

# From Compliance to Competitiveness

## Natural Refrigerants in Commercial Cooling

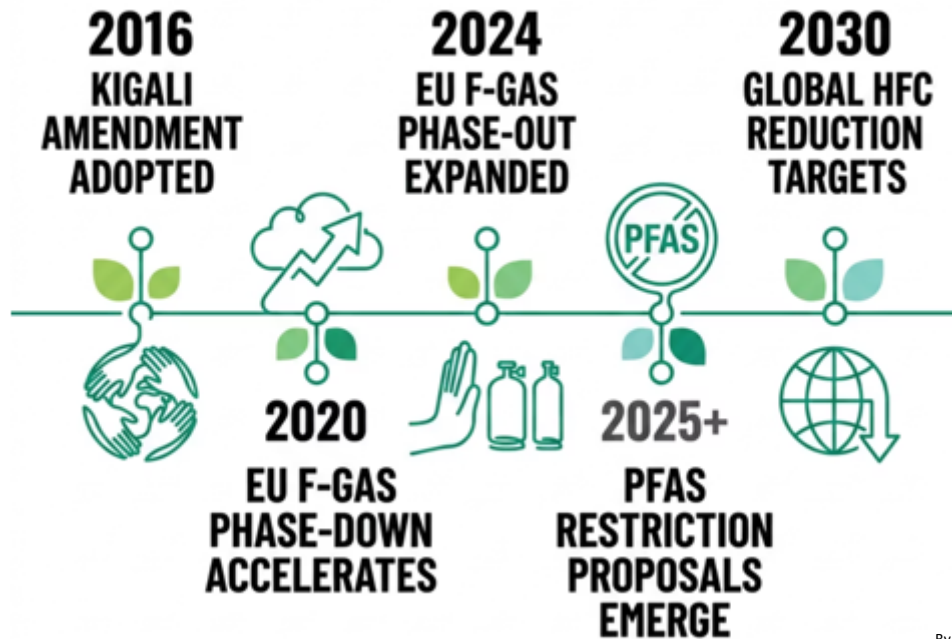
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# Regulation as a Market Catalyst

Regulation is reshaping global markets — creating both risk and opportunity



By AI

## Key Market Drivers

- Sustainability mandates
- Regulatory pressure
- Energy efficiency
- Future proofing

# Natural Refrigerants - Opportunity and Reality

No single refrigerant fits all applications



## Safety

Flammability, toxicity and building code compliance



## Availability

Supply chain access across global markets



## Technical Feasibility

System design compatibility and performance



## Economic Feasibility

Total cost of ownership and affordability

## Barriers & Enablers

### Challenges

Flammability standards, technician training, infrastructure gaps, cost barriers in developing markets



### Path Forward

Updated safety standards, certification programs, improved system design, policy support, industry collaboration

# Balanced Refrigerant Strategy Across Applications

Johnson Controls supports both synthetic and natural refrigerants — matched to application requirements, safety, and market readiness



## Natural Refrigerant Portfolio

R290 – Propane

Commercial Cooling and Heating

R744 – CO<sub>2</sub>

Industrial Cooling and Heating

R717 - Ammonia

Industrial Cooling and Heating

R718 - Water

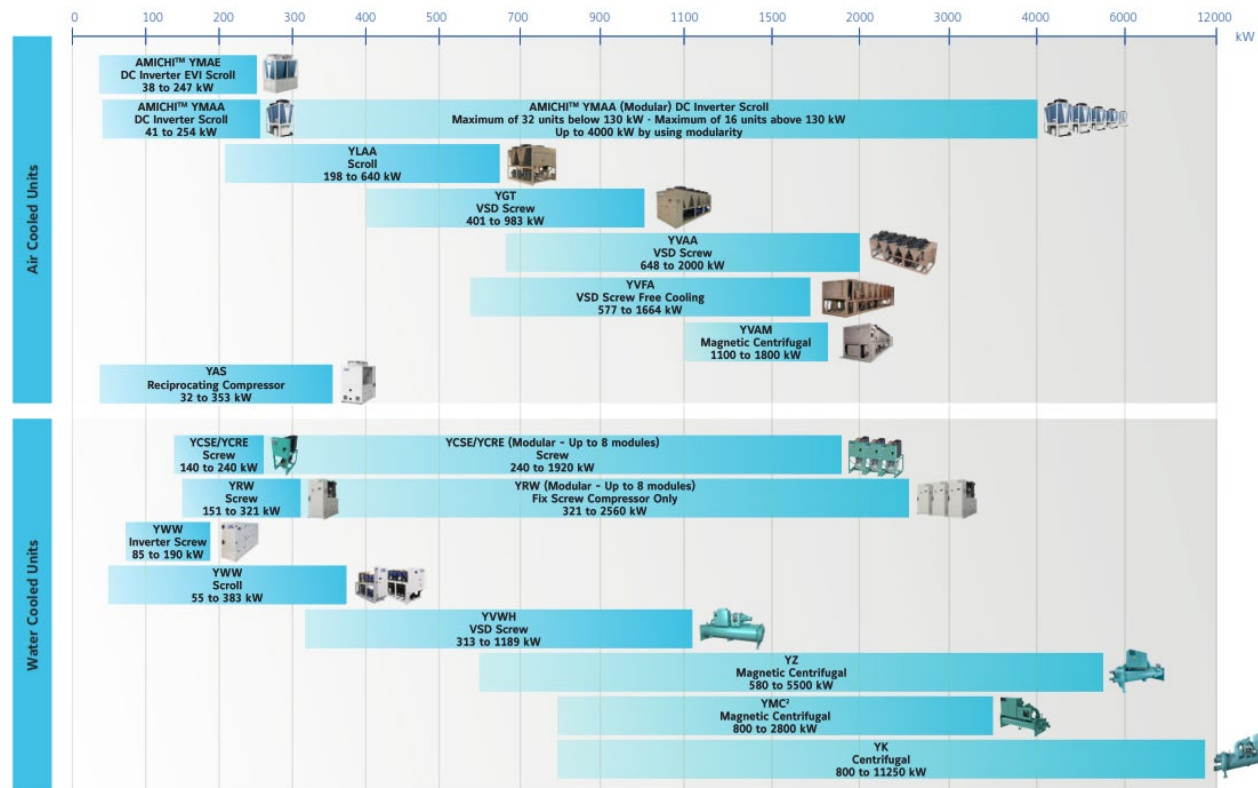
District Cooling and Heating

R600 - Butane

R600a - Isobutane

Large District Heating and HTHP

### YORK Chiller Units



# Case Study: University Germany

Documenting real-world natural refrigerant deployments in commercial buildings



By AI



University / R&D  
Bavaria / Germany

Lab & Office Building  
Air Conditioning

Customer ask  
Natural refrigerant

Cooling Capacity: 257kW  
Type: Air Cooled  
Temperature Conditions:  
10/4°C with 38°C Ambient  
EER: 2.7  
Refrigerant / Charge:  
Propane / 16kg  
Sound Power: 59 dB(A)

# The Path Forward: Compliance Meets Competitiveness



## **Regulation accelerates transformation**

F-Gas, Kigali, and PFAS are reshaping global cooling markets

## **Natural refrigerants are increasingly viable**

Application-specific decisions unlock real opportunity

## **Safety and feasibility are non-negotiable**

Engineering rigor and standards enable safe adoption

## **Developing markets need scalable solutions**

Affordability, training, and infrastructure are critical

## **Collaboration drives progress**

Industry, policymakers, and stakeholders must align

# Thank you



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