



# The Heat Is On

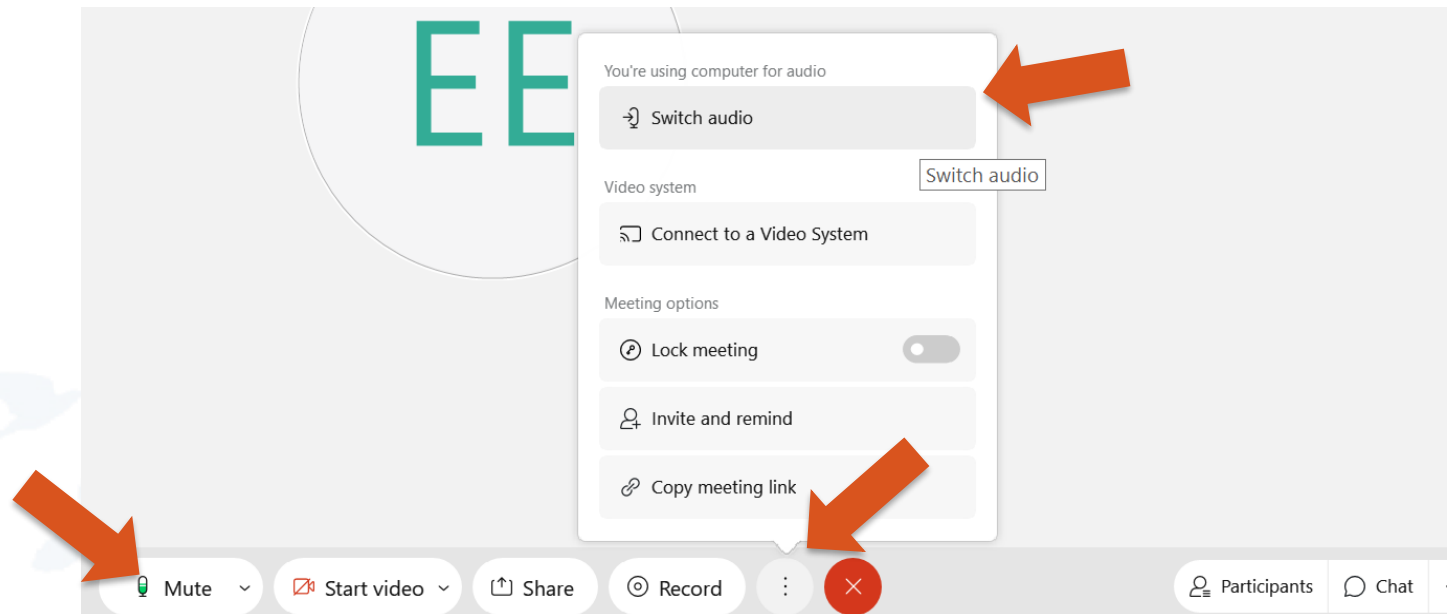
Finalizing Revisions to the CEE Residential Heating and Cooling Systems Initiative

Alice Rosenberg  
CEE Industry Partners Meeting  
12:30-1:45pm Eastern (*Remote*)  
October 1, 2020

# WEBEX MEETINGS – AUDIO PARTICIPATION



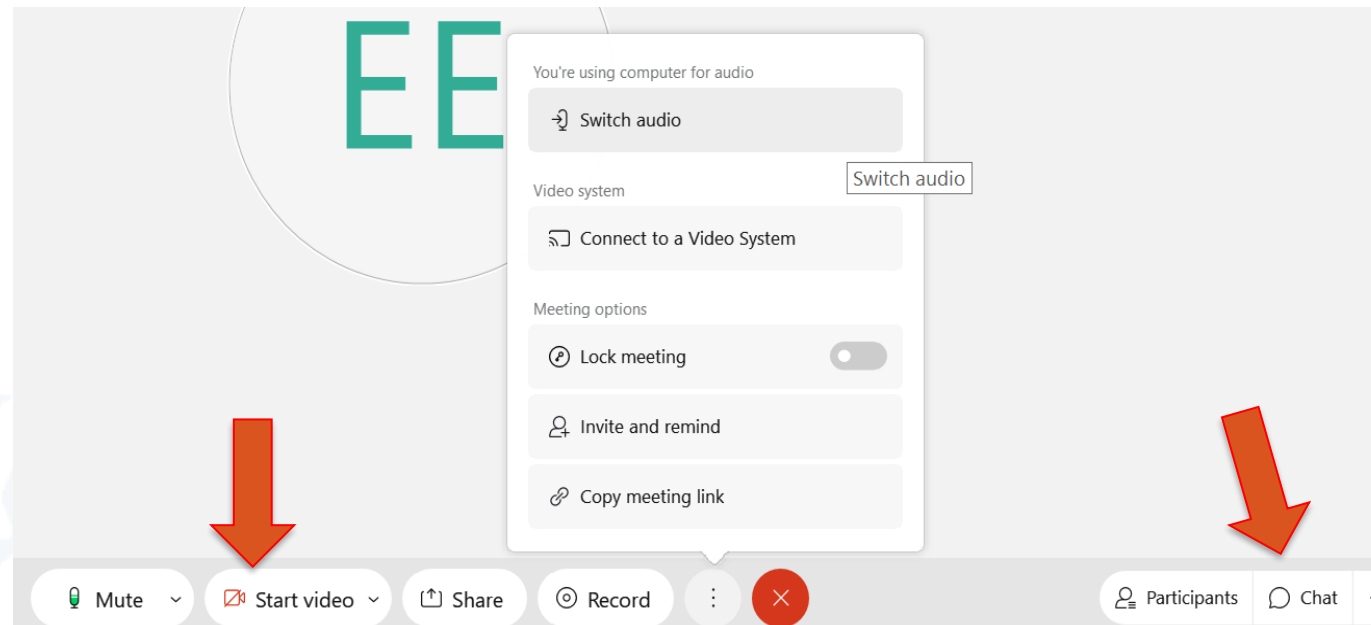
- You may participate through computer audio or by calling in  
You can switch at any point if you are having call quality issues
- Please mute yourself when not speaking



# WEBEX MEETINGS – PARTICIPATION



- If you are able, please use video when speaking  
If you are experiencing bandwidth issues, you may need to turn off your video
- Use the chat or raise hand if you are having trouble participating

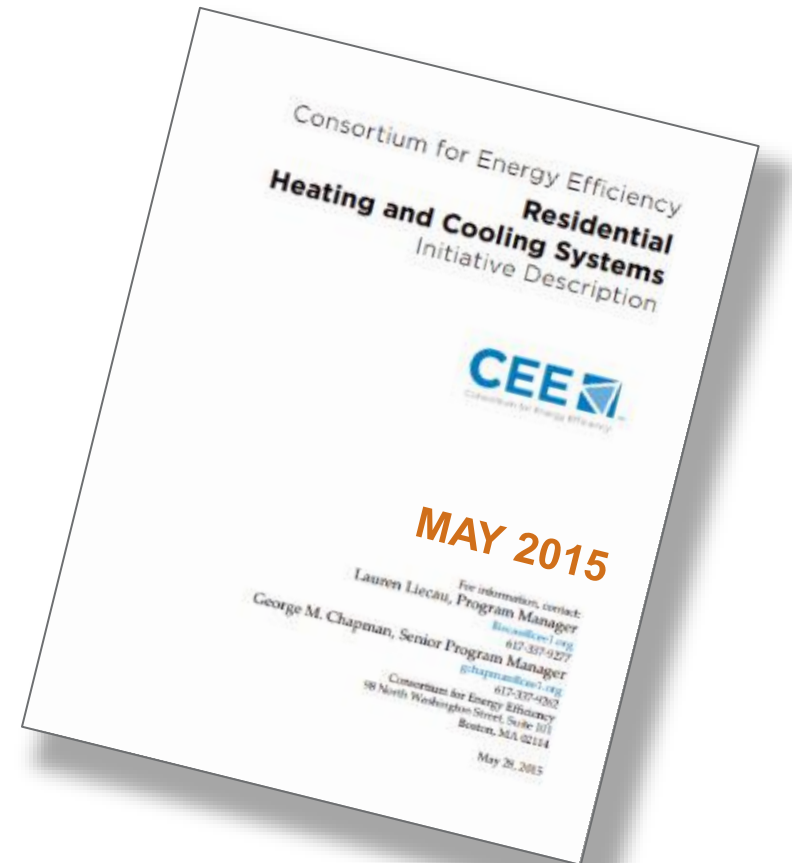


# Session Objectives

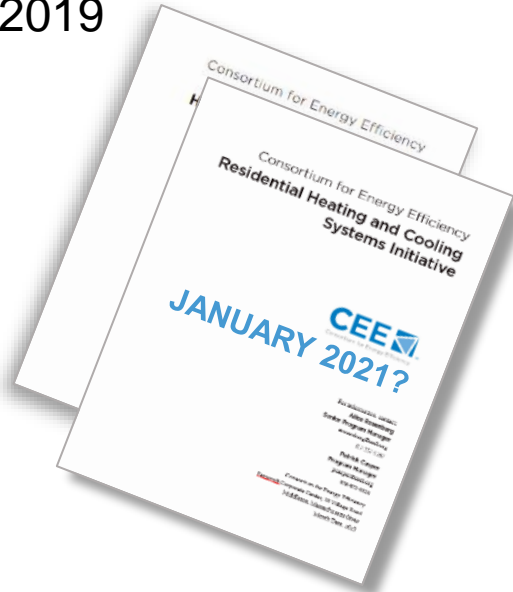
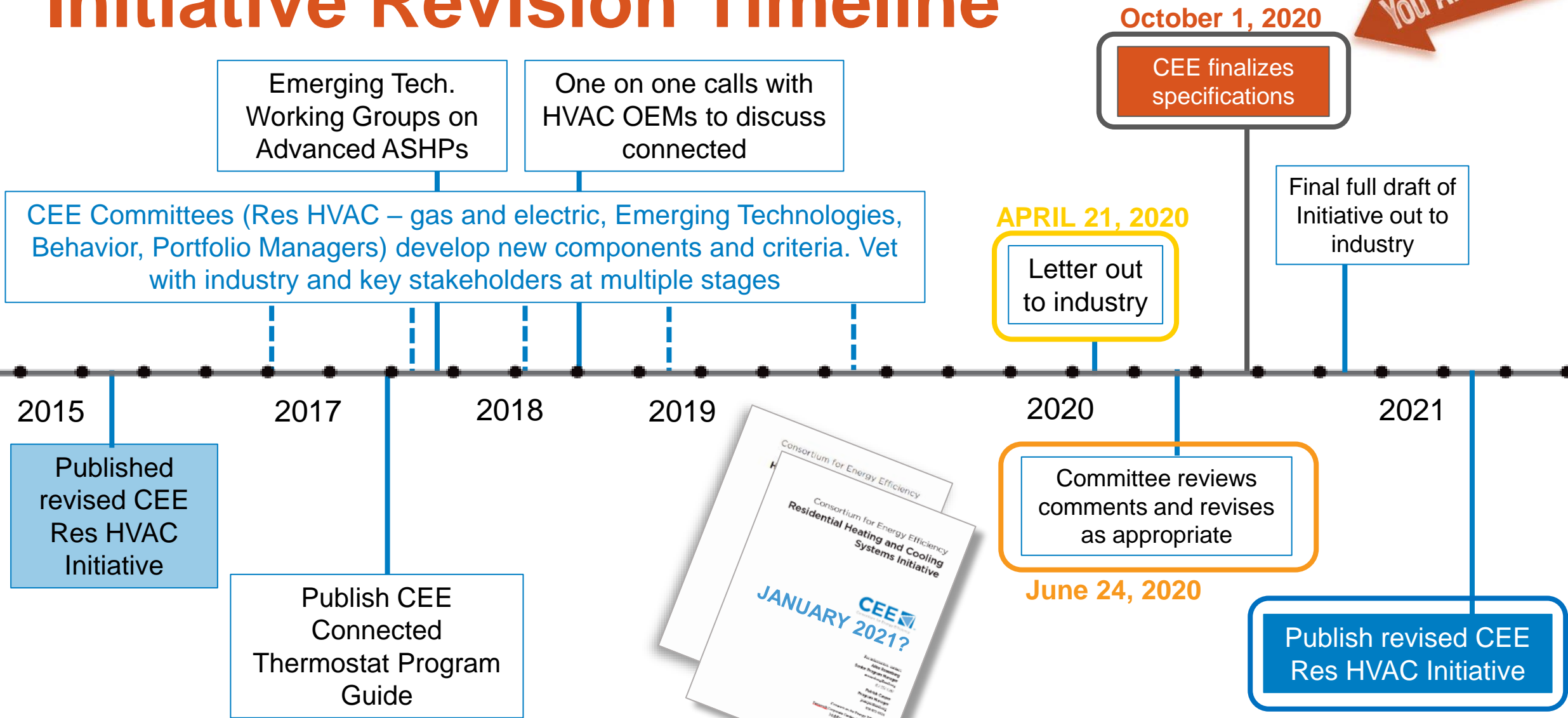
- ▶ **Review changes and incorporations** to the draft *CEE Residential Heating and Cooling Systems Initiative* since it went out for industry review in April 2020.
- ▶ **Discuss and deliberate any outstanding comments** and develop consensus positions for a finalized Initiative to bring to the CEE Board for authorization in January 2021.

# CEE Residential HVAC Initiative

- ▶ First published in 1995
- ▶ Last revised in 2015, includes:
  - Common Efficiency Specification
    - Central Air Conditioners
    - Air Source Heat Pumps
    - Furnaces and Furnace Fans
    - Boilers
  - Quality Installation
  - Education and Awareness Building
  - CEE Directory
- ▶ Currently under revision (2018-2020)



# Initiative Revision Timeline



# Agenda



▼ Background and Initiative Strategy 10 mins

▼ Natural Gas Specifications 15 mins

- Boilers, Furnaces, and Gas Heat Pump Specifications

▼ Electric Specifications 35 mins

- Tier Structure and Applications
- SEER/EER/HSPF Levels
- Rated Capacity Requirements

▼ Connected Criteria 10 mins

▼ Next Steps 5 mins



# Overarching Initiative Strategy





# Initiative Strategy

- ▶ There is a need for increased emphasis on the role of equipment selection and tailored system considerations
- ▶ Existing federally regulated rating metrics for differentiating equipment are not consistently reliable indicators of actual in-field performance
- ▶ Not all the areas that the Committee is interested in addressing can be achieved in this Initiative revision

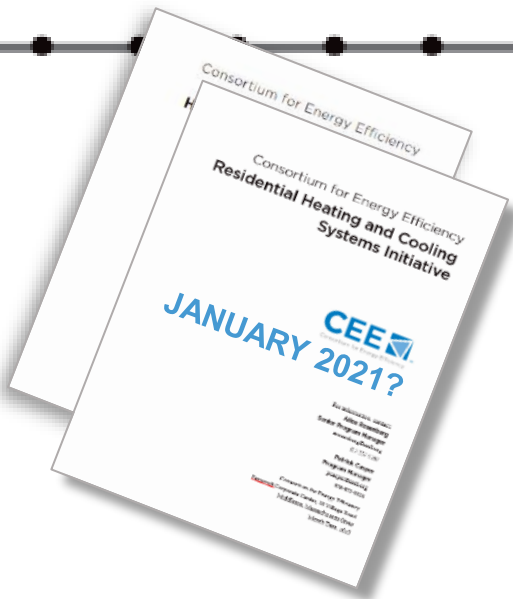
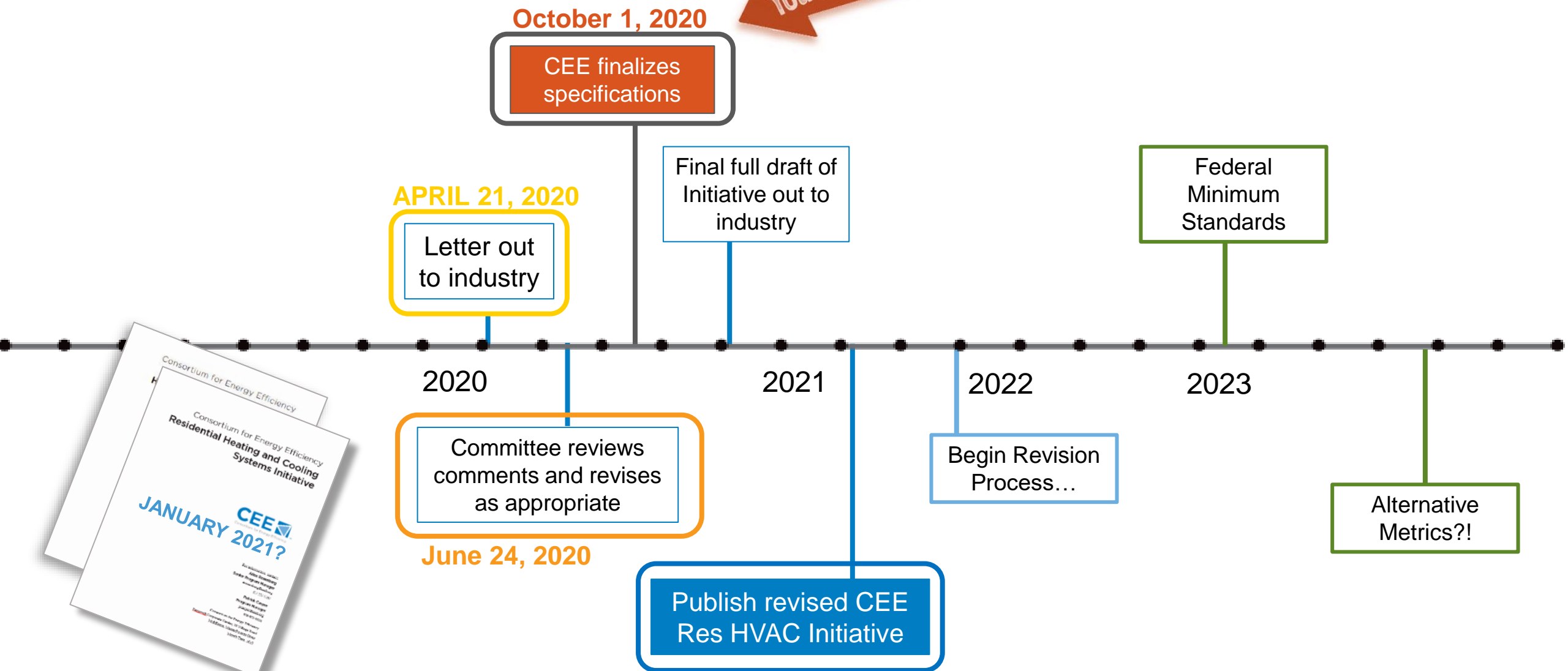


# Key Changes Since April Proposal

- ▶ Concerted effort to minimize changes and burden on industry, given disruptive time and competing priorities
- ▶ Continued reinforcement of design and equipment selection as central strategy to broader CEE Res HVAC Initiative
- ▶ Attempted simplicity of specifications with respect to climate considerations and applications
- ▶ Incorporation of Tier 1 as an option for a market of replacement scenarios that offer incremental savings

Electric  
Equipment

# Initiative Timeline



# Natural Gas Specifications

- Furnaces
- Boilers
- Air Source Heat Pumps

# CEE Gas-Fired Specifications

## Forced Hot Air

Level	AFUE
CEE Tier 1	≥ 92%*
CEE Tier 2	≥ 95%*
CEE Tier 3	≥ 97%*
Advanced Tier	≥ 110%**

## Boiler (Hydronic)

Level	AFUE	Other Requirements
CEE Tier 1	≥ 90%*	Thermal Load Management <sup>^</sup>
CEE Tier 2	≥ 95%*	Thermal Load Management <sup>^</sup>
Advanced Tier	≥ 110%**	Thermal Load Management <sup>^</sup>

\* 10 CFR Appendix N to Subpart B of Part 430 - *Uniform Test Method for Measuring the Energy Consumption of Furnaces and Boilers*

\*\* ANSI Z21.40.4 *Performance Testing and Rating of Gas-Fired, Air Conditioning and Heat Pump Appliances*, designated for Region IV

<sup>^</sup> May be met by incorporating outdoor reset control, indoor load reset, or thermal targeting strategies

## Advanced Tier Additional Reporting Metrics (where applicable)

- System Type
- Refrigerant/Working Fluid(s)
- Target Applications (all that apply)
- Heat Rejection or Acceptance
- Heating Capacity (kBtu/h)
- Input Modulation Range (MBH)
- Maximum Supply Water Output Temperature
- Cooling Capacity (Tons)
- COP<sub>gas HHV</sub>
- COP<sub>cooling</sub>
- Total Input Electric Power (kW) at maximum input
- Percentage of Rated Heating Capacity
- Maximum Number of Units that Can be Interconnected
- Noise (dBA)

# Gas Heat Pump Approach

## Forced Hot Air

Level	AFUE
CEE Tier 1	≥ 92%*
CEE Tier 2	≥ 95%*
CEE Tier 3	≥ 97%*
<b>Advanced Tier</b>	<b>≥ 110%**</b>

## Boiler (Hydronic)

Level	AFUE	Other Requirements
CEE Tier 1	≥ 90%*	Thermal Load Management <sup>^</sup>
CEE Tier 2	≥ 95%*	Thermal Load Management <sup>^</sup>
<b>Advanced Tier</b>	<b>≥ 110%**</b>	<b>Thermal Load Management<sup>^</sup></b>

## Key Changes Since April Proposal:

- ▼ **Maintained the Advanced Tier Approach**  
 A CEE Advanced Tier represents an aspirational level of performance that is agreed to be technically feasible.
- ▼ **Referenced ANSI Z21.40.4 as Test Method for Advanced Tier**  
 Currently under revision to address gas heat pumps in greater detail, this federal standard provides a credible method for calculating an AFUE
- ▼ **Reduced Advanced Tier from ≥120% AFUE to ≥110% AFUE**  
 Ensures that all prospective gas heat pumps potentially coming on the market will meet the tier

# CEE Gas-Fired Forced Hot Air Specification

**Scope:** Input rating <225,000 BTU/h (Optional distinction for units ≤40,000 BTU/h)

Level	AFUE
CEE Tier 1	≥ 92%*
CEE Tier 2	≥ 95%*
CEE Tier 3	≥ 97%*
Advanced Tier	≥ 110%**

## Key Changes Since April Proposal:

- ▶ Renamed “Furnace Specification” to “Forced Hot Air Specification”  
Broader name allows for incorporation of gas heat pump technologies in the Advanced Tier level
- ▶ Removed Standalone ≤ 40,000 BTU/h Specification  
Note an optional distinction for these models, but not through an explicit separate specification table

# CEE Gas-Fired Boiler (Hydronic) Specification

Scope: Input rating <300,000 BTU/h

Level	AFUE	Other Requirements
CEE Tier 1	≥ 90%*	Thermal Load Management <sup>^</sup>
CEE Tier 2	≥ 95%*	Thermal Load Management <sup>^</sup>
Advanced Tier	≥ 110%**	Thermal Load Management <sup>^</sup>

## Key Changes Since April Proposal:

- ▶ Renamed “Boiler Specification” to “Boiler (Hydronic) Specification”  
Broader name allows for incorporation of gas heat pump technologies in the Advanced Tier level
- ▶ Renamed “Outdoor Reset Control” to “Thermal Load Management”  
<sup>^</sup> May be met by incorporating outdoor reset control, indoor load reset, or thermal targeting strategies
- ▶ Removed Tier 0 ≥ 85% Entirely  
Had proposed to sunset CEE Tier 0 in January 2021, when the amended federal minimum standards for residential boilers go into effect



# Electric Specifications

- Split Central Air Conditioners
- Packaged Central Air Conditioners
- Split Air Source Heat Pumps
- Packaged Air Source Heat Pumps

# CEE Electric Specifications

## Split CAC

Level	SEER	EER
<b>CEE Tier 1</b>	≥ 16.0	≥ 13.0
<b>CEE Tier 2</b>	≥ 18.0	≥ 13.0

## Split ASHP

Level	SEER	EER	HSPF	Rated Capacity at 17°F/47°F
<b>CEE Tier 1</b>	≥ 15.0	≥ 12.5	≥ 8.5	≥ 58% <sup>^</sup>
<b>CEE Tier 2</b>	≥ 16.0	≥ 13.0	≥ 9.0	≥ 58% <sup>^</sup>
<b>CEE Tier 3<sup>^^</sup></b>	≥ 18.0	≥ 13.0	≥ 10.0	≥ 58%

## Packaged CAC

Level	SEER	EER
<b>CEE Tier 1</b>	≥ 15.0	≥ 12.0
<b>CEE Tier 2</b>	≥ 16.0	≥ 12.0

## Packaged ASHP

Level	SEER	EER	HSPF	Rated Capacity at 17°F/47°F
<b>CEE Tier 1</b>	≥ 15.0	≥ 12.0	≥ 8.2	≥ 60% <sup>^</sup>
<b>CEE Tier 2</b>	≥ 16.0	≥ 12.0	≥ 8.5	≥ 60% <sup>^</sup>
<b>CEE Tier 3<sup>^^</sup></b>	≥ 16.0	≥ 12.0	≥ 9.5	≥ 60%

<sup>^</sup> Rated Capacity in CEE Tier 1 and 2 – recommended for South and Southwest DOE climates – is an optional requirement

<sup>^^</sup> CEE Tier 3 is recommended for North/Canada DOE climates

# Central AC Specifications

## Split CAC

Level	SEER	EER
CEE Tier 1	≥ 16.0	≥ 13.0
CEE Tier 2	≥ 18.0	≥ 13.0

## Packaged CAC

Level	SEER	EER
CEE Tier 1	≥ 15.0	≥ 12.0
CEE Tier 2	≥ 16.0	≥ 12.0

## Key Changes Since April Proposal:

- ▶ **Removed Climate References**  
No mention of applied DOE climate zones
- ▶ **Revised Split CAC Tiers**  
Increased CEE Tier 1 from 12.5 to 13.0 to reflect model availability as determined from AHRI Directory
- ▶ **Revised Packaged CAC Tiers**  
Decreased CEE Tier 1 SEER from 16.0 to 15.0  
Decreased CEE Tier 2 SEER from 17.0 to 16.0  
Decreased CEE Tier 3 EER from 12.5 to 12.0

# Air Source Heat Pump Specifications

## Key Changes Since April Proposal:

- ▼ **Removed Climate References**  
 Changed “Advanced Tier” for North/Canada to be “CEE Tier 3”; recommended applications
- ▼ **Revised Split ASHP Tiers**  
 Decreased CEE Tier 1 SEER from 16.0 to 15.0  
 Decreased CEE Tier 2 SEER from 18.0 to 16.0
- ▼ **Revised Packaged ASHP Tiers**  
 Decreased CEE Tier 1 SEER from 16.0 to 15.0  
 Decreased CEE Tier 2 SEER from 17.0 to 16.0  
 Decreased CEE Tier 3 SEER from 17.0 to 16.0  
 Increased CEE Tier 2 HSPF from 8.2 to 8.5  
 Increased CEE Tier 3 HSPF from 9.0 to 9.5

## Split ASHP

Level	SEER	EER	HSPF	Rated Capacity at 17°F/47°F
<b>CEE Tier 1</b>	≥ 15.0	≥ 12.5	≥ 8.5	≥ 58%^
<b>CEE Tier 2</b>	≥ 16.0	≥ 13.0	≥ 9.0	≥ 58%^
<b>CEE Tier 3^^</b>	≥ 18.0	≥ 13.0	≥ 10.0	≥ 58%

## Packaged ASHP

Level	SEER	EER	HSPF	Rated Capacity at 17°F/47°F
<b>CEE Tier 1</b>	≥ 15.0	≥ 12.0	≥ 8.2	≥ 60%^
<b>CEE Tier 2</b>	≥ 16.0	≥ 12.0	≥ 8.5	≥ 60%^
<b>CEE Tier 3^^</b>	≥ 16.0	≥ 12.0	≥ 9.5	≥ 60%

# Air Source Heat Pump Specifications

## Key Changes Since April Proposal:

- ▼ **Establishment of Single Heating Capacity Requirement**  
 Ratio COP at 17°F/47°F, with a threshold of ≥ 58% (split) and ≥ 60% (packaged) to distinguish products
- ▼ **Recognition of Alternative Strategies and Approaches**  
 Full Initiative to elaborate on other ways to achieve similar objectives, primarily:
  1. Promotion of dual fuel solutions and
  2. Oversizing air source heat pumps

## Split ASHP

Level	SEER	EER	HSPF	Rated Capacity at 17°F/47°F
<b>CEE Tier 1</b>	≥ 15.0	≥ 12.5	≥ 8.5	≥ 58%^
<b>CEE Tier 2</b>	≥ 16.0	≥ 13.0	≥ 9.0	≥ 58%^
<b>CEE Tier 3^^</b>	≥ 18.0	≥ 13.0	≥ 10.0	≥ 58%

## Packaged ASHP

Level	SEER	EER	HSPF	Rated Capacity at 17°F/47°F
<b>CEE Tier 1</b>	≥ 15.0	≥ 12.0	≥ 8.2	≥ 60%^
<b>CEE Tier 2</b>	≥ 16.0	≥ 12.0	≥ 8.5	≥ 60%^
<b>CEE Tier 3^^</b>	≥ 16.0	≥ 12.0	≥ 9.5	≥ 60%



# Connected Criteria

- Energy Management Criteria
- Demand Response Criteria

# CEE Energy Management Criteria

Scope: Electric and Gas, Any System

## Energy Management Capability Requirements

- |   |  |
|---|--|
| A | The ability to report operational status of the product or system upon request.  |
| B | The ability for remote operation <sup>^</sup> of the product or system by a customer-authorized third party.   |
| C | The ability for the customer to override <sup>^^</sup> remote changes of load states.  |
| D | The ability for firmware updates to the product or connected control for a system, to ensure that reliability and cybersecurity remain current with little to no consumer interaction. |

## Key Changes Since April Proposal:

- ▶ Added “or connected control for a system” to Item D
- ▶ Continued Alignment with CEE Integrated Home Initiative  
Enhanced coordination with the complete CEE Minimum Elements being developed for Integrated Home

# CEE Demand Response Criteria

**Scope:** Electric Variable Capacity HVAC Systems, as defined in AHRI Standard 1380

Level	Requirements
CEE Tier 1	AHRI Standard 1380 as is: Either ANSI/CTA-2045-A OR OpenADR 2.0 communication interfaces.
CEE Tier 2	Both ANSI/CTA-2045-A AND OpenADR 2.0 communication interfaces; An open modular physical interface of ANSI/CTA-2045-A; and a secondary communication interface to facilitate customer interactions.



## Key Changes Since April Proposal:

### ▶ No Changes

Continued interest from members to establish a Tier 2 that requires both paths of communication. Will work internally and with industry to demonstrate value proposition for this level.





# Next Steps



# Next Steps and Contact



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October 1, 2020

CEE finalizes specifications

October 2020

Final full draft of Initiative out to industry

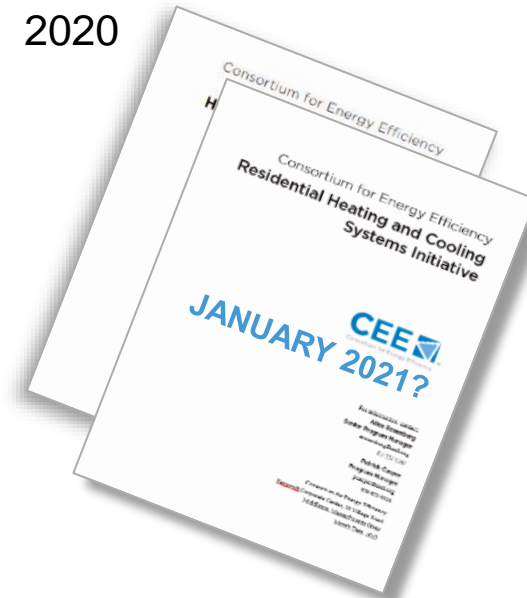
2020

2021

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January 2021

Publish revised CEE Res HVAC Initiative