their best to address your questions and will follow up with you on anything that goes unanswered during this session.

Thank you for attending!

Sponsored by

**Johnson
Controls**

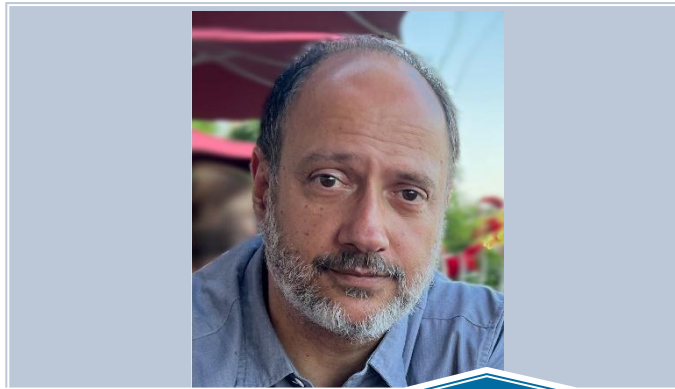


Thank you for attending!

The recording and slides of this webinar will be made available to attendees via email later today.

PDH Certificates will be e-mailed to Attendees within 2 days.

June 2026 Webinar
Understanding Compressed Air Load Profiles and Peak Demand Management



Mauricio Uribe
Compressed Air Consultants
Keynote Speaker

Sponsored by



Thursday, June 25, 2026– 2:00 PM EDT

Register for free at

www.airbestpractices.com/webinars