Are You Ready for the Upcoming Efficiency Regulations and Refrigerant Changes in Commercial HVAC?

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Today’s Presenter

David Hules

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

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

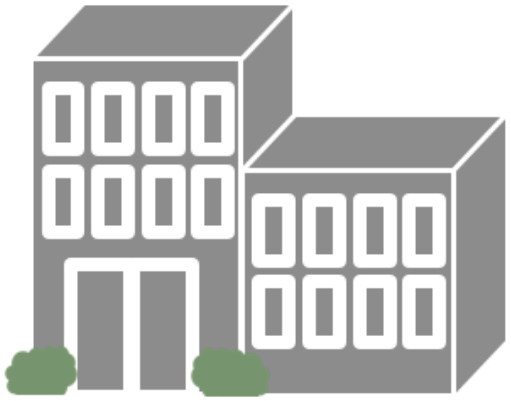
Polling Question

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

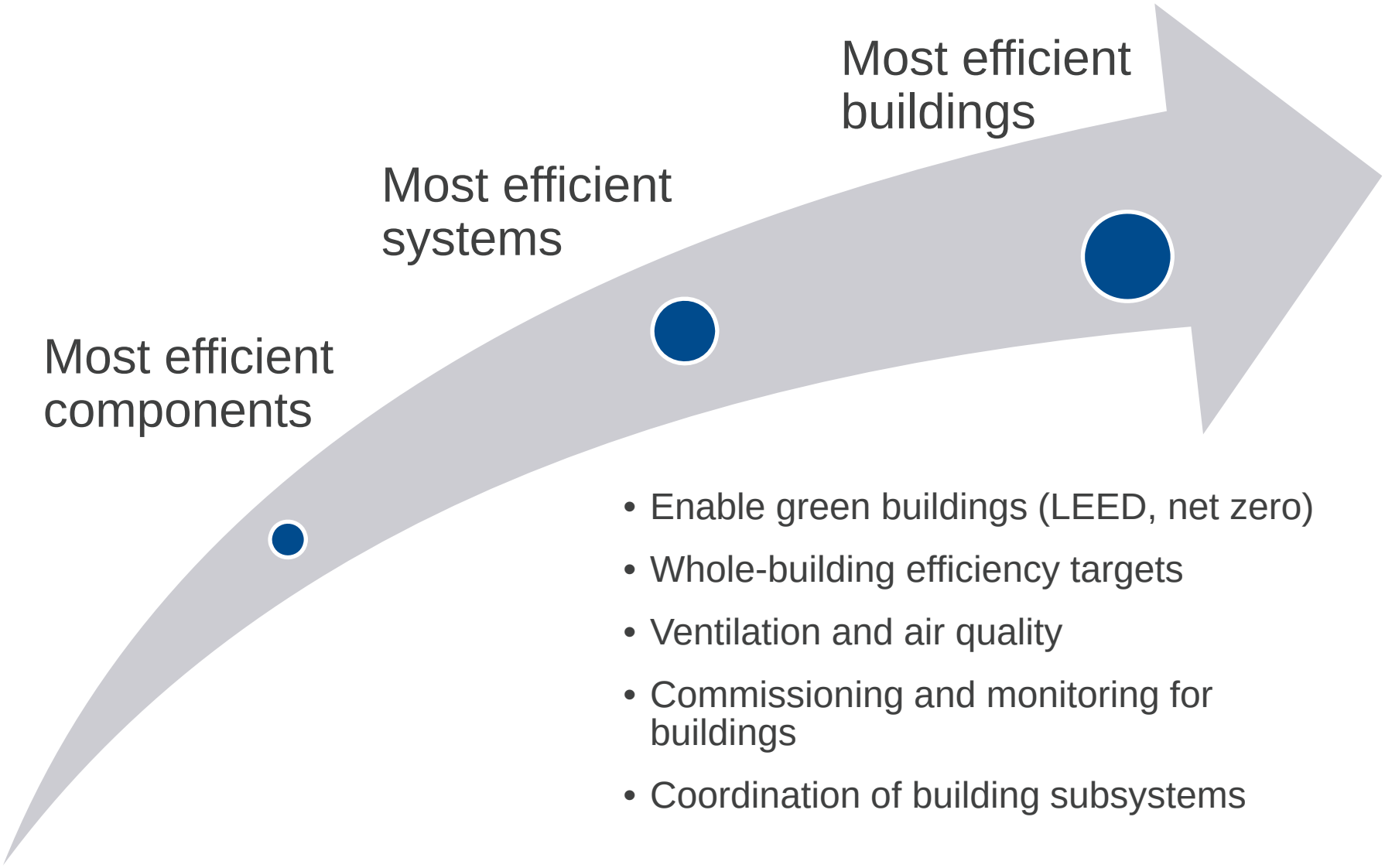
1. 0–30%
2. 30–60%
3. 60–100%

Megatrends Driving Commercial Air Conditioning

Trend	Industry Response
Building automation/connectivity	• Modulation technologies
Energy efficiency and sustainability	• Advanced diagnostics
Comfort and air quality	• Sensing and facility monitoring
	• Low-GWP refrigerants
	• Efficiency retrofits

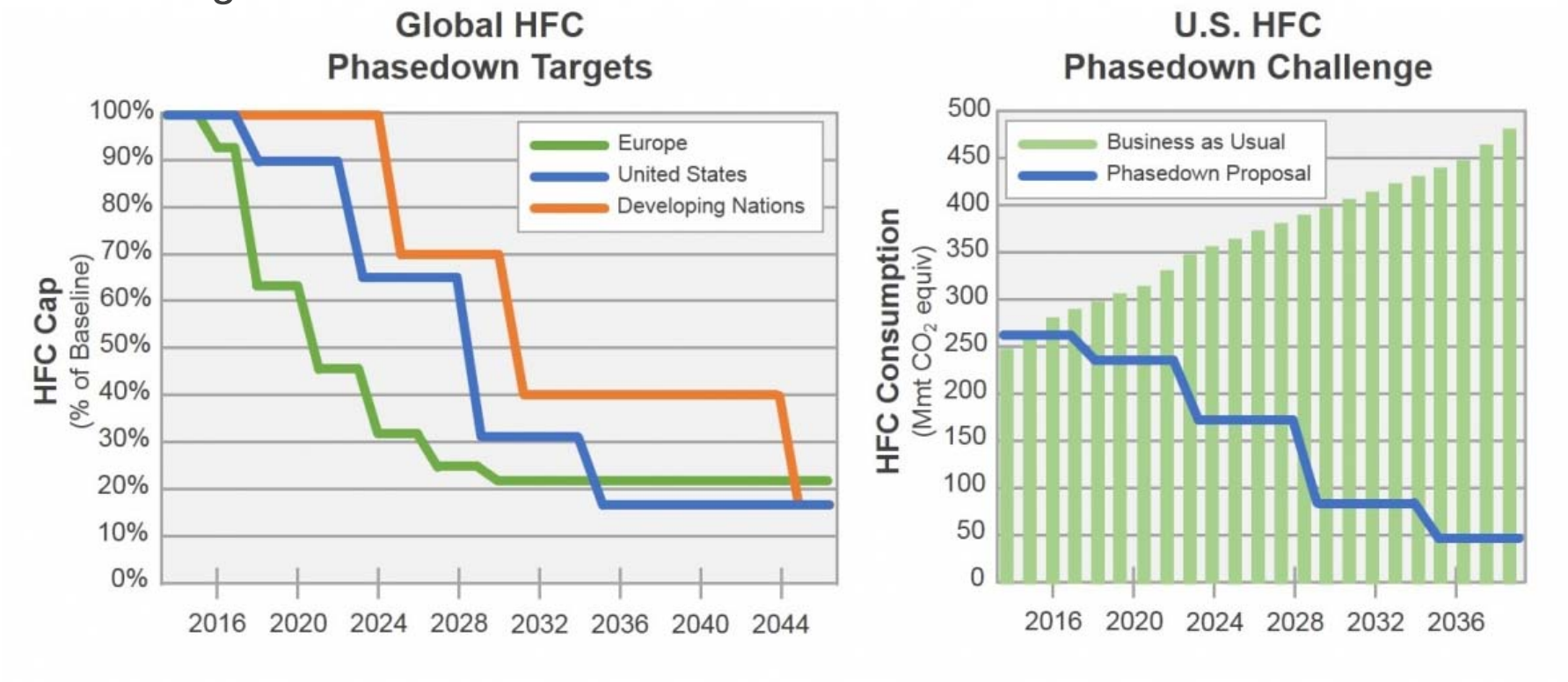


Industry Trends Driving Toward Solutions to Deliver the Most Efficient Buildings



The Road to Zero: DOE's Next-Generation Heating and 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 and residential buildings



Source: U.S. Department of Energy

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

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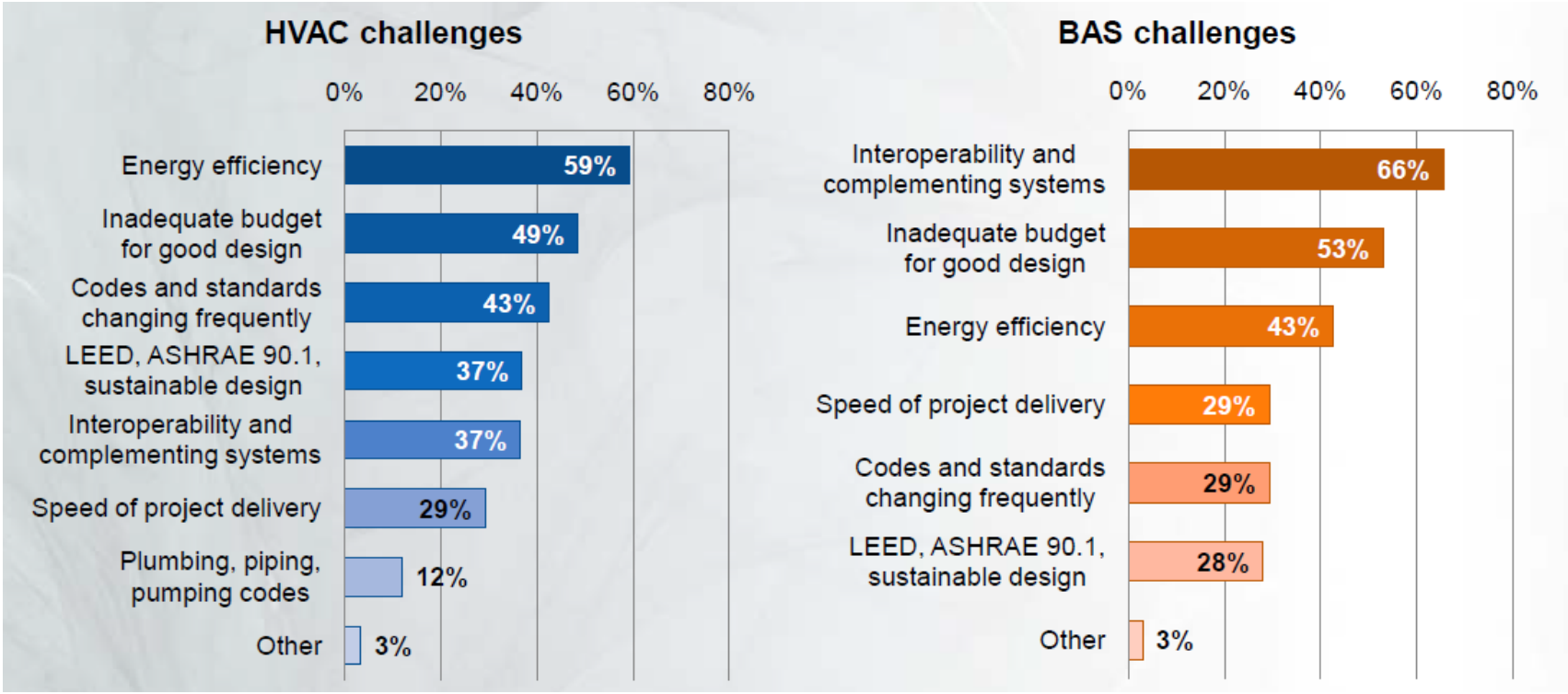
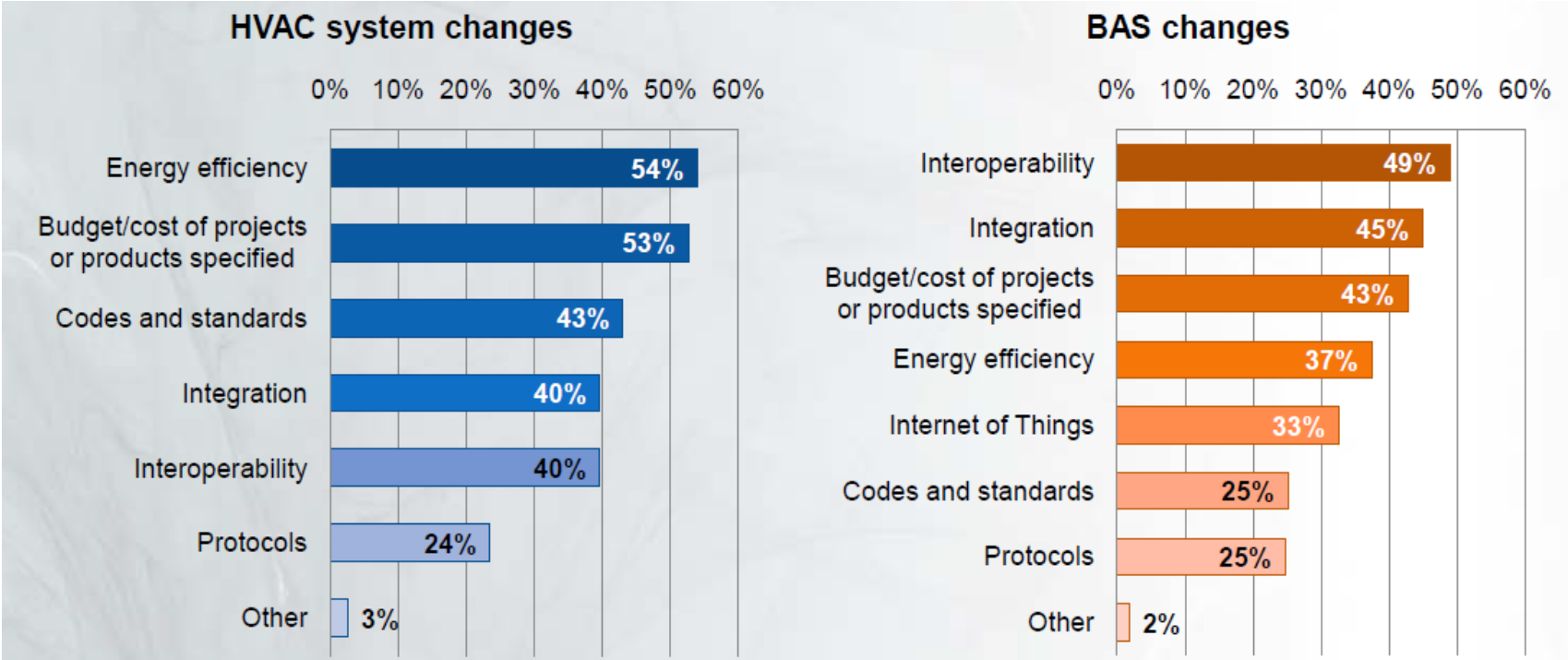
43% of Respondents Said That Frequent Changes to HVAC Codes and Standards Is a Challenge



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)

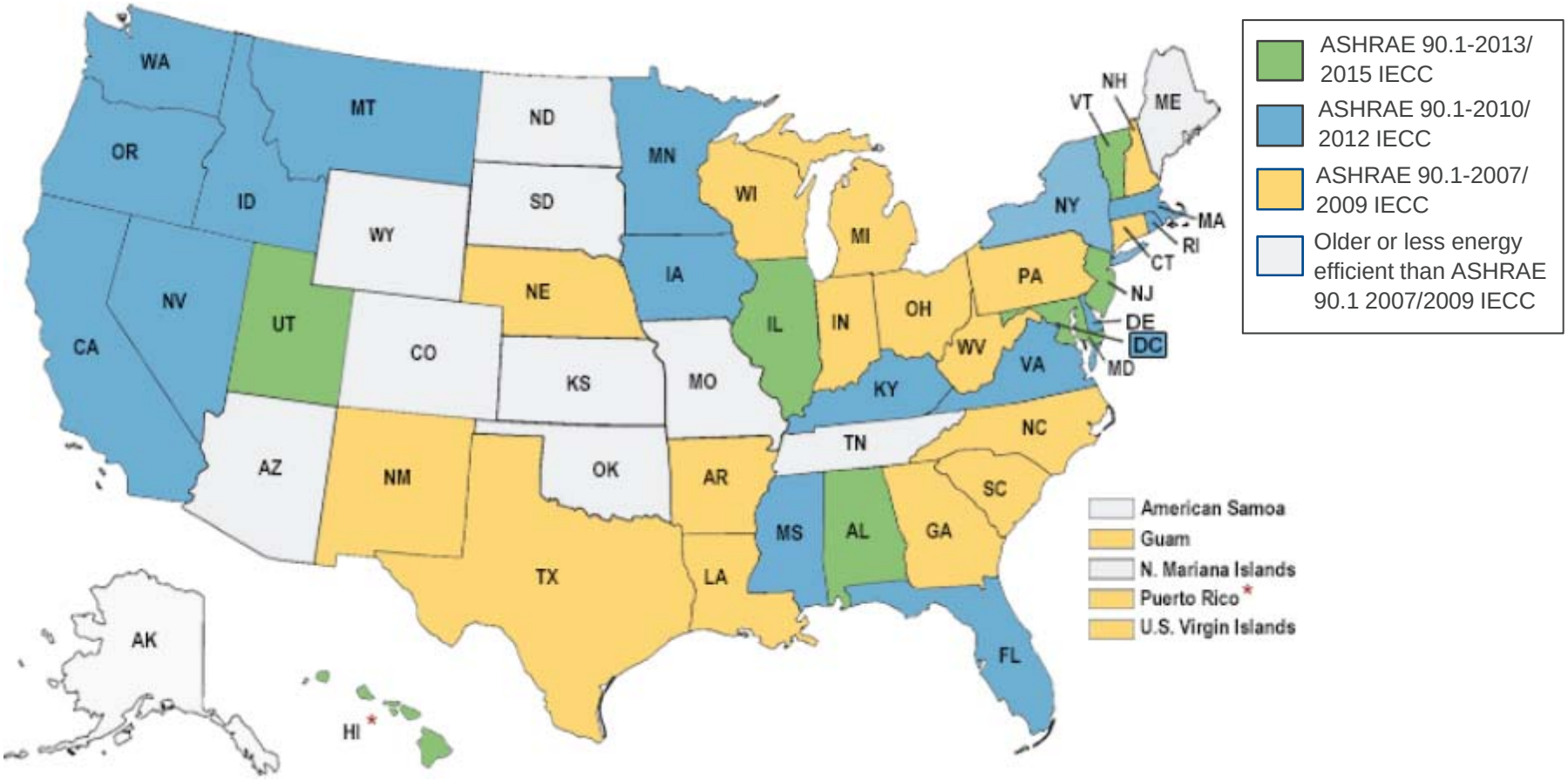
Source: Consulting Specifying Engineer 2015 HVAC and building automation systems study

Polling Question

What region of the country are your primary operations?

1. Northcentral
2. Southeast
3. Northeast
4. Southcentral
5. Southwest
6. Northwest

Status of State Energy Code Adoption for Commercial Buildings (as of July 2016)



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

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Polling Question

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

1. Fully aware
2. Somewhat aware
3. Not aware

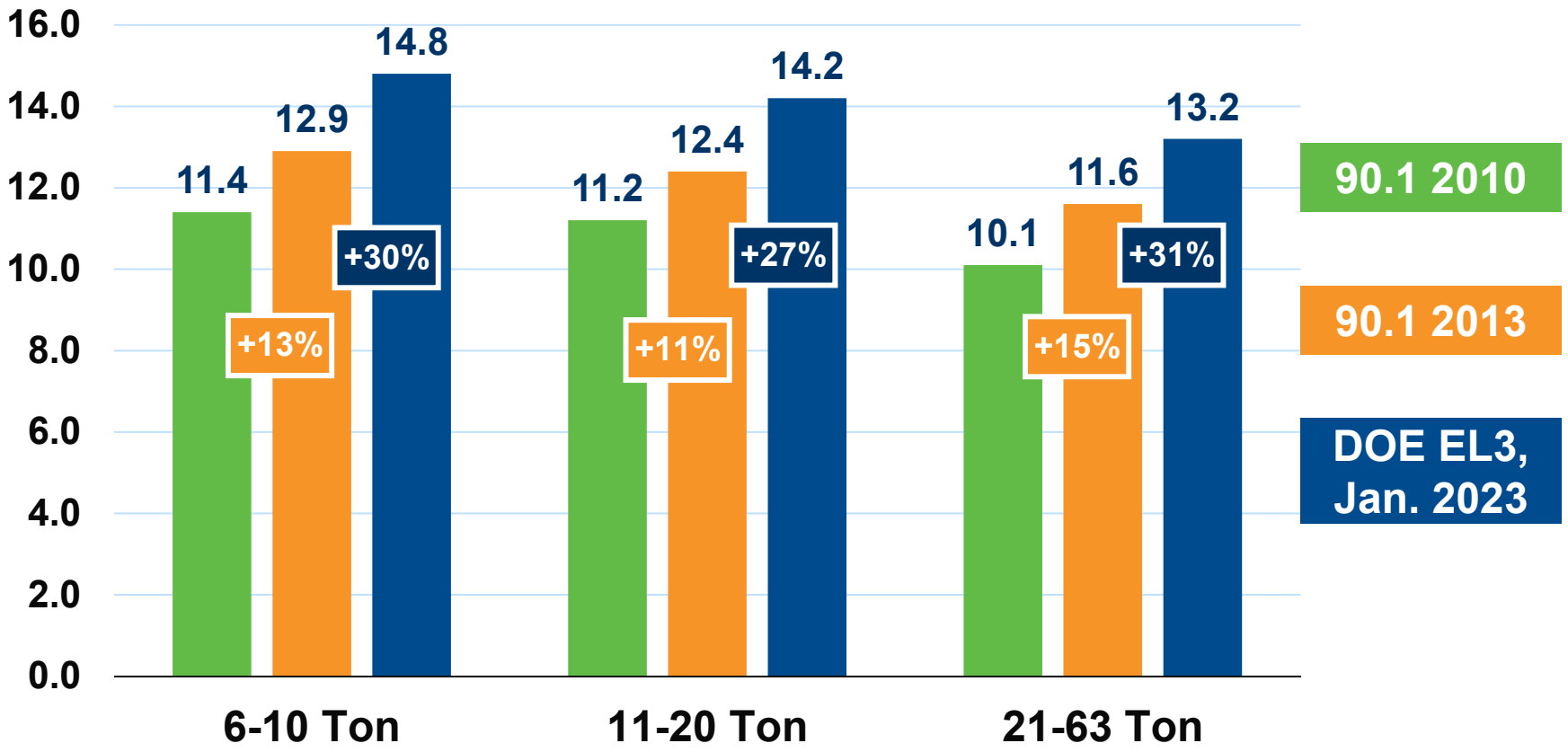
Consulting Specifying Engineer Survey Feedback/Inputs

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 CSEs 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™

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.

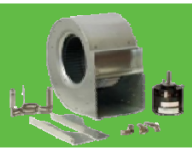
CEE Commercial Unitary Specification — Demanding Efficiency Levels Driven by Utility Advocates

CEE Commercial Unitary AC and HP Specification (With Electric Heat or No Heat)							
		Old Specifications			Current Specifications		
Size Category	System Type	CEE Tier 0	CEE Tier 1	CEE Tier 2	CEE Tier 1	CEE Tier 2	CEE Advanced Tier
<65,000 Btu/h	All split	N/A	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-packaged	N/A	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 11.8IEER	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	N/A

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 and 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 ≥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: 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 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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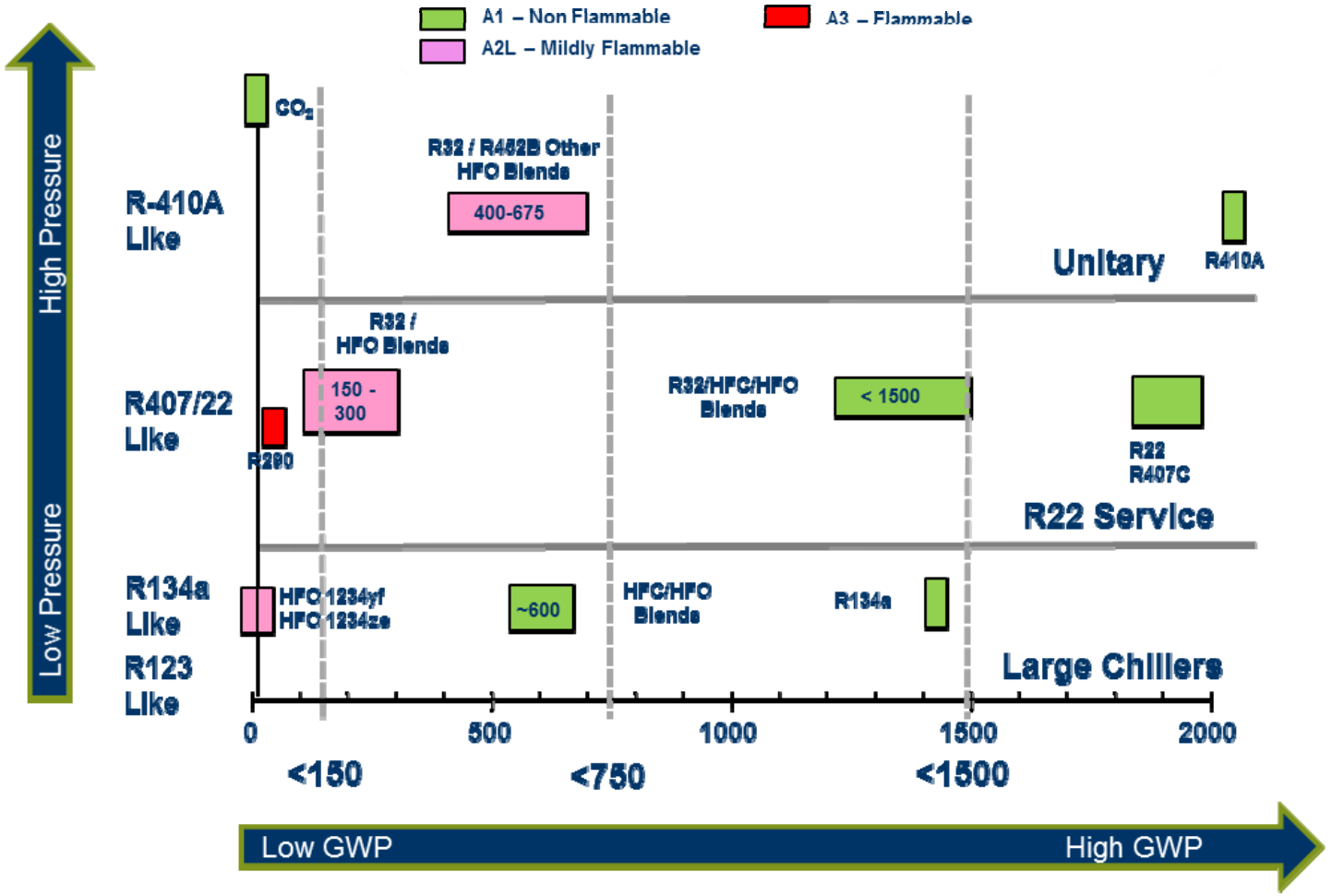
Current Low-GWP Candidates for Air Conditioning and Heat Pump Applications

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 phase-down framework underway — Montreal Protocol Amendment

- EPA proposed ruling for status change (delist) in chillers
  - R-134a, R-410A and R-407C

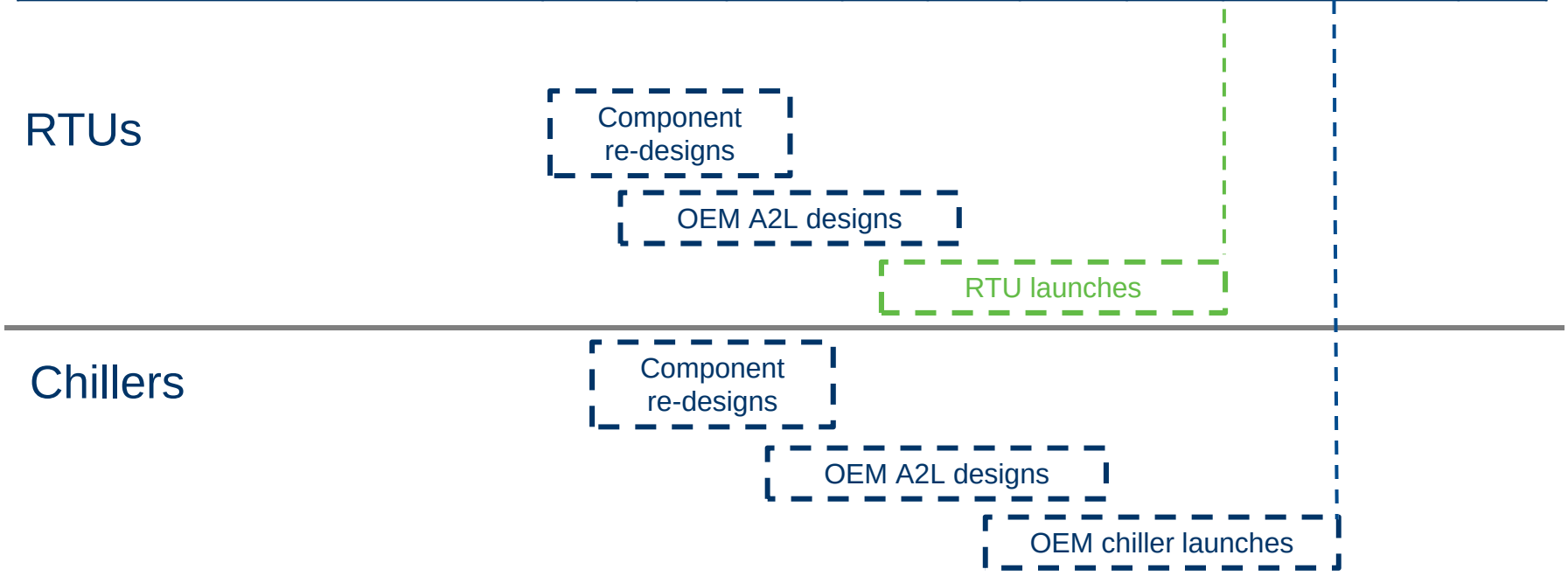
- Key safety standards under revision for A2L fluids
  - U.S.: UL1995 and ASHRAE15
  - International: ISO-5149, IEC 60335, EN-378

- 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 building codes										
DOE commercial RTUs IEER standard			1/1/18 EL1					1/1/23 EL3		
EPA proposed delist (chillers)						1/1/21 Initial			1/1/24 Rev.	



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

Application	China	Japan	Rest of Asia	Europe	U.S./N.A.	Middle East and Africa
Residential air to air split AC/HP						
Residential air to water heating						
Residential geothermal						
Lt. commercial rooftop						
Lt. commercial PAC						
Scroll chillers						
Large chillers						
PTACs/window units						

A3 active programs

A2L active programs

A3/A2L beyond 2021

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Thank You!

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Questions?