

Getting Comfortable with Designer Air

Commercial HVAC Efficiency Regulations and Refrigerants Are Changing: Are You Ready?



Polling Question

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1. _____



Today's Presenters



David Hules

- **Director of Commercial Marketing, Air Conditioning Business**
- **9 years With Emerson**
- **Responsible for understanding industry trends across the commercial air conditioning market segments and translating these into marketing activities and new products**



Karim Amrane, Ph.D.

- **Senior Vice President, Regulatory and International Policy at Air-Conditioning, Heating, and Refrigeration Institute**
- **25 Years Experience In HVACR Industry**
- **Manages industry's cooperative research program**
- **Responsible for the development and implementation of AHRI's regulatory and international policy**

Agenda

- 1 Commercial Heating and Air Conditioning Trends**
- 2 Current State of Commercial HVAC Industry**
- 3 Efficiency Regulations and Activities**
- 4 Future Refrigerants Landscape → What it means for you**
- 5 Summary and Key Takeaways**

Polling Question

What percentage of your job is spent helping your clients understand or make HVAC decisions?

1. 0-30%
2. 30-60%
3. 60-100%



Megatrends Driving Commercial Air Conditioning

Trend



Building Automation /
Connectivity



Energy Efficiency and
Sustainability

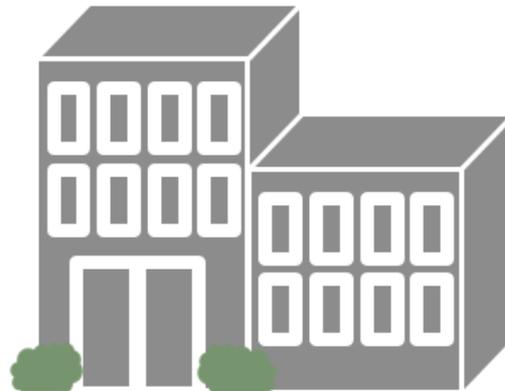


Comfort and Air Quality

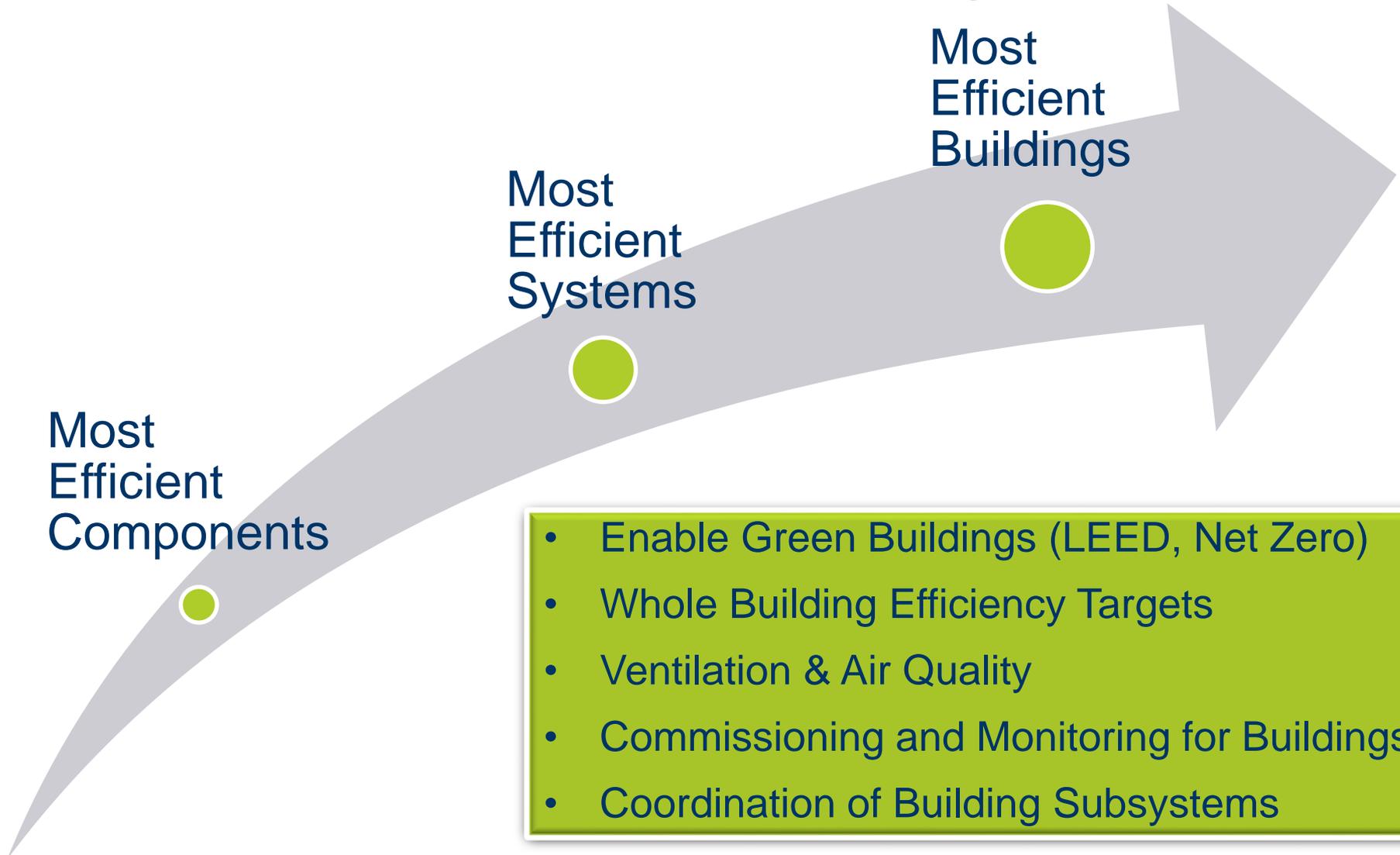


Industry Response

- Modulation Technologies
- Advanced Diagnostics
- Sensing and Facility Monitoring
- Low-GWP Refrigerants
- Efficiency Retrofits

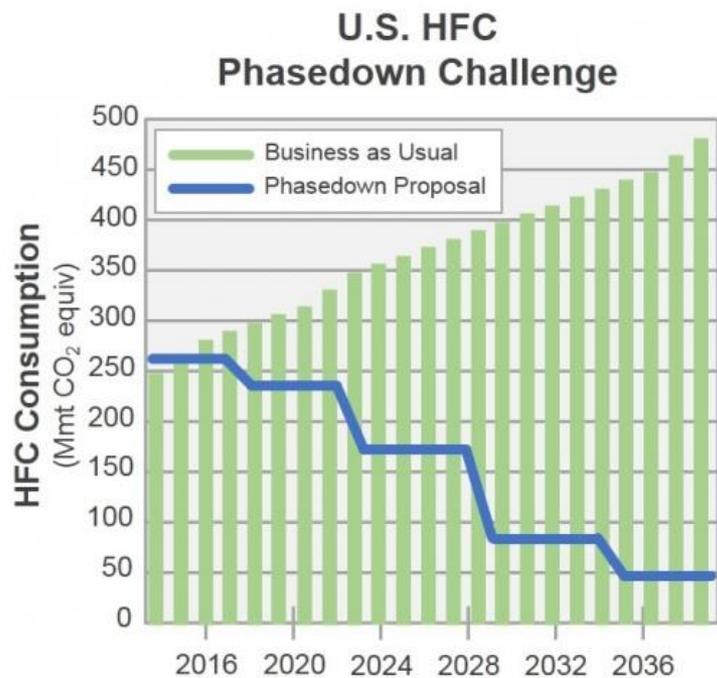
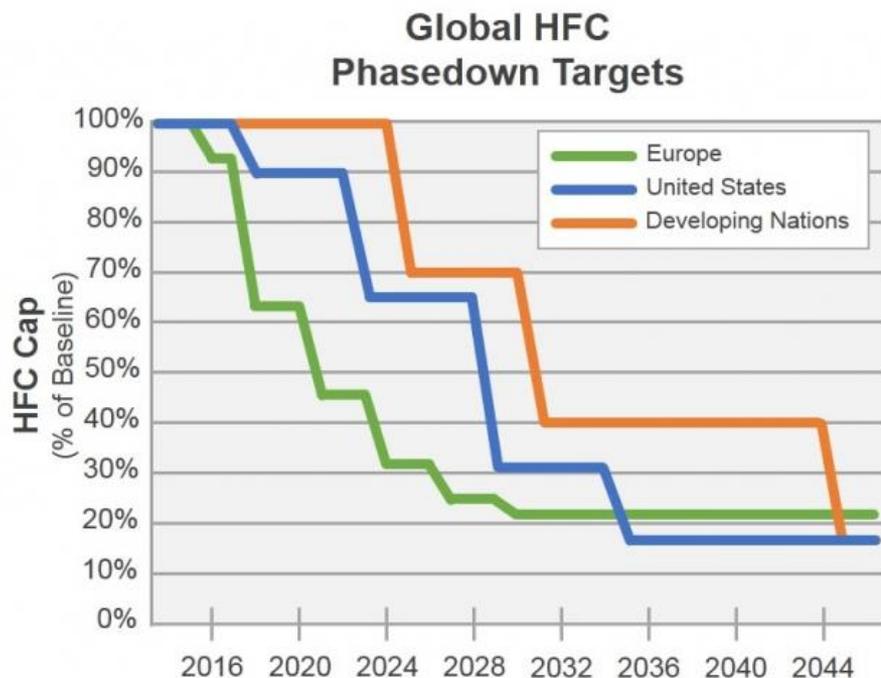


Industry Trends Driving Towards Solutions to Deliver the Most Efficient Buildings



The Road to Zero: DOE's Next Generation Heating & Cooling R&D Strategy

- Action to phase-down HFCs can avoid up to 0.5°C of warming by 2100
- HVACR uses 50% of all energy in U.S. commercial & residential buildings



Source: U.S. Department of Energy

(<http://energy.gov/eere/buildings/road-zero-does-next-generation-heating-and-cooling-rd-strategy>)

Agenda

1 Commercial Heating and Air Conditioning Trends

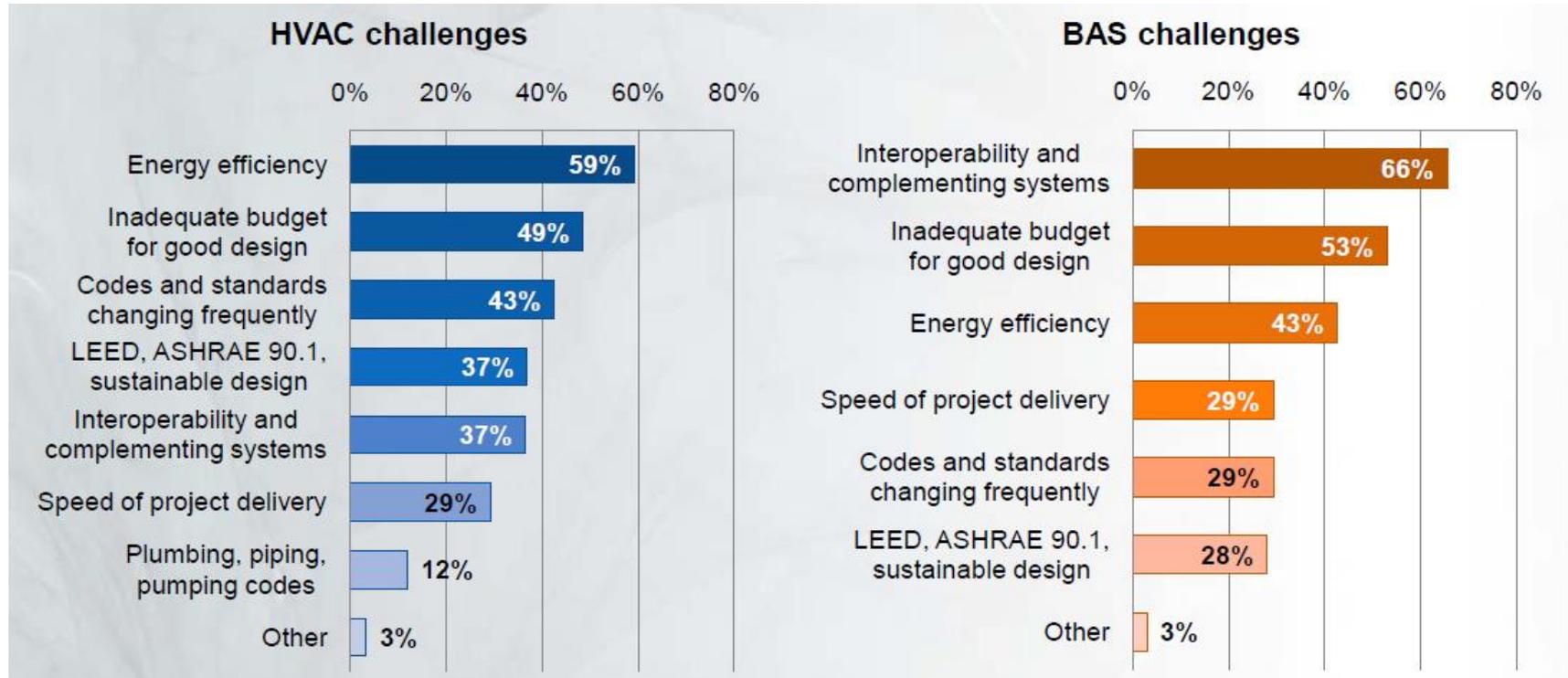
2 **Current State of Commercial HVAC Industry**

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5 Summary and Key Takeaways

43% of Respondents Said that Frequent Changes to HVAC Codes and Standards is a Challenge

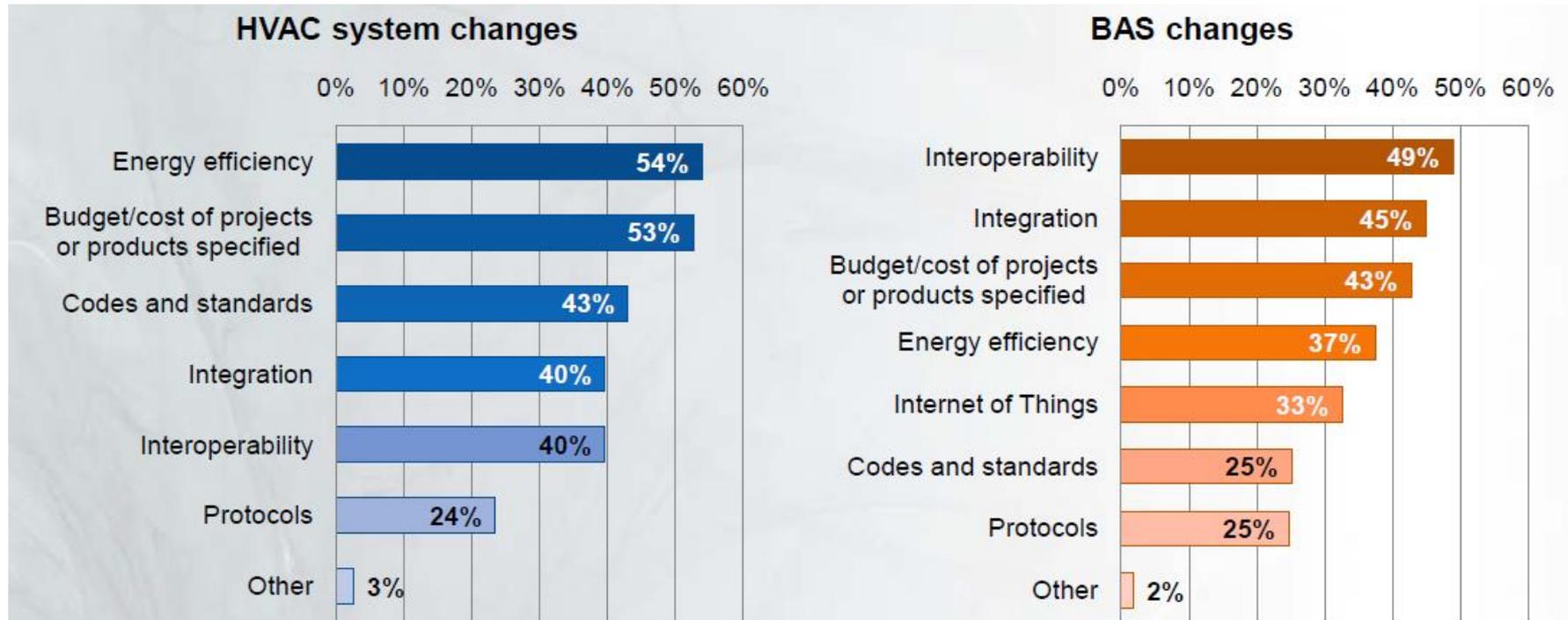


Q: What are critical challenges or issues affecting the future of HVAC systems? (n=233)

Q: What are critical challenges or issues affecting the future of building automation systems? (n=233)

Source: Consulting Specifying Engineer 2015 HVAC and Building Automation Systems Study

Energy Efficiency and Interoperability Changes are Impacting Engineers



Q: What are the biggest changes in HVAC systems that you've observed during the past 12 to 18 months? (n=230)

Q: What are the biggest changes in building automation systems that you've observed during the past 12 to 18 months (n=227)

Source: Consulting Specifying Engineer 2015 HVAC and Building Automation Systems Study

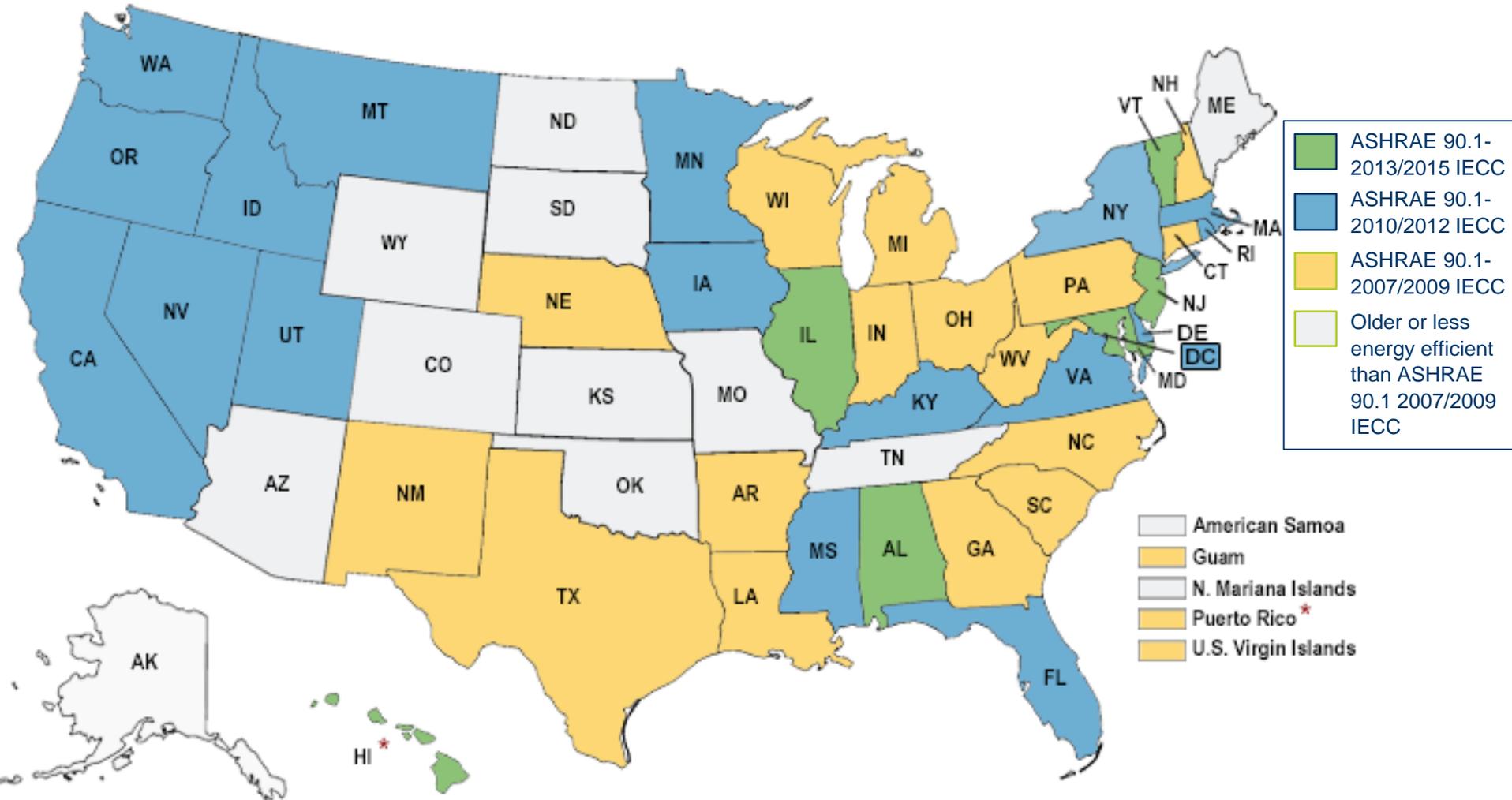
Polling Question

What Region Of The Country Are Your Primary Operations?

1. North Central
2. South East
3. North East
4. South Central
5. South West
6. North West



Status of State Energy Code Adoption for Commercial Buildings (As of April 2016)



Source: <https://www.energycodes.gov/status-state-energy-code-adoption>

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Pooling Question

How aware are you of government regulations to reduce/mitigate energy consumption & adopt more environmentally responsible refrigerants in the United States?

1. Fully Aware
2. Somewhat Aware
3. Not Aware



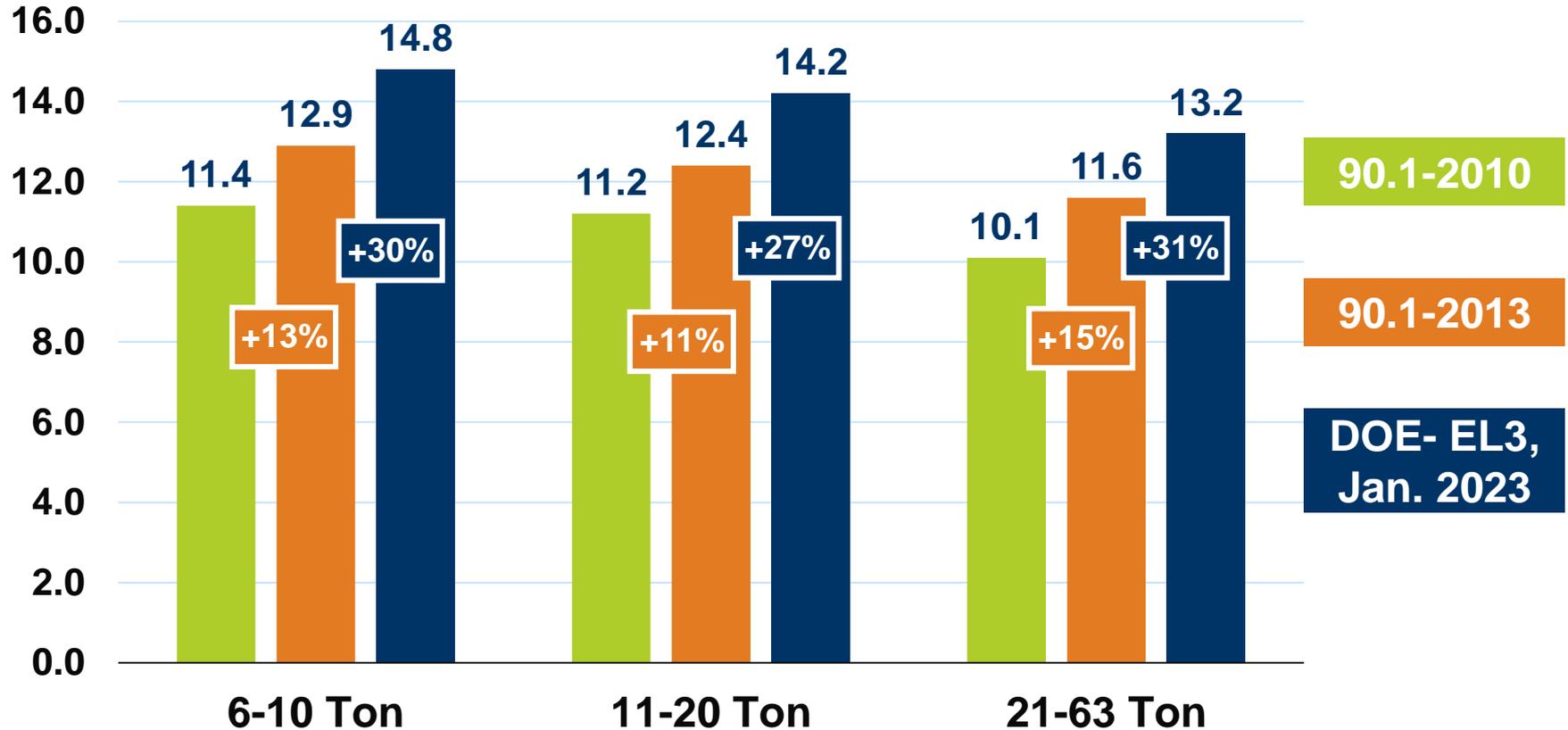
Consulting Specifying Engineer Survey Feedback / Inputs

Learnings:

- 86% of CSEs agree that "*tracking and understanding government, utility and/or trade association HVAC regulations*" is important to their business.
 - However only 20% of CSE's are both aware of the DOE regulations AND understand how the regulations impact their business.
- 22 % of CSEs report that they have interactions with customers in which HVAC regulations are discussed.
- 55% of CSEs say in general, their clients are NOT aware of HVAC energy efficiency standards and that they need to educate them on these standards.

To find more on HVAC regulations visit: [AC & Heating *Connect*TM](#)

DOE Efficiency Standards for Commercial AC Packaged / Split Systems



Note: ASHRAE 90.1 also has an EER component not shown here

On 1/1/2018 The DOE Will Adopt The 90.1-2013 IEER Levels Nationally

CEE Commercial Unitary Specification - Demanding Efficiency Levels Driven By Utility Advocates

CEE Commercial Unitary AC and HP Specification (w/Electric Heat or No Heat)

Size Category	System Type	Old Specifications			Current Specifications		
		CEE Tier 0	CEE Tier 1	CEE Tier 2	CEE Tier 1	CEE Tier 2	CEE Advanced Tier
<65,000 Btu/h	All Split	NA	14.0 SEER 12.0 EER	15.0 SEER 12.5 EER	15 SEER 12.5 EER	16 SEER 13 EER	18 SEER 13 EER
	All Single Package	NA	14.0 SEER 11.6 EER	15.0 SEER 12.0 EER	15 SEER 12 EER	16 SEER 12 EER	17 SEER 12.5 EER
≥65,000 Btu/h and <135,000 Btu/h	Single Packaged and Split	11.7 EER 11.8 IEER	11.7 EER 13.0 IEER	12.2 EER 14.0 IEER	11.7 EER 12.9 IEER	12.2 EER 14.0 IEER	12.6 EER 18.0 IEER
≥135,000 Btu/h and <240,000 Btu/h	Single Packaged and Split	11.7 EER 11.8 IEER	11.7 EER 12.5 IEER	12.2 EER 13.2 IEER	11.7 EER 12.4 IEER	12.2 EER 13.2 IEER	12.2 EER 17.0 IEER
≥240,000 Btu/h and <760,000 Btu/h	Single Packaged and Split	10.5 EER 10.6 IEER	10.5 EER 11.3 IEER	10.8 EER 12.3 IEER	10.5 EER 11.6 IEER	10.8 EER 12.3 IEER	10.8 EER 13.5 IEER
>760,000 Btu/h	Single Packaged and Split	9.9 EER 10.0 IEER	9.9 EER 11.1 IEER	10.4 EER 11.6 IEER	9.9 EER 11.2 IEER	10.4 EER 11.6 IEER	NA

Note: Electric Resistance Values Shown, Subtract 0.2 EER/IEER For All Other Equipment

Note: Effective January 2016

Technology Solutions to Optimize System Part Load Efficiency – IEER

Technology Levers



Multi-Speed Blower Fans



Multi-Speed Condenser Fans



Compression



Larger Coil Heat Exchangers



Controls

Higher IEER



DOE Efficiency Standards for Residential AC & HP Packaged / Split Systems Effective January 1, 2023

Product Class	National		Southeast*	Southwest**	
	SEER	HSPF	SEER	SEER	EER
Split System Air Conditioners with a Certified Cooling Capacity <45,000 Btu/h	14		15	15	12.2/10.2***
Split System Air Conditioners with a Certified Cooling Capacity \geq 45,000 Btu/h	14		14.5	14.5	11.7/10.2***
Split System Heat Pumps	15	8.8			
Single-Package Air Conditioners and Heat Pumps	14	8.0			11.0

- *Southeast includes: The states of Alabama, Arkansas, Delaware, Florida, Georgia, Hawaii, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas, Virginia, the District of Columbia, and the U.S. territories.
- **Southwest includes the states of Arizona, California, Nevada and New Mexico
- ***The 10.2 EER amended energy conservation standard applies to split system air conditioners with a seasonal energy efficiency ratio greater than or equal to 16.
- Note: The energy conservation standards for small-duct high velocity and space-constrained remain unchanged from current levels.

How Could Regulations Impact You?

- **Higher Part Load Efficiency (IEER) Systems**
 - Potentially higher first cost
 - Lower operating cost
- **Potential Increase in System Footprint**
 - Larger heat exchanger surface area
- **Reduction in System Refrigerant Circuits**
- **More Applications with Modulated Scroll Compressors**
 - Mechanical Modulation and Variable Speed Technology
- **VFDs on Evaporator Blower Motors – Staged Speeds**



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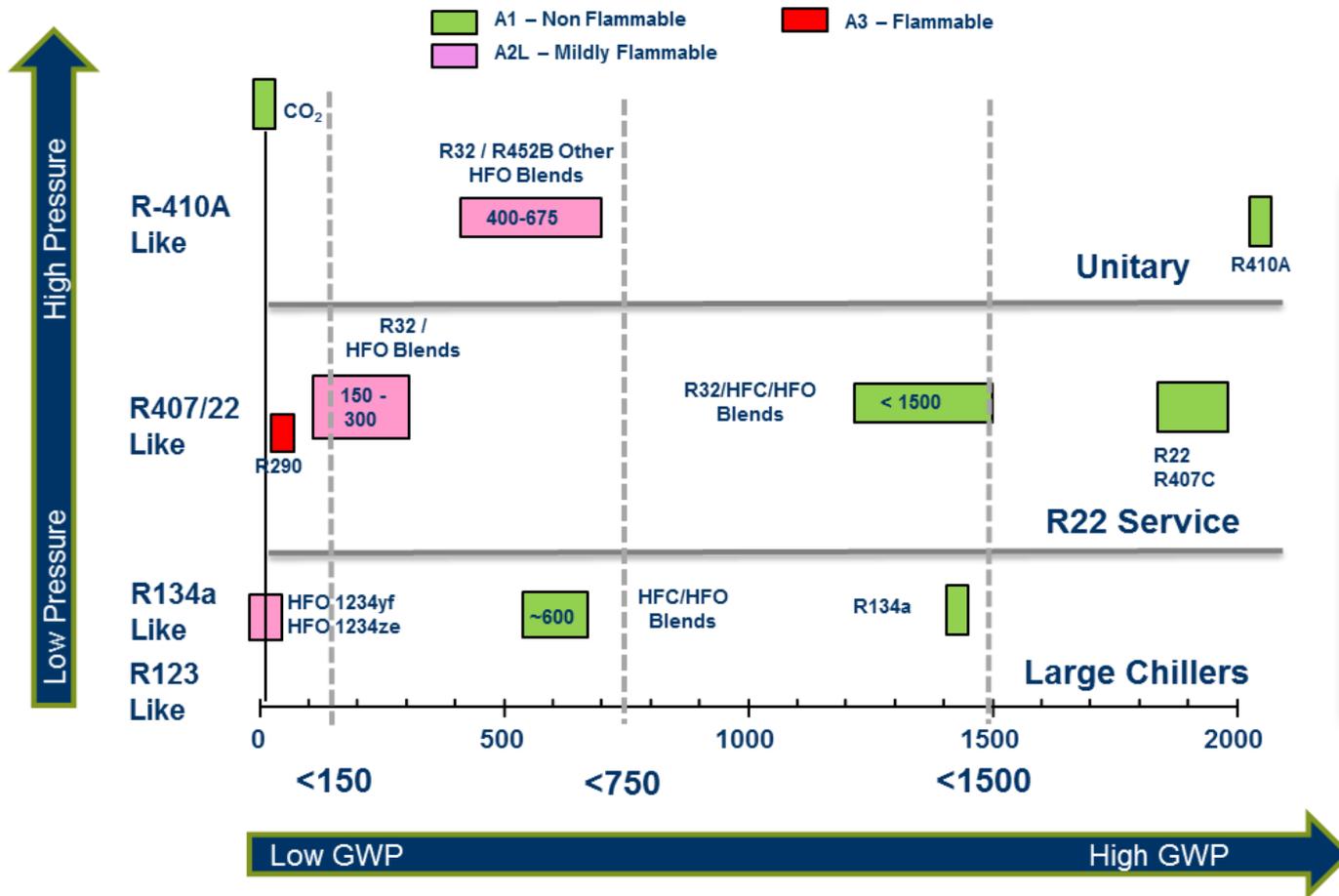
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Current Low GWP Candidates for Air Conditioning & Heat Pump Applications



Common Questions:

- What Is A Low-GWP Refrigerant?
- Why Is The Industry Moving In This Direction?
- What Does This Mean For Me?

Key Activities Impacting Low GWP Refrigerant Regulations and Timing for HVAC

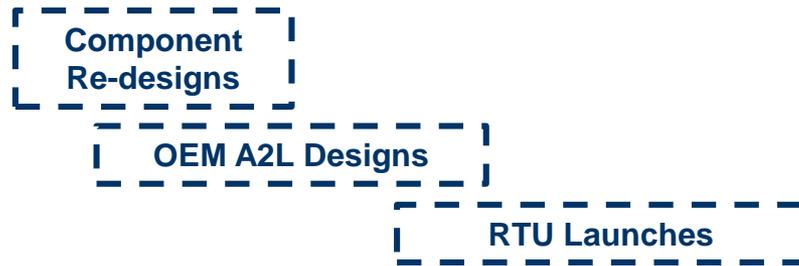


- **Global HFC Phasedown Framework Underway – Montreal Protocol Amendment**
- **EPA Proposed Ruling For Status Change (Delist) In Chillers**
 - R134a, R410A and R407C
- **Key Safety Standards Under Revision For A2L Fluids**
 - US: UL1995 & ASHRAE15
 - International: ISO-5149, IEC 60335, EN-378
- **AHRI A2L “Real World” Flammability Study Underway**
- **Equipment Manufacturers Launching New Systems With A2L**
 - Region And Application Dependent

Our Understanding of Regulation Timing for Low GWP Refrigerants in AC Applications

	'16	'17	'18	'19	'20	'21	'22	'23	'24	'25
IEC/UL/ASHRAE Stds. Update for A2L's										
A2L Into Bldg Codes										
DOE Commercial RTU's IEER Std			1/1/18 EL1					1/1/23 EL3		
EPA Proposed Delist (Chillers)						1/1/21 Initial			1/1/24 Rev.	

RTU'S



Chillers



Flammable LGWP Refrigerants Emerging in HVAC Applications in the Next 5 Years

Application	China	Japan	Rest of Asia	Europe	US/NA	Middle East & Africa
Residential Air To Air Split AC/HP	A3 Active Programs	A2L Active Programs	A2L Active Programs	A2L Active Programs	A3 / A2L Beyond 2021	A2L Active Programs
Residential Air To Water Heating	A3 Active Programs	A3 / A2L Beyond 2021	A3 / A2L Beyond 2021	A2L Active Programs	A3 / A2L Beyond 2021	A3 / A2L Beyond 2021
Residential Geothermal	A3 / A2L Beyond 2021	A3 / A2L Beyond 2021	A3 / A2L Beyond 2021	A2L Active Programs	A3 / A2L Beyond 2021	A3 / A2L Beyond 2021
Lt Commercial Rooftop	A3 / A2L Beyond 2021	A3 / A2L Beyond 2021	A3 / A2L Beyond 2021	A2L Active Programs	A3 / A2L Beyond 2021	A3 / A2L Beyond 2021
Lt Commercial PAC	A3 Active Programs	A2L Active Programs	A2L Active Programs	A2L Active Programs	A3 / A2L Beyond 2021	A2L Active Programs
Scroll Chillers	A3 Active Programs	A3 / A2L Beyond 2021	A2L Active Programs	A2L Active Programs	A3 / A2L Beyond 2021	A3 / A2L Beyond 2021
Large Chillers	A3 Active Programs	A3 / A2L Beyond 2021	A3 / A2L Beyond 2021	A2L Active Programs	A3 / A2L Beyond 2021	A3 / A2L Beyond 2021
PTACs / Window Units	A3 / A2L Beyond 2021					

A3 Active Programs

A2L Active Programs

A3 / A2L Beyond 2021

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INTRODUCING DESIGNER AIR

Thank You For Attending!

To Learn More On “*Getting Comfortable With Designer Air*”, Please Visit Our Webpage At emersonclimate.com/designerair

Stay Tuned For More Emails Containing Information And Timing On Our Next Webinar!

