

# Consulting Breakout Refrigeration- On the Horizon



Charlie Souhrada, CFSP, NAFEM  
Saturday, April 16 – 10:30-11:45 a.m.



# Refrigeration on the Horizon

# Business as Usual?

“...repealing federal regulations is far easier promised than done ... writing and legally justifying new regulations [is a] process that could take nearly two years and might not withstand legal scrutiny”

- *The Wall Street Journal*, March 9, 2016

# Business as Usual?



- Monitor external factors
- Develop a long-term plan
- Keep an eye out for detail
- Don't cut corners



# Session Objectives

- Discuss the challenges from 30,000 feet
- Address inconsistencies/misunderstandings
- Suggest operator considerations
- Provide resources for future reference

# What is NAFEM?

**The North American Association of Food Equipment Manufacturers (NAFEM)** is a trade association of nearly 550 foodservice equipment and supplies manufacturers providing products for food preparation, cooking, storage and table service.

# Refrigeration Products

- Blast Chillers
- Cabinets, Refrigerated
- Cook-Chill Systems
- Coolers, Bar Back
- Coolers, Beverage
- Coolers, Display/Floral
- Coolers, Milk
- Coolers, Reach-in
- Coolers, Walk-in
- Coolers, Wine
- Coolers, Display/Pastry
- Deli Cabinets, Cases
- Dispensers, Ice
- Dispensers, Ice & Beverage
- Dispensers, Ice Cream
- Dispensers, Ice Tea
- Freezer Bases, Undercounter
- Freezers, Reach-in
- Freezers, Roll-in
- Freezers, Soft Ice Cream
- Freezers, Walk-in
- Gelato Equipment
- Ice Crushers
- Ice Machines
- Ice Storage & Transport
- Refrigerated Merchandisers
- Refrigerated Pass-throughs
- Refrigerated Drawers
- Remote Compressors & Condensers
- Refrigeration Evaporators
- Refrigerator Bases
- Refrigerators, Reach-in
- Refrigerators, Roll-in
- Refrigerators, Walk-ins
- Slush Machines
- Sno-Cone Machines

# Industry Segments

- **Restaurants/Chains**  
*1 million locations in the U.S. alone*
- **Corporate Facilities**
- **Correctional Facilities**
- **Health Care**
- **Lodging & Casinos**
- **Schools**
- **Supermarkets**





# Commercial Refrigeration Industry

- Mature marketplace
- Manufacturers focus on:
  - Quality
  - Reliability
  - Efficiency (energy and throughput)
  - Environmental Impact
  - Availability/Delivery Time
  - Total Cost of Ownership

# Regulations Affect All Aspects & Stakeholders

- Design
- Manufacture
- Testing
- Marketing
- Use
- Service
- End of Life/Disposal

# Manufacturer's Refrigerant Considerations



Source: Mike Thompson-Ingersoll Rand

# No Perfect Refrigerants

Ozone Depleting Substances (Montreal Protocol)	High (CFCs)	R-11	ODP	GWP	R-113	ODP	GWP
		R-12	ODP	GWP	R-500	ODP	GWP
	Low (HCFCs)	R-22	ODP	GWP			
		R-123	ODP				
Global Warming (Kyoto Protocol)	High (HFCs > 1,000)	R-134a		GWP	R-407C		GWP
		R-410A		GWP	R-245fa		GWP
	Moderate (HFCs > 150 to 1,000)	R-32	Flammable	GWP			
	Low (HFCs & HFOs ≤ 500)	R-1234yf	Slightly Flammability 2L		R-152a	Slightly Flammability 2L	
		R-1234ze	Slightly Flammability 2L				
Natural & Hydrocarbons	Propane	Flammable	Cost	CO <sub>2</sub>	Efficiency	Cost	
	Butane	Flammable	Cost	Ammonia	Slightly Flammability 2L	Toxicity	

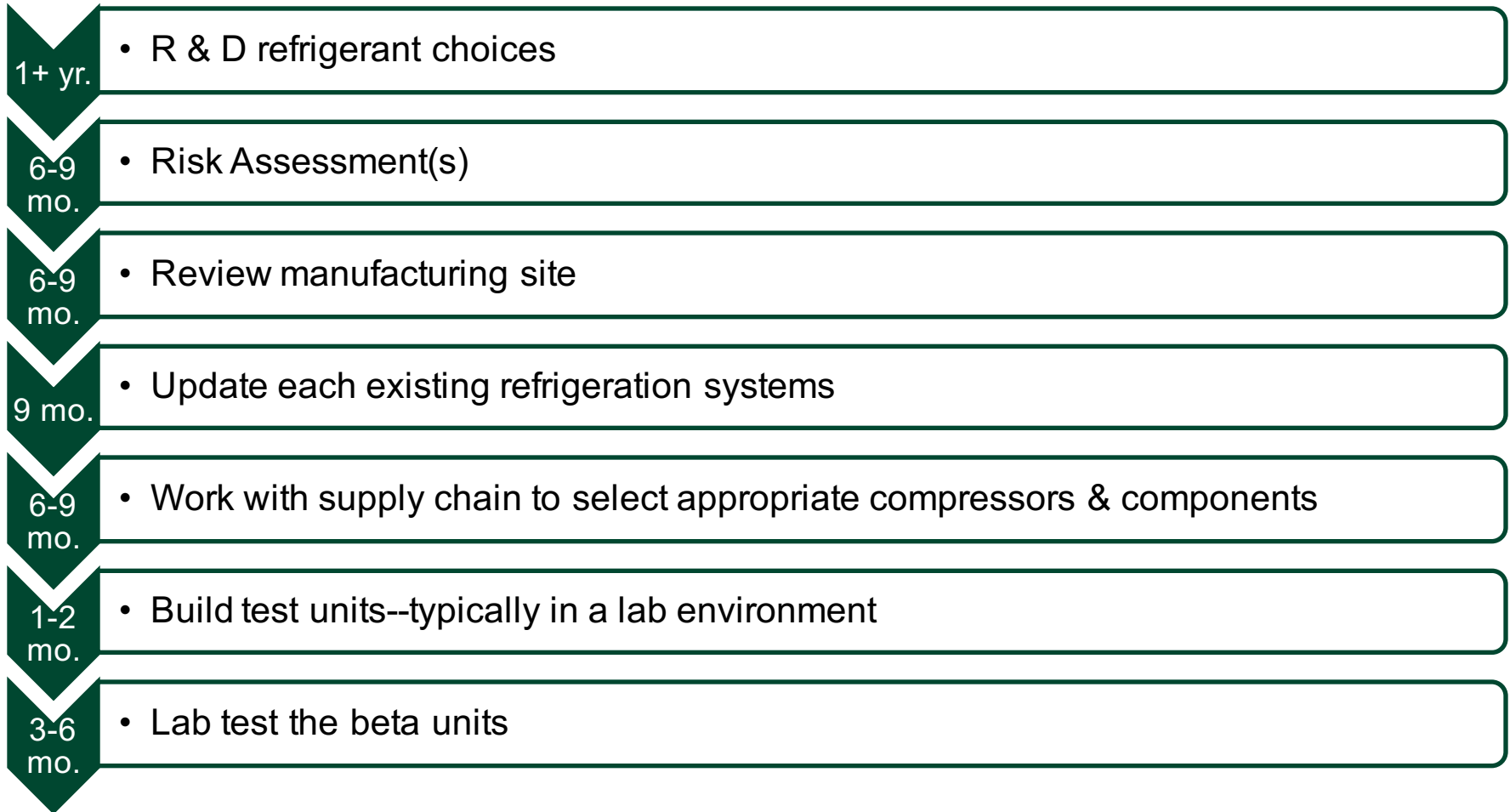
## Concerns

-  Ozone Depletion Potential
-  Global Warming Potential
-  Flammable
-  Slightly Flammability 2L
-  Efficiency
-  Cost
-  Toxicity

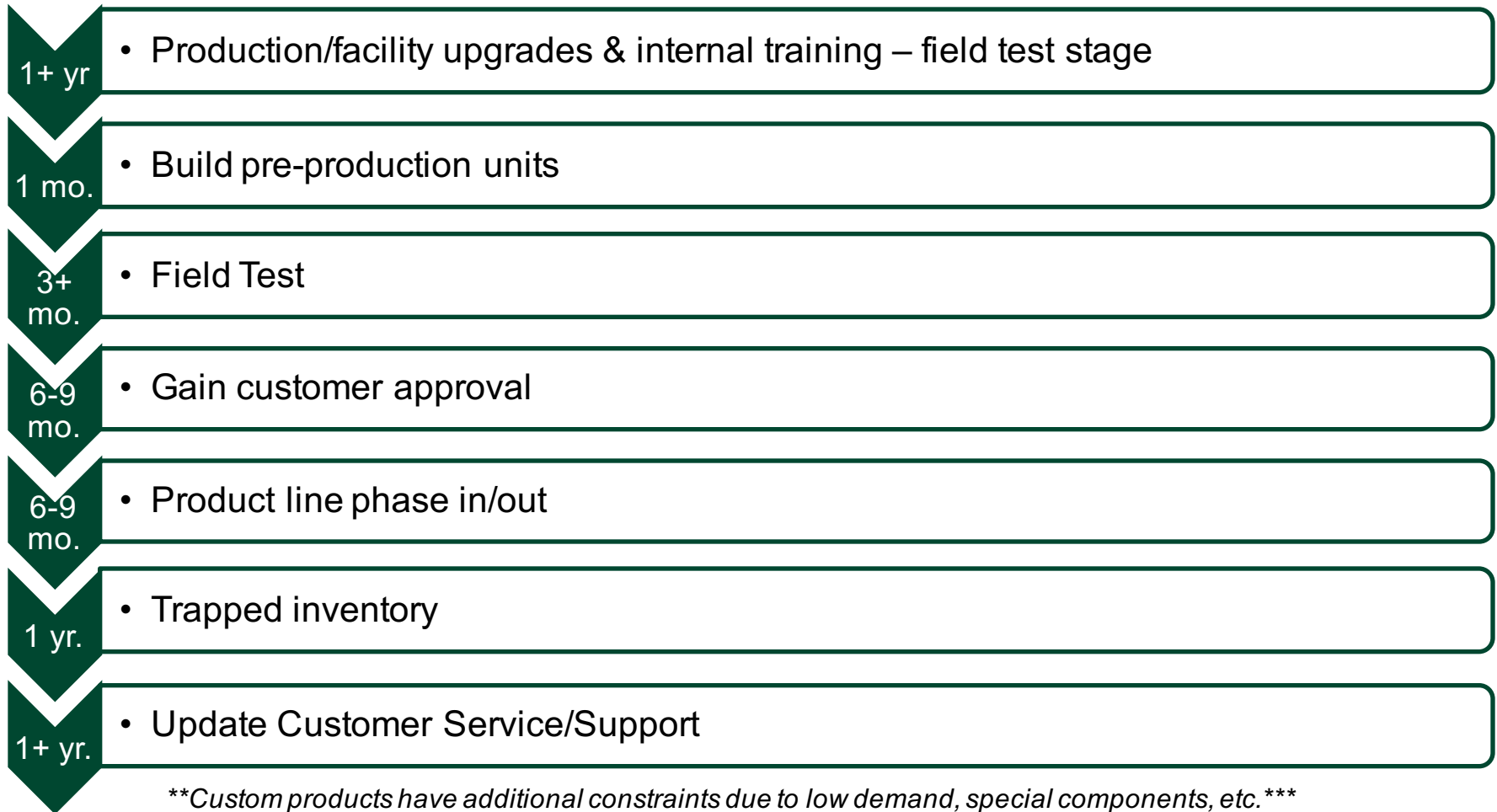
Source: Mike Thompson-Ingersoll Rand



# Approximate Product Development Timeline



# Approximate Product Development Timeline



# Regulatory Influencers



- U.S. Department of Energy (DOE)



- U.S. Environmental Protection Agency (EPA)



- California Air Resources Board (ARB)



- Environment Canada

# Origins

- Clean Air Act – 1970, 1990 amendments

<http://energy.gov/ehss/clean-air-act>






# Origins

## ■ Energy Policy and Conservation Act – 2005

<https://www.congress.gov/bill/109th-congress/house-bill/6>

**FEDERAL ENERGY  
REGULATORY COMMISSION**

WASHINGTON, D.C. 20426



**FACT SHEET**  
AUGUST 8, 2006

**ENERGY POLICY ACT OF 2005**

*Significant Policy Changes*

The Energy Policy Act of 2005 (EPAct) is the first major energy law enacted in more than a decade, and makes the most significant changes in Commission authority since the New Deal's Federal Power Act of 1935 and the Natural Gas Act of 1938. In passing EPAct, Congress signaled a strong vote of confidence in the Commission. The Commission has taken on new duties and authorities with a sense of purpose, mindful of the public trust they entail. Moreover, the Commission has been dedicated to meeting these obligations within the time allotted by Congress.

EPAct had three principal policy goals in the areas of the statute that relate to the Commission: (1) it reaffirmed a commitment to competition in wholesale power markets as national policy, the third major federal law in the last 30 years to do so; (2) it strengthened the Commission's regulatory tools, recognizing that effective regulation is necessary to protect the consumer from exploitation and assure fair competition; and (3) it provided for development of a stronger energy infrastructure.

EPAct granted the Commission significant new responsibilities and significant new authority to discharge these responsibilities by modifying the Federal Power Act, the Natural Gas Act and the Public Utility Regulatory Policies Act of 1978 (PURPA).

*New Responsibilities*

Significant new responsibilities include:

# Origins

- Montreal Protocol on Substances that Deplete the Ozone Layer – 1989

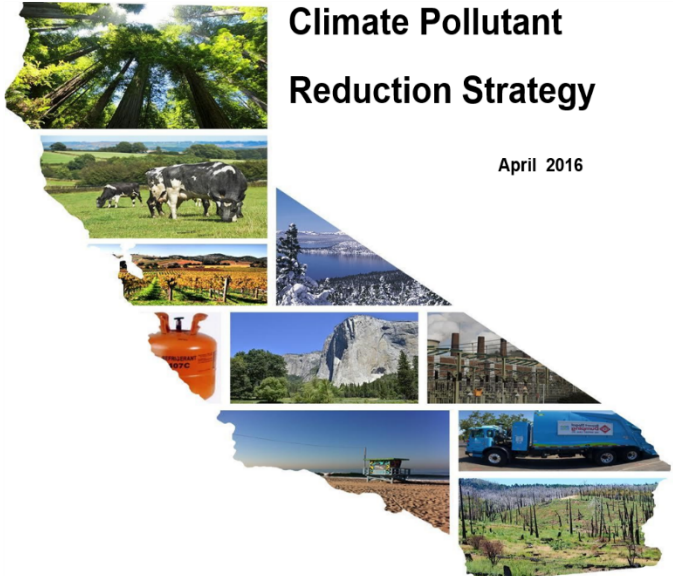
<http://ozone.unep.org/en/treaties-and-decisions/montreal-protocol-substances-deplete-ozone-layer>



# Additional Influencers

Proposed Short -Lived  
Climate Pollutant  
Reduction Strategy

April 2016



California Environmental Protection Agency  
**Air Resources Board**

- Black Carbon
- F-Gases
- Methane

<http://www.arb.ca.gov/cc/shortlived/shortlived.htm>

# Additional Influencers

**California SLCP Emissions and Proposed Target Emission Levels (MMTCO<sub>2e</sub>)\***

Pollutant	2013	2030 BAU**	2030 Proposed Strategy
Black carbon (nonforest)	38	26	19
Methane	118	117	71
Hydrofluorocarbons (HFCs)	40	65	24

\*Using 20-year GWPs from the 4<sup>th</sup> Assessment report of the IPCC for methane and HFCs, and 5<sup>th</sup> Assessment report for black carbon (the first report to define a GWP for black carbon)

# Additional Influencers

- Environment Canada – 2014
  - Notice of Intent to Regulate HFCs
  - Gradual Phase Down

<https://www.ec.gc.ca/ozone/default.asp?lang=En&n=77A94123-1>

# Two Key Regulations

- DOE Final Rule on Commercial Refrigeration Equipment Energy Conservation Standards – 2014

[http://www1.eere.energy.gov/buildings/appliance\\_standards/rulemaking.aspx/ruleid/27](http://www1.eere.energy.gov/buildings/appliance_standards/rulemaking.aspx/ruleid/27)

- EPA Significant New Alternatives Policy (SNAP) – 2015

<https://www.federalregister.gov/articles/2015/07/20/2015-17066/protection-of-stratospheric-ozone-change-of-listing-status-for-certain-substitutes-under-the>



# DOE CRE

- Sets Energy Consumption Standards
  - Affect design and construction of 49 Classes of CRE, e.g. self-contained cabinets & reach-ins
  - March 2017 compliance
- NAFEM Filed Suit in 2014
  - Regulatory burden of EPA SNAP & ENERGY STAR
  - Didn't follow the Energy Policy & Conversation Act
  - Engineering model was flawed
  - Asks the Court to vacate the FR or send it back to DOE
- Federal Court Sept. 2015
  - Waiting for ruling

# EPA SNAP

- SNAP – Significant New Alternatives Policy
  - EPA’s program to approve alternative refrigerants to ozone-depleting chemicals, such as CFCs
  - Approval specific to refrigerant application or use
  - FR issued July 2015
  - Delists specific refrigerants and foam-blowing agents, e.g., R-134a, R-404a
  - Transition by January 2020 – per application & use

# EPA SNAP Expansion – 2016



FOR IMMEDIATE RELEASE:  
March 29, 2016

[www.epa.gov/snap](http://www.epa.gov/snap)

## FACT SHEET

### **Proposed Rule - Protection of Stratospheric Ozone: New Listings of Substitutes; Changes of Listing Status; Reinterpretation of Unacceptability for Closed Cell Foam Products under the Significant New Alternatives Policy Program; and Revision of Clean Air Act Section 608's Venting Prohibition for Propane**

#### **EPA's Significant New Alternatives Policy Program**

Under section 612 of the Clean Air Act (CAA), EPA reviews substitutes within a comparative risk framework. More specifically, section 612 provides that EPA must prohibit the use of a substitute where EPA has determined that there are other available substitutes or potentially available substitutes that pose less overall risk to human health and the environment. Thus, EPA's Significant New Alternatives Policy (SNAP) program, which implements section 612, does not provide a static list of alternatives but instead evolves the list as the EPA

#### **Proposed Rule**

##### *What is EPA proposing?*

- List as acceptable subject to use conditions, list as unacceptable, and change the status of several substances
- Exempt propane from the CAA's section 608 venting prohibition
- Clarify status of acceptable fire

# Other Rules

- DOE Automatic Commercial Ice Maker (ACIM)
  - Issued January 2015; Eff. January 2018
  - Amended standards for previously covered cube-type (50-2,500 lbs/24-hour period)
  - New standards for batch & tube-type
  - Extended coverage for all batch & continuous type (50-4,000 lbs/24-hour period)
  - Details:  
[https://www1.eere.energy.gov/buildings/appliance\\_standards/standards.aspx?productid=53&action=viewlive](https://www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=53&action=viewlive)

# Other Rules

- DOE Walk-In Cooler/Walk-In Freezer (WIC/WIF)

- Issued May 2014; Eff. June 2017
- Updates existing energy standards
- Covers
  - WIC/WIF that can be walked into
  - Chilled storage area of >3,000 sq. ft.

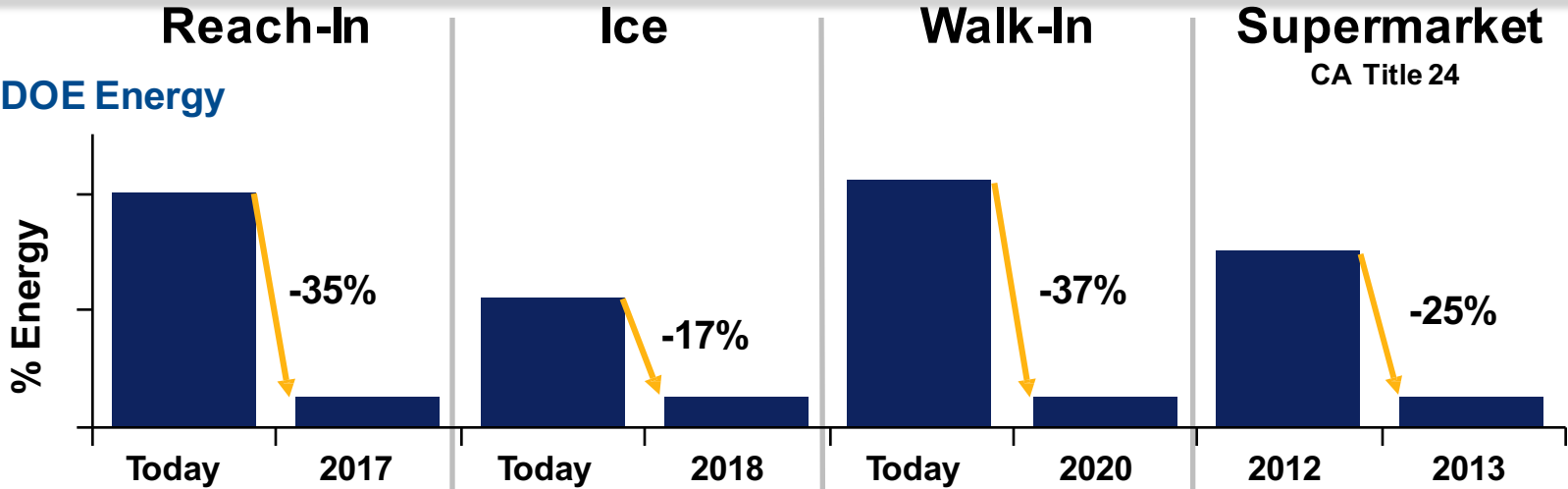
- Details:

[https://www1.eere.energy.gov/buildings/appliance\\_standards/rulemaking.aspx/ruleid/30](https://www1.eere.energy.gov/buildings/appliance_standards/rulemaking.aspx/ruleid/30)

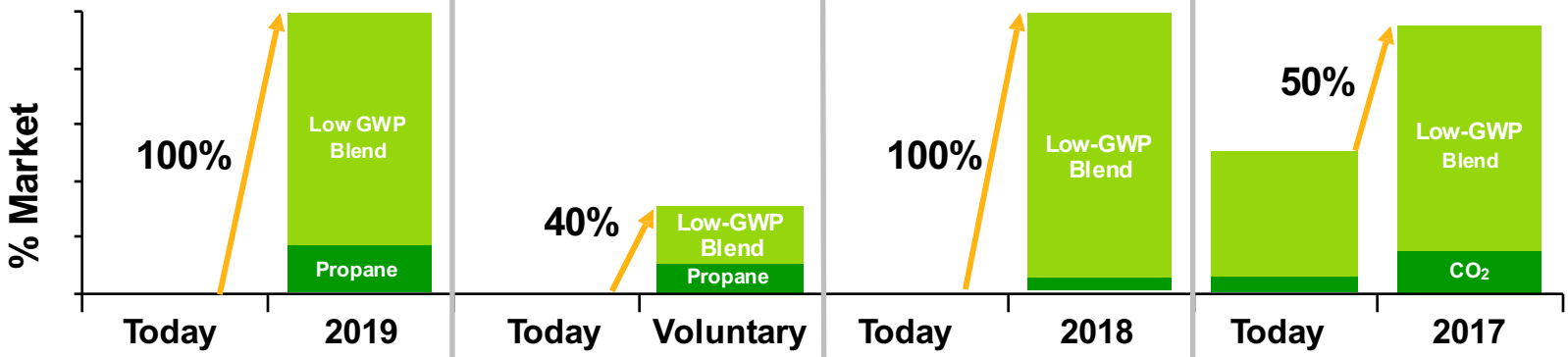
# Compliance Comparison



## DOE Energy



## EPA Refrigerants



Source: Emerson



# Status of U.S. Refrigeration Energy Regulations

	Product Class	Current	NOPR	Final	Effective	Energy Level Reduction
U.S. Department of Energy	Closed-door Reach-in (Self-contained)	2010	Oct. 2013	March 2014*	March 2017	<u>kWh/Day</u> 30% – 50%
	Ice Maker	2010	NODA Sept. 2014	Jan. 2015	Jan. 2018	<u>kWh/100 lbs</u> 5% – 15%
	Display Case, Including Remote	2012	Oct. 2013	March 2014*	March 2017	<u>kWh/Day</u> 30% – 50%
	Walk-In (Foodservice)	2009	Sept. 2013	Jan. 2016** No change MT; No change panels & doors; LT & multiplex back in cmte.	Jan. 2020 (All enforced)	<u>AWEF</u> 20% – 40%; LT & Multiplex TBD %
U.S./Canada	Supermarket	<p>California Title 24 Effective July 2014</p> <p>Building Energy Alliance Challenge Spec in Process</p> <p>ASHRAE 90.1 Advanced Energy Design Guideline in Process</p> <p>Canada Supermarket Minimum Efficiency Std. in Process</p>				

\* Lawsuit filed by NAFEM & AHRI in 7<sup>th</sup> Circuit Court;

\*\* Lawsuit filed by AHRI in 5<sup>th</sup> Circuit Court; settlement reached July 2015 in setting standards

Source: Emerson

# EPA's Final Rule

## Phase-out dates / Likely alternatives

Summary of most commonly used refrigerants

Phase-out Refrigerant	Super-market New*	Super-market Retrofit**	Remote CDU New	Remote CDU Retrofit**	Stand-alone			
					MT, <2,200 BTU/hr. and no flooded evap. New	MT, >2,200 BTU/hr. or contain flooded evap. New	LT New	LT & MT Retrofit* *
R-404A/507A	Jan. 1 2017	July 20 2016	Jan. 1 2018	July 20 2016	2019	2020	2020	July 20 2016
R-410A	OK	-	OK	-	2019	2020	2020	-
R-407A/C/F	OK	OK	OK	OK	2019	2020	2020	OK
HFC-134a	OK	OK	OK	OK	2019	2020	OK	OK
<b>Likely Alternatives</b>								
R-448A/449A	OK	OK	OK	OK	Neither SNAP-approved, nor banned	Neither SNAP-approved, nor banned	OK	OK for LT only
R-450A/513A	OK	OK	OK	OK	OK	OK	OK	OK
R-290	-	-	-	-	OK	OK	OK	-
R-744	OK	-	OK	-	OK	OK	OK	-
R-717	OK (in primary loop of secondary CO <sub>2</sub> sys.)	-	OK (in primary loop of secondary CO <sub>2</sub> sys.)	-	-	-	-	-

\* Includes ice machines connected to a supermarket rack refrigeration system.

\*\* EPA uses term "retrofit" to indicate the use of a refrigerant in an appliance that was designed for and originally operated using a different refrigerant. Term does not apply to upgrades to existing equipment where the refrigerant is not changed.

Source: Emerson

# Conflicting Goals

“The government has set a bar for energy standards that conflicts with its goals (set at the same time) to reduce high GWP refrigerant emissions like HFCs.

Virtually every change made to reduce the impact of refrigerants increases the amount of energy required (and therefore adds cost).”

— *Foster Frable, FEDA News & Views, Jan./Feb. 2015*

# Balance Four Key Needs



Energy

- **Reduce energy consumption** with optimized refrigeration equipment system performance



Environment

- Ensure **EPA compliance and reduce GWP** with refrigerant choices that minimize impact to equipment performance



Equipment

- Preserve **reliability, serviceability and safety**; Understand the toxicity, flammability and pressure implications



Economics

- Estimate the **total cost of ownership and viability of technology** changes

# Unintended Consequences

- Reduces **product innovation** and **variety**
- Poses **unknown risks**, i.e., safety, occupational, health
- Requires **infrastructure changes** to manufacturing sites
- System **complexity & limited design know-how**
- Limited **availability of approved components and alternate refrigerants**
- **Inventory management of spare and replacement parts**

# Unintended Consequences

- Limited **test lab resources** – internal/external (3<sup>rd</sup> party)
- Challenges limited **compliance laboratory resources**, e.g., CSA, Intertek, NSF, UL, due to short timeframe
- Shortage of trained/certified **service technicians**
- Traps **inventory** – throughout the supply chain
- Passes **direct costs to operators** (customers)



# Things to Think About

- **Cost implications:** short- and long-term?
- Have 2017 **budgets and capital requests** been made?
- Do local regulations, including **building, fire codes & safety requirements** support flammable refrigerants?
- Can the facility run **concurrent operations while transitioning** equipment?
- Can **small operators comply**?
- How do the changes **support the brand**?

# Questions?



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# Resources

- **CARB** - <http://www.arb.ca.gov/cc/shortlived/shortlived.htm>
- **Dane, Mary**, “Impact of the EPA’s SNAP Program on the Commercial Refrigeration Industry”, NAFEM Presentation to the U.S. Small Business Administration Office of Advocacy Environmental Roundtable, August 2014
- **Environment Canada**, “Consultation Document: Proposed Regulatory Measures on Hydrofluorocarbons”, December 6, 2014; <https://www.ec.gc.ca/ozone/default.asp?lang=En&n=77A94123-1>
- **EPA** - <http://www.epa.gov/snap/overview-snap>
- **Frale, Foster Jr.**, “New Developments in Foodservice Refrigeration”, FEDA News & Views, January/February 2015; <http://www.e-digitaleditions.com/i/447632-fedajanfeb2015/52>
- **Harder, Amy**, “Roll-Back of Regulations Isn’t Easy”, The Wall Street Journal, Wed., March 9, 2016; <http://www.wsj.com/articles/roll-back-of-federal-regulations-isnt-easy-1457482577>
- **Intertek White Paper**: “Commercial Refrigeration: Manufacturer’s Guide to the Changing Regulatory Landscape”; 2016 <http://www.intertek.com/knowledge-education/commercial-refrigeration-wp/>
- **Levin, Amelia**, “Myths and Realities Re: New Refrigeration Rules”, Foodservice Equipment & Supplies, January 2016
- **Linde R290 Refrigerant Grade Propane**, promotional brochure, 2016
- **NAFEM, Petition for Review, U.S. Court of Appeals for the Seventh Circuit, May 2015**
- **NAFEM**, Special Report: NAFEM Advocacy Efforts on Commercial Refrigeration Issues, June 2014
- **Rajandran, Dr. Raj**, “Refrigerant and Energy Regulations Update”, Emerson E360 event, September 2015
- **Regulations.gov**, <https://www.regulations.gov/#!home>
- **Rousseau, Rita**, “A Chill Wind: Latest Refrigeration Regulations”, Food Equipment Reports, February 2016
- **Soucie, Ray**, “Avoiding the Icebergs Ahead”, Foodservice Equipment & Supplies, January 2016
- **UL**, “**White Paper**: Revisiting Flammable Refrigerants”, 2011 <http://www.epa.gov/greenchill/white-paper-revisiting-flammable-refrigerants>
- **U.S. Department of State**, United States, Canada, and Mexico Submit North American HFC Phase Down Amendment to the Montreal Protocol, April 2015; <http://www.state.gov/r/pa/prs/ps/2015/04/240730.htm>
- **Weber, Tony**, “Repair, Replace or Retrofit: How New Refrigeration Regulations Impact Service”, Foodservice Equipment & Supplies, February 2016
- **iWicher, Allen & Jayanth, Ani**, “How to Meet 2017/2020 Energy Efficiency and Refrigerant Regulations”, Emerson E360 event, September 2015