Low-GWP Refrigerant Transition

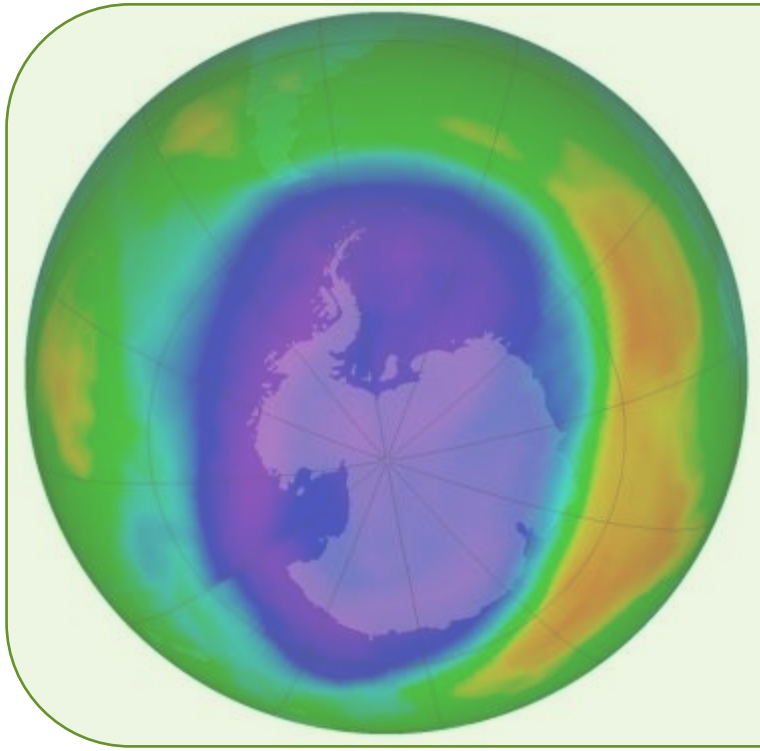
NASEO Buildings Committee

June 29, 2023

AIM Act, Technology Transition, Proposed Dates from EPA

Johnson Controls

The Montreal Protocol and the Kigali Amendment



In 1987, Montreal Protocol on Substances that Deplete the Ozone Layer was signed, establishing the phaseout of chemicals such as chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs)

In 2016, the Kigali Amendment to the Montreal Protocol updated the scope of substances covered to now include the phasedown of hydrofluorocarbons (HFCs), which are potent greenhouse gases (GHG).

Introducing the AIM Act

The United States ratified the Montreal Protocol as a treaty and the U.S. EPA has authority to regulate Ozone Depleting Substances (ODS) through the Clean Air Act

The U.S. EPA attempted to regulate HFCs under the Kigali Amendment through its existing Clean Air Act authority, but the courts stopped this in 2017.

Congress passed the American Innovation in Manufacturing (AIM) Act in 2020, codifying the Kigali Amendment HFC Phasedown and granting EPA authority to regulate HFCs. The Senate ratified the Kigali Amendment in 2022

The AIM Act

The AIM Act directs the EPA to:

1. Phase down HFC production and consumption (Allocation)
2. Maximize reclamation and minimize releases from equipment (Refrigerant Management)
3. Facilitate the transition to next-generation refrigerants through sector-based HFC restrictions (Technology Transition)

Technology Transitions

Through technology transitions, EPA can restrict the use of certain HFCs in HVACR and water heating equipment.

Notably, R-410A targeted for restriction from use starting in 2025. Alternatives have new performance and safety characteristics, requiring updates to building and safety codes across the country.

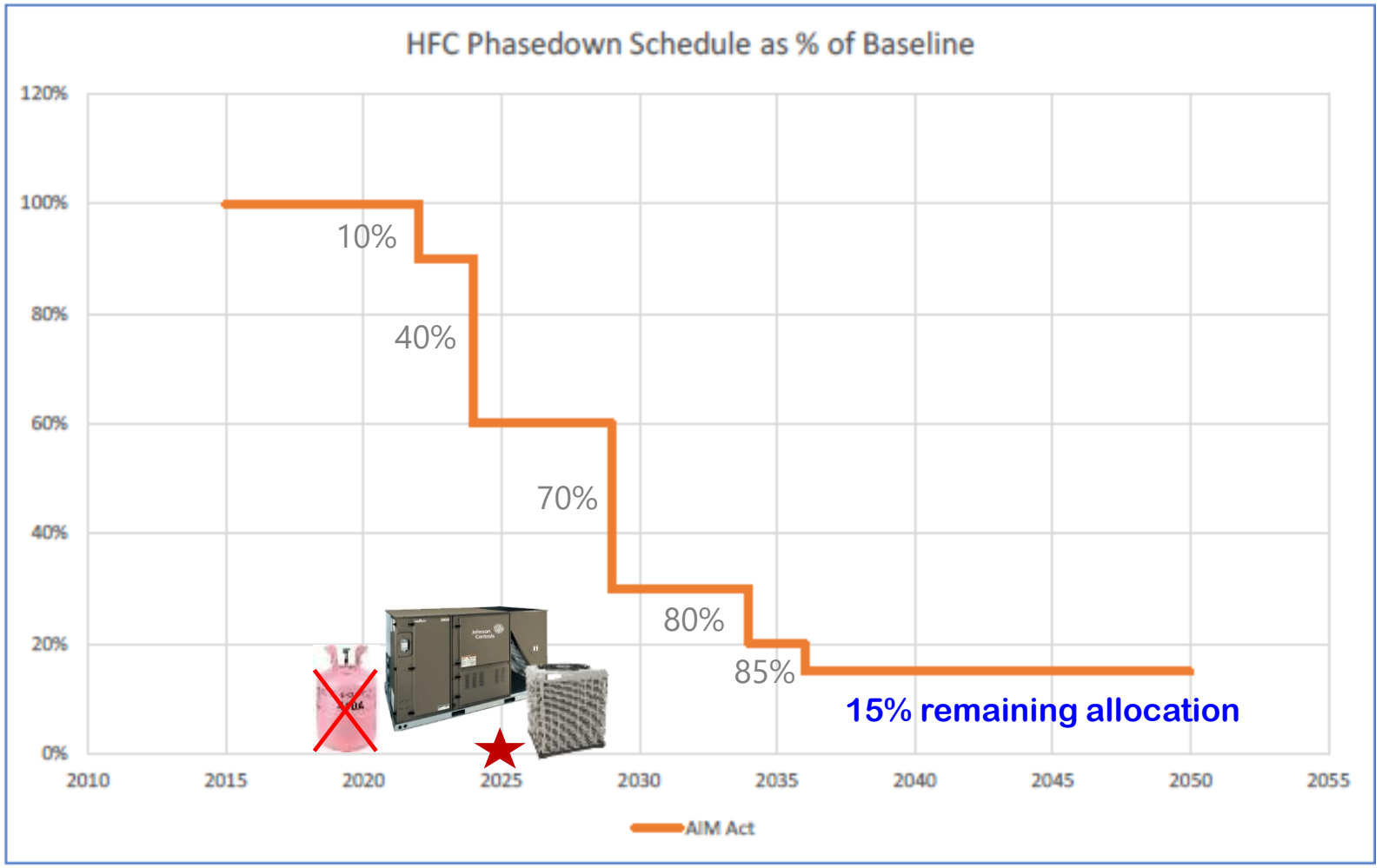
Refrigerant Transition Deadline

Proposed – 700 GWP limit: Jan 1, 2025

- Date of Manufacture – some sell-through allowed
- Federal & Individual States
- R454B and R32 – ASHRAE A2L “mildly flammable”
  - R454B: 466 GWP
  - R32: 675 GWP
- State building codes must be updated

U.S. ENVIRONMENTAL PROTECTION AGENCY

Kigali Phasedown Schedule

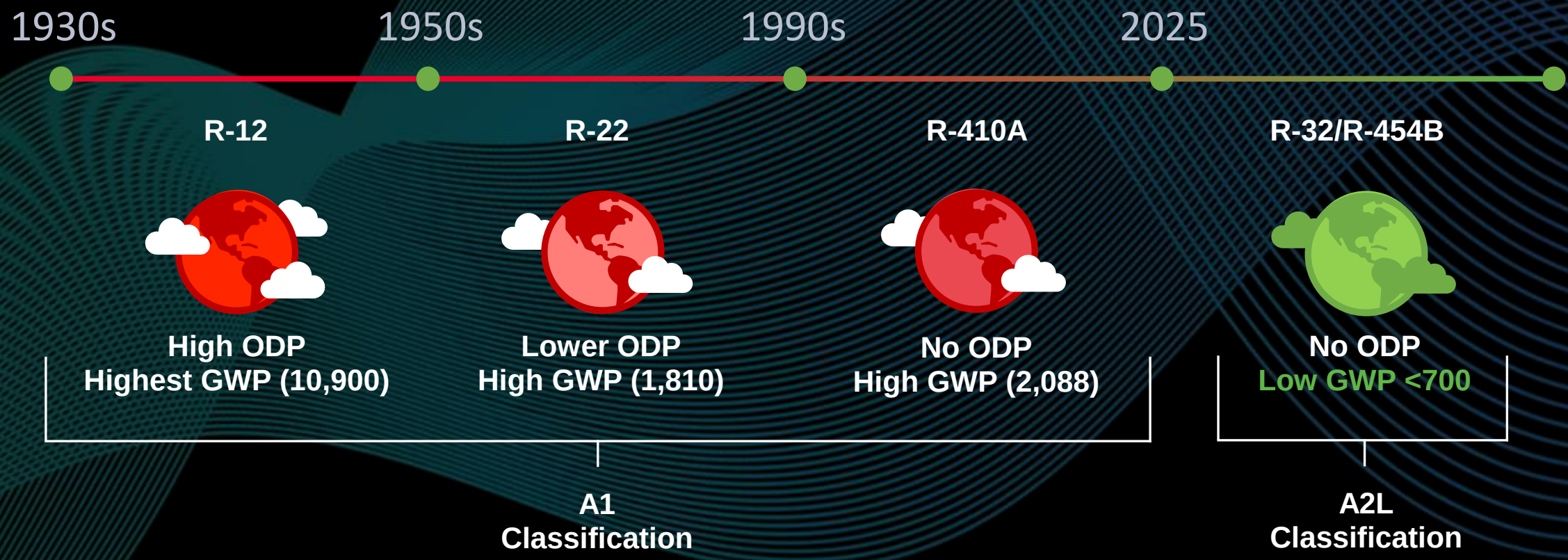


- Authority granted to EPA
- Overall HFC Schedule
- Phase-down, not a Phase-out
- 15% remaining at 2036 will remain indefinitely or until EPA takes additional action
- EPA can take additional actions to ensure the schedule is met
- Opportunity to accelerate but only after formal petition, notice & comment. Not before 2024
- Sector based mandates will drive earlier reductions (SNAP)

A second transition could be required if other sectors don't transition soon or low enough

A2L OVERVIEW

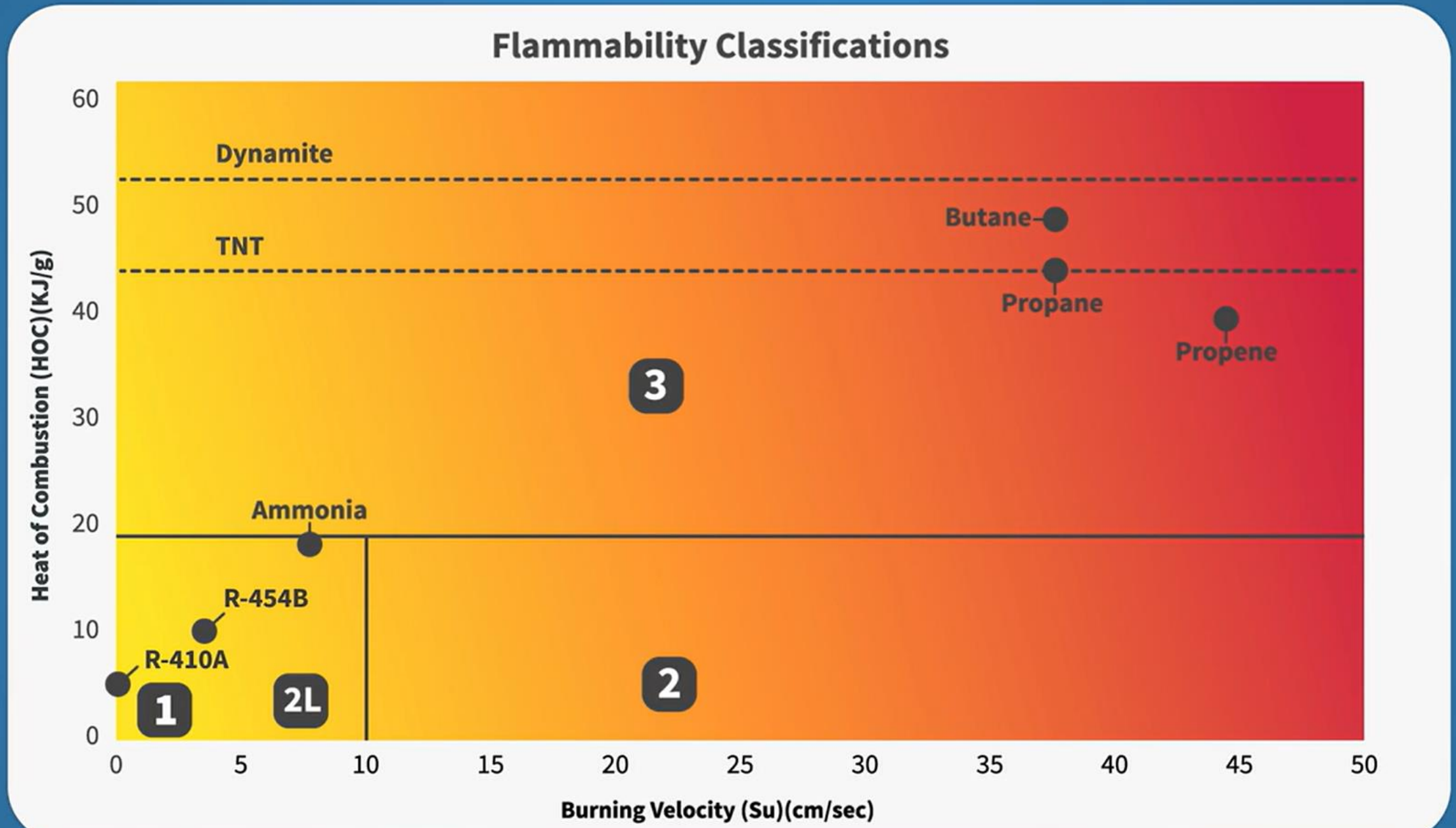
Refrigerant Regulation History



ODP: Ozone depletion potential

GWP: Global warming potential

	ASHRAE CLASS	EXAMPLE REFRIGERANTS	
Higher Flammability	**A3**	Propane, Isobutane	Ignites very easily Potentially Explosive 
Lower Flammability	**A2**	**R-152A**	Ignites Easily Relatively Low Energy Release 
	A2L	R-454B, R-32, R-454A, R-455A	"Mildly Flammable" Difficult to Ignite Relatively Low Energy Release Low Flame Speed 
No Flame Propagation	**A1**	R-410-A, R-404A, R-134a, R-452A Equinox Blends	No Ignition 


Flammability Classifications
Heat of Combustion (HOC)(KJ/g)
60
50
40
30
20
10
0
Dynamite
TNT
Butane
Propane
Propene
3
Ammonia
R-454B
R-410A
1
2L
2
0
5
10
15
20
25
30
35
40
45
50
Burning Velocity (Su)(cm/sec)

Active Mitigation for Leaks

Dissipation System:

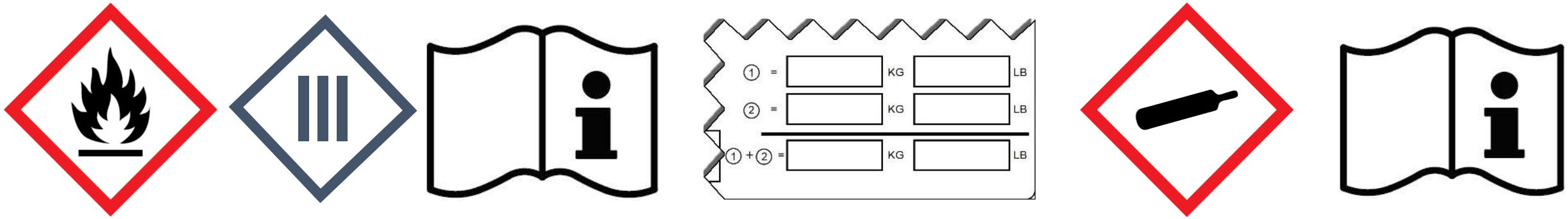
- Leak sensor in indoor coil cabinet
  +
- Mitigation circuit board
  +
- Unit blower

* Actual part design and location may vary

Labels

WHAT WE DID TO COMPLY:

- Clearly draw attention to components and procedural changes related to R454-B
- 5 labels:



Air-Conditioning, Heating & Refrigeration Institute

Samantha Slater
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June 29, 2023

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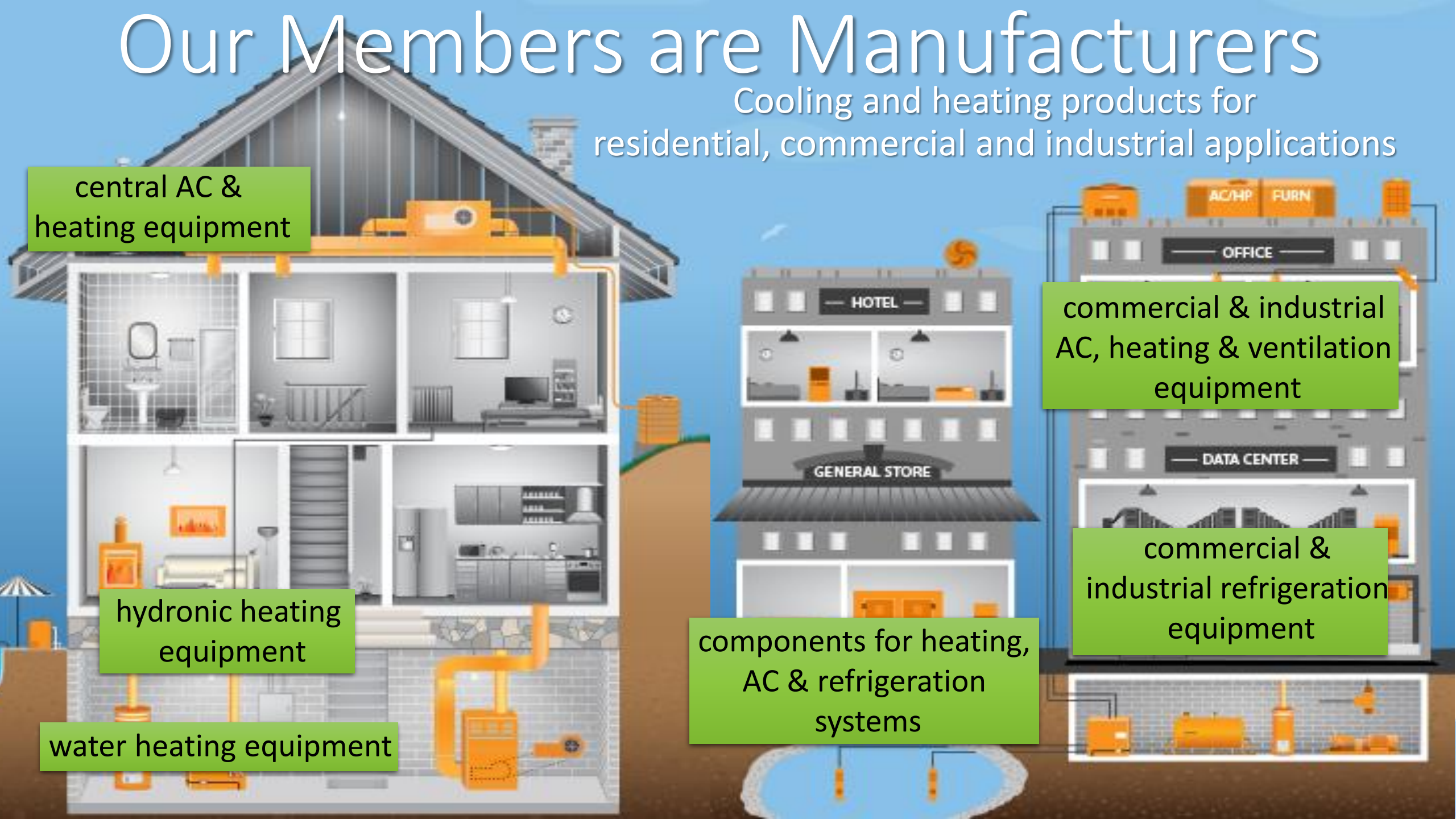

State (and Local) Adoption of Low GWP (or A2L) Refrigerant Requirements

- **What You Need to Know:** EPA regulations will restrict the use of the current refrigerants. Updates to state and local codes will be required to allow for the safe use of new refrigerants in all new air conditioning and commercial refrigeration equipment.
- Over the last two years, many states have adopted new safety standards into building codes to allow for the safe use of new low global warming potential (GWP) refrigerants.
    - Other states are in the process of doing so.
- Over $7 million of research was instrumental in updating and developing safety standards such as ASHRAE 15, ASHRAE 15.2, UL 60335-2-40, and UL 60335-2-89.
    - Most new air conditioning and refrigeration systems using A2L refrigerants must be listed to, and installed, following the latest editions of these standards.
    - Training for the new low-GWP refrigerants has also been developed and is available from refrigerant and equipment manufacturers and trade associations such as the Air-Conditioning Contractors of America (ACCA), The ESCO Institute, North American Technician Excellence (NATE), and Refrigeration Service Engineers Society (RSES).

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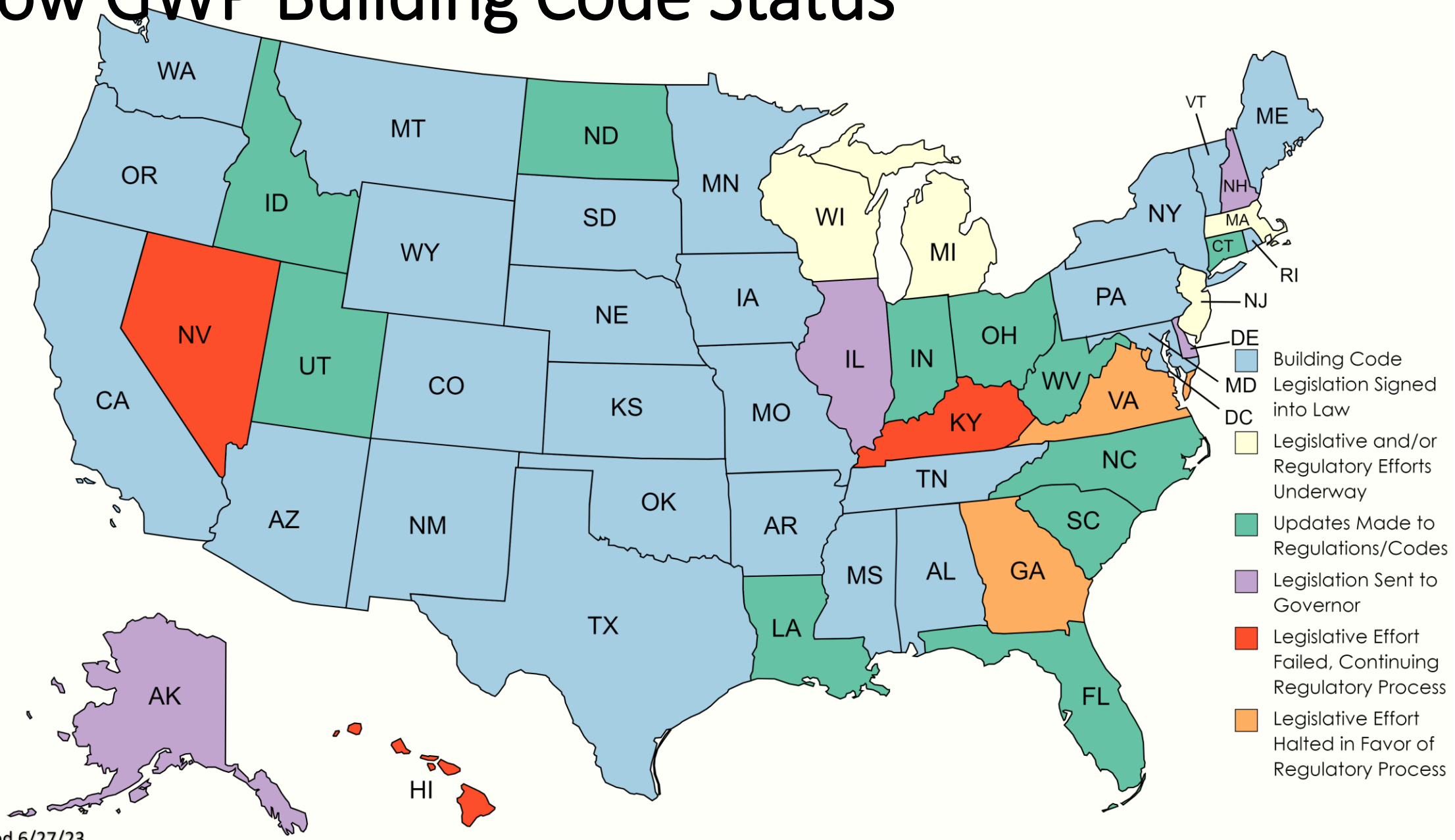
Low GWP Building Code Status



Updated 6/27/23

Low GWP Building Code State Progress

- Active Building Code Work
  - California
  - District of Columbia
  - Florida (C)
  - Georgia (R+C)
  - Hawaii (R+C)
  - Kentucky (R+C)
  - Louisiana (C)
  - Nevada (R+C)
  - Oregon (C)
  - South Carolina (C)
  - Virginia (R+C)
- Active Building Code Legislation
  - Alaska (Governor's Desk)
  - Delaware (Governor's Desk)
  - Illinois (Governor's Desk)
  - New Hampshire (Governor's Desk)
  - Massachusetts
  - Michigan
  - New Jersey
  - Wisconsin

R: Residential C: Commercial

* Warehousing updates in early stages in all states except West Virginia