globalFACTForumLIVE

Understanding Refrigerant Policy Drivers and Practical Implications

Please send presentation questions to
questions@globalFACT.org

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- 50 years of experience in building technology, refrigerants and energy efficiency compliance
- Montreal Protocol, Kyoto Protocol, and climate change policy influencer
- Chairman of the International Policy Committee, Business Council for Sustainable Energy
- Former President, American Society for Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
- Former Chairman, Alliance for Responsible Atmospheric Policy (ARAP)
- Recipient, U.S. EPA Award for Leadership in Ozone Protection
- BS, Electrical Engineering, University of Arizona; MBA, American University

GLOBAL POLICY DRIVING REFRIGERANT TRANSITIONS

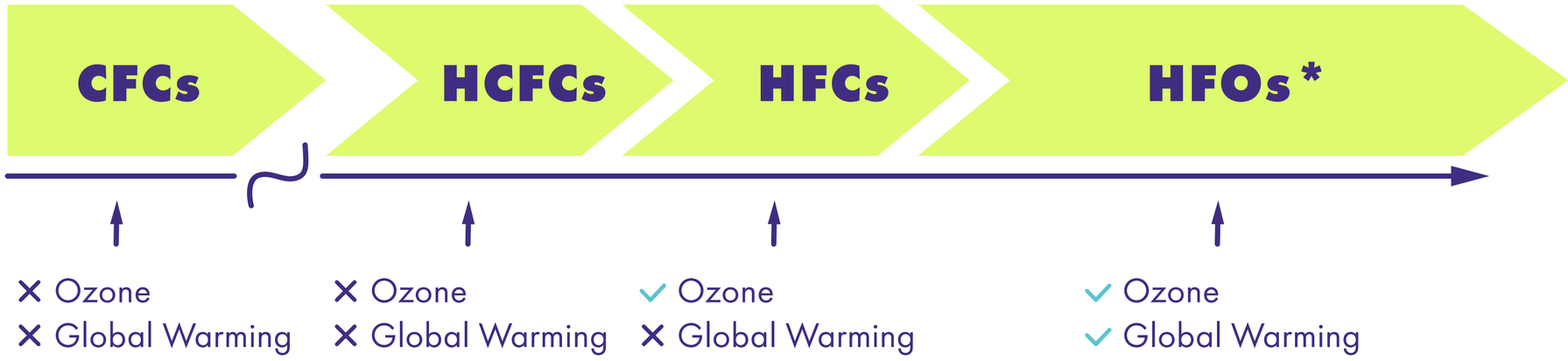
MONTREAL PROTOCOL
Ozone Depletion

CFC
Phase-out

HCFC
Phase-out

KIGALI AGREEMENT
Climate Change

HFC
Phase-Down



*HFOs and other low-GWP alternatives

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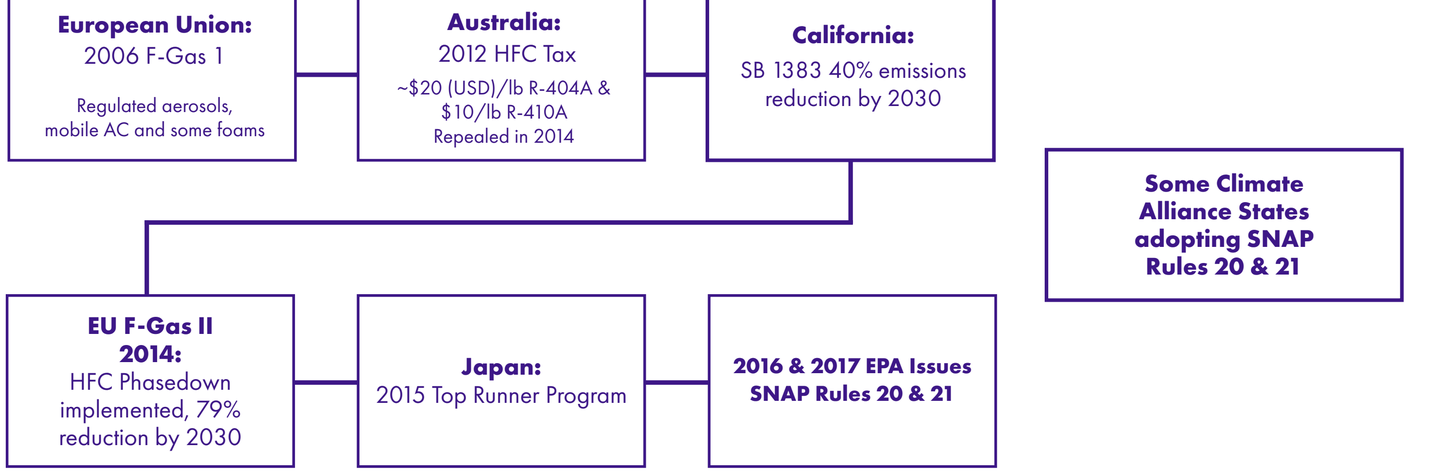
DOMESTIC REGULATIONS FORCING TECHNOLOGY *DEVELOPMENT*



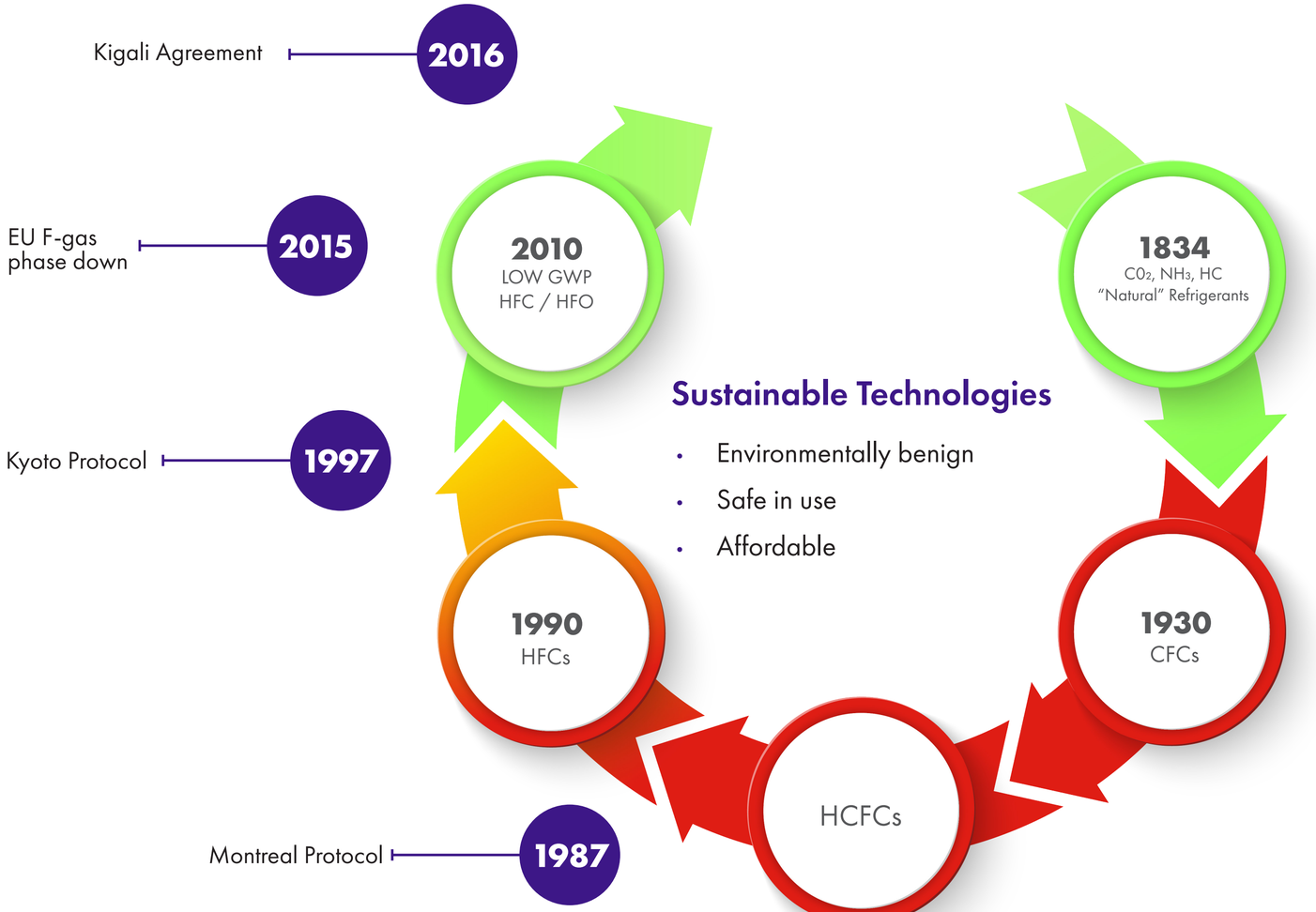
Bottom Line: Local to global, governments are regulating HFCs

Graphic From AHRI

- Canada proposed rule on HFCs & Refrigerant Management

- EPA-issued SNAP rules 20 and 21 partially invalidated by the Court (some U.S. states adopting)

WE CONTINUE TO SEARCH FOR THE IDEAL REFRIGERANT



Source: ORNL

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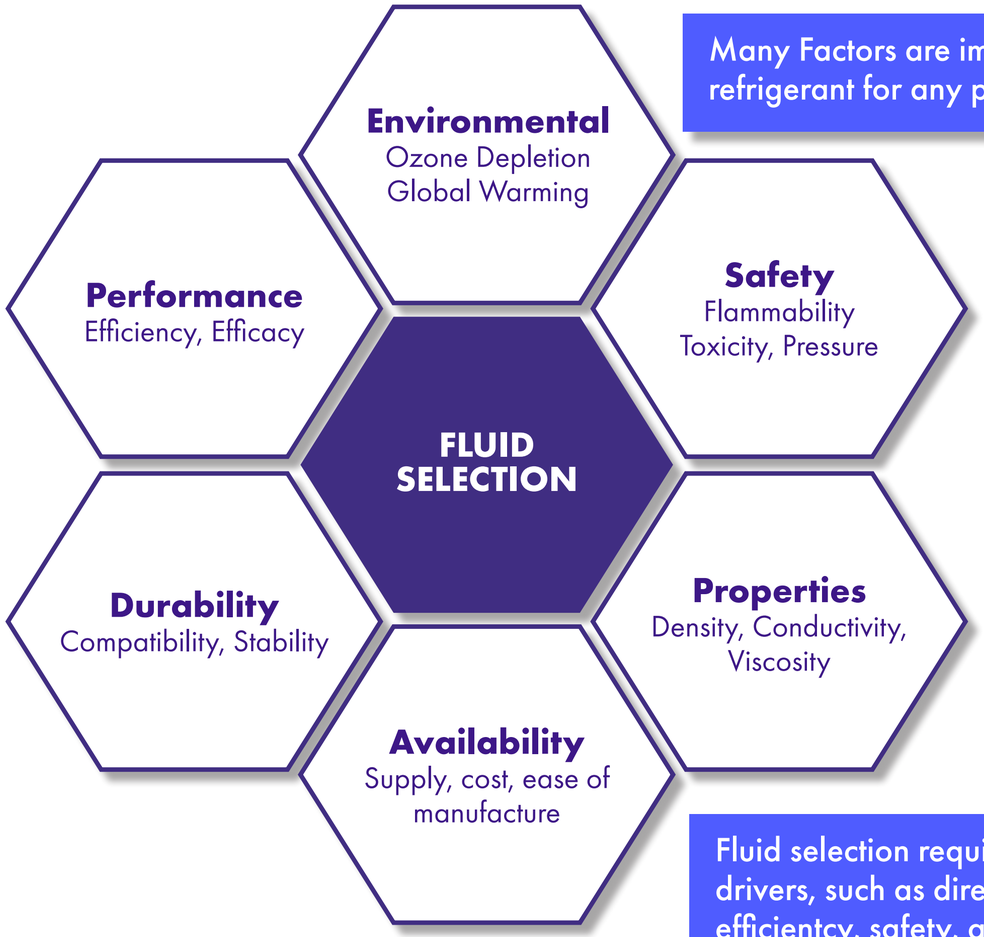
THE BUSINESS CHALLENGE

- Transition is creating uncertainty
- Success = sustainable for the environment, consumers, *and* business
- Businesses must weigh
  - Current and *anticipated* regulatory requirements
  - Product effectiveness and cost effectiveness
  - Safety
  - Resources to support implementation

THERE WILL BE TRADE-OFFS

- Finding the ideal refrigerant is a never-ending challenge
- Characteristics of ideal refrigerant
  - Low Cost
  - Non toxic
  - Non reactive
  - Thermodynamically efficient
  - Chemically stable
  - Compatible with materials
  - Safe for users
  - Environmentally safe

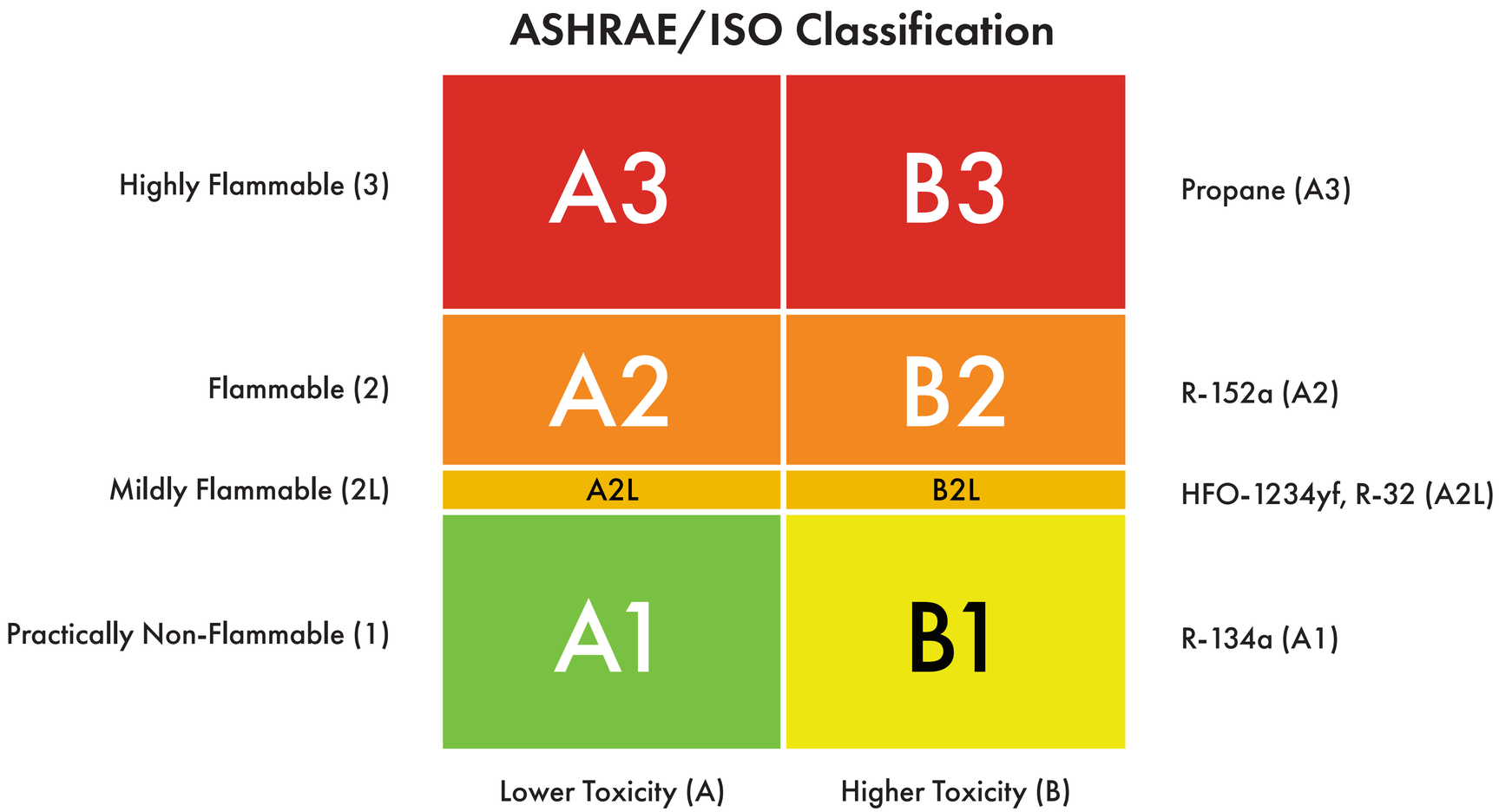
CONSIDERATIONS IN FLUID SELECTION



Many Factors are important for selecting a refrigerant for any particular application

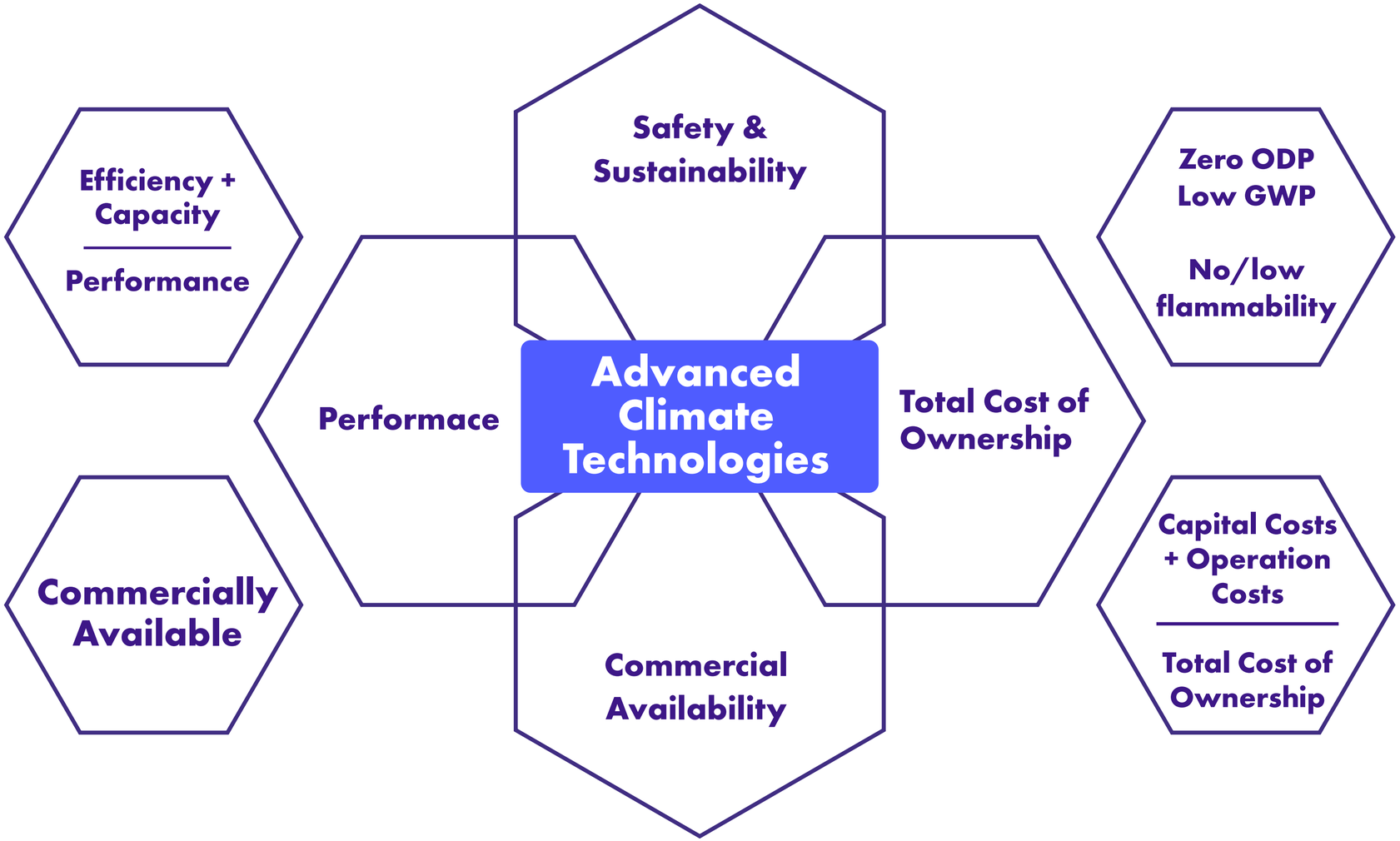
Fluid selection requires a balance among various drivers, such as direct enviromental impact, energy efficientcy, safety, and so forth.

REFRIGERANT CLASSIFICATION



Source: TEAP

THE RIGHT BALANCE



REFRIGERANTS - WHAT REFRIGERANTS ARE DESIRABLE?

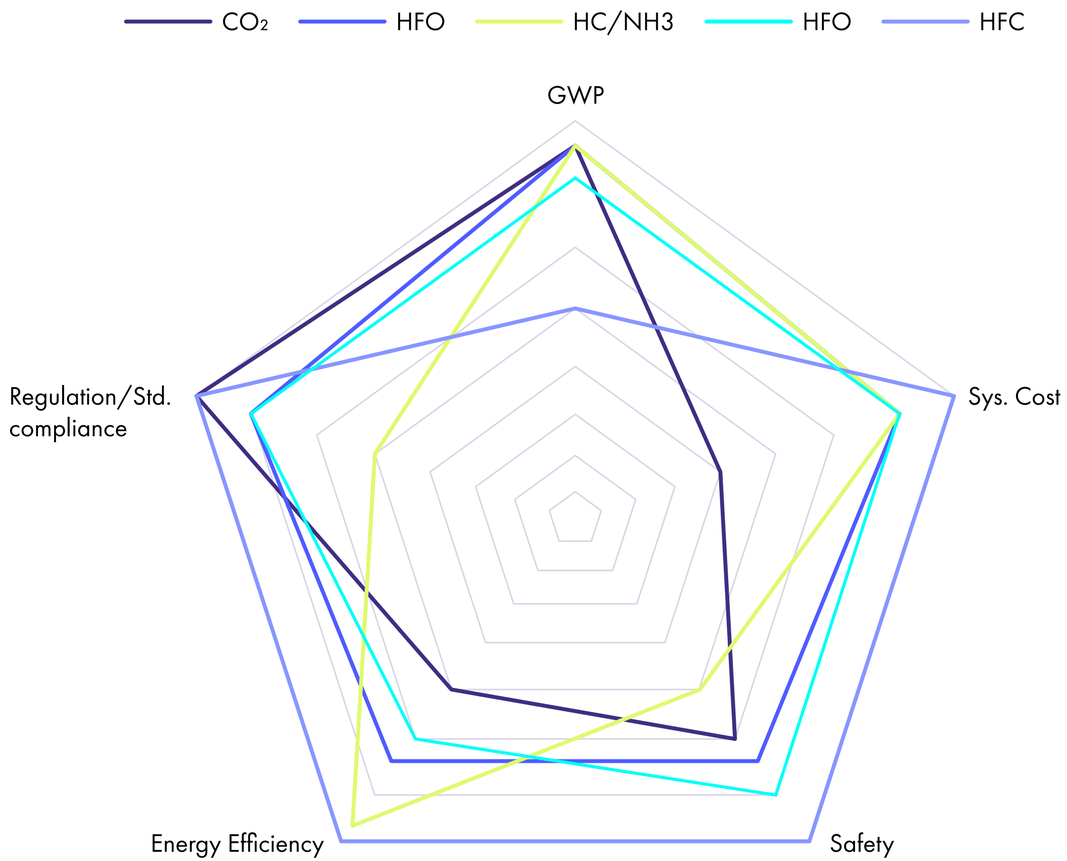
In the past fluorocarbons satisfied all of our needs

In the future, other gases will be used in some applications

Trade-offs will be required

Options for various technologies:

- Fluorinated: Hydrofluoroolefins (HFO-1233-zd, 1234-ze,yf) also low GWP HFCs and HFC/HFO blends
- Hydrocarbons: Propane, Butane, Iso-butane, Pentane
- Ammonia
- CO2



INDUSTRY PREPARING TO SHIFT TO MILDLY FLAMMABLE REFRIGERANTS

- New HFO refrigerants are being developed
- Research is being conducted to develop requirements for safe use
- Standards are being updated with safety requirements
- Codes are being revised to allow use
- Industry program is being developed to assist in the safe transition to mildly flammable refrigerants

Questions?

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BUILDING AND FIRE CODES

U.S. Path for using flammable refrigerants

Graphic From AHRI

- Neither ICC nor UMC Model Building Codes will include A2Ls in their 2021 editions;
- Next opportunity is 2024