



Proposed ENERGY STAR Manufactured Homes Version 2.1 Program Requirements

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Agenda

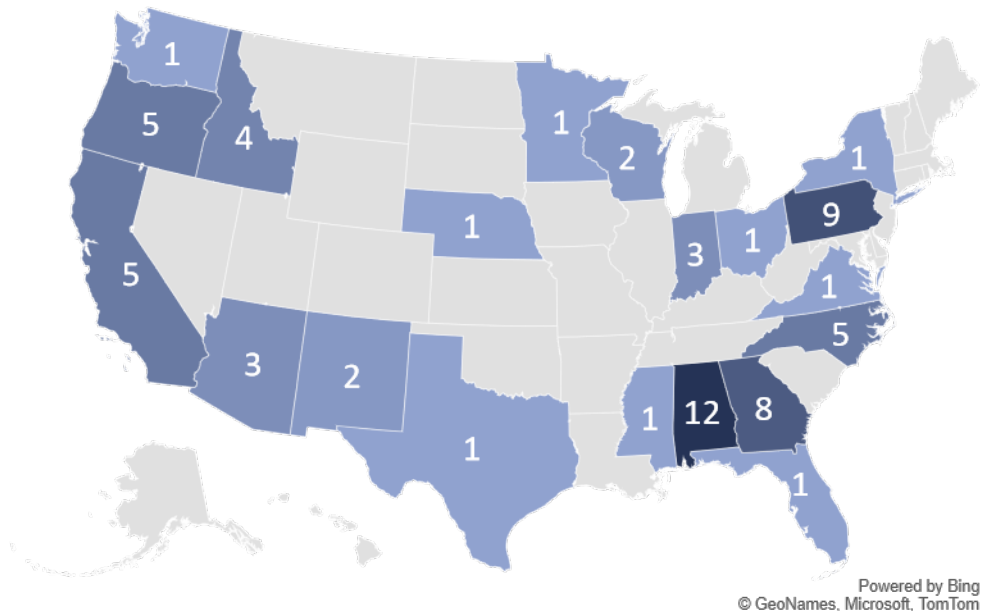
- Overview of current ENERGY STAR Manufactured Homes program requirements (Version 2)
- Review of DOE/HUD code updates for manufactured housing
- Discussion of EPA's development process and intended proposal for the next version of ENERGY STAR Manufactured Homes (Version 2.1)
- Stakeholder Feedback Period
- Q&A

A wide-angle photograph of a large industrial facility, likely a manufactured home factory. The space is filled with various pieces of machinery, including overhead cranes with yellow beams and blue support structures. In the foreground, a worker wearing a yellow hard hat and a green shirt is pushing a blue cart. The floor is concrete, and there are yellow safety markings. The background shows the skeletal frames of several manufactured homes being assembled.

Current ENERGY STAR Program Requirements for Manufactured Homes

History of ENERGY STAR in the Manufactured Housing Sector

Plants Certified to Produce ENERGY STAR Manufactured Homes



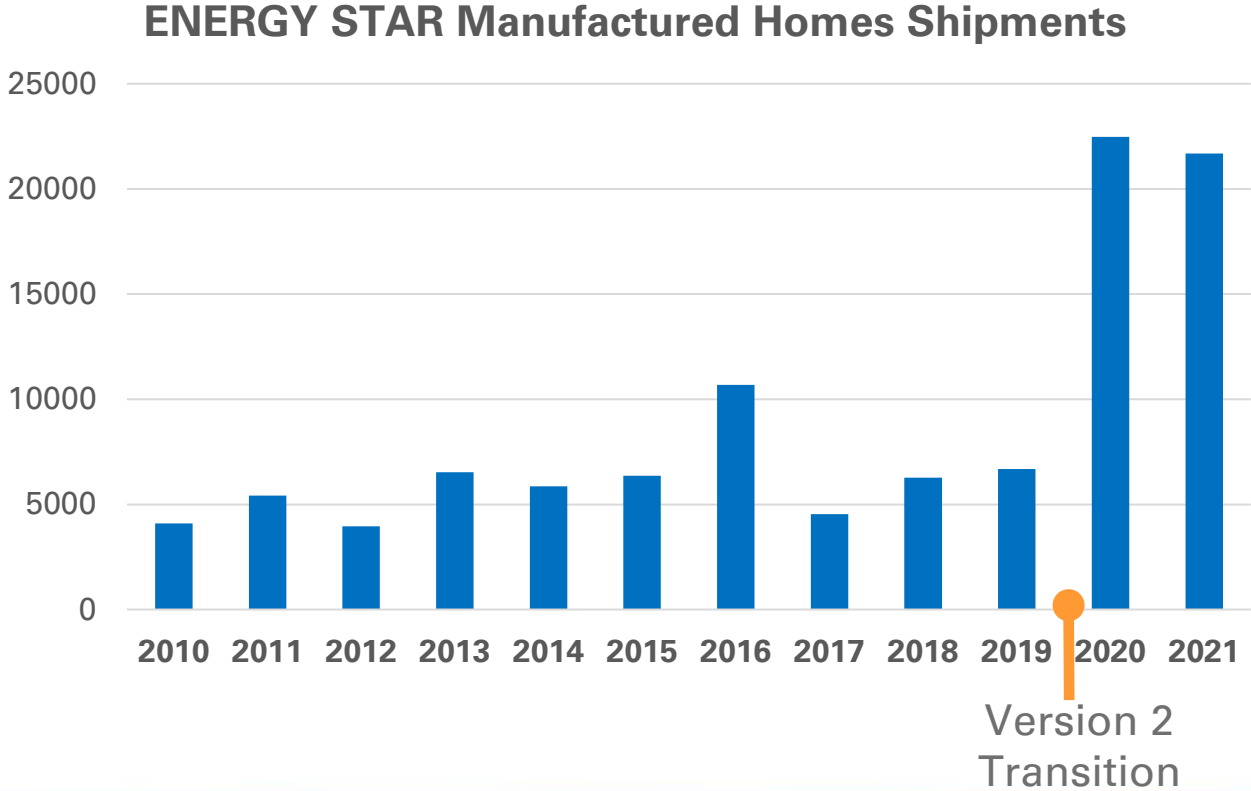
- ENERGY STAR Manufactured Homes have been available since **1998**.
- More than **145,000** ENERGY STAR certified manufactured homes have been built to date.
- Historically, **one-in-ten** manufactured homes built over the last decade were ENERGY STAR certified.
- Over **75** manufactured home plants throughout the U.S. are certified to produce ENERGY STAR homes.
- ENERGY STAR manufactured homes are at least **10%** more efficient than a model built to minimum code.

History of ENERGY STAR in the Manufactured Housing Sector

- ENERGY STAR Manufactured Homes **Version 2** was released in June 2019 and became mandatory for all certified homes produced after June 1, 2020.
- Version 2 had the same performance target as Version 1, but the program design was improved to allow easier participation.
- Manufacturers choose from 3 packages (down from 32), which start with envelope measures and add a “tentpole” equipment improvement or a more enhanced envelope.
 - Electric Heat Pump
 - High-Efficiency Gas Furnace
 - Envelope-Only
- Most homes are certified before they leave the plant.

History of ENERGY STAR in the Manufactured Housing Sector


- Historical market share = ~10%
- Market share since Version 2 = 20-25% for 2020-2021.



ENERGY STAR Certification Process for Manufactured Homes

1. Plants complete a certification process through an EPA-recognized Quality Assurance Provider (QAP).
2. Plants incorporate the ENERGY STAR program requirements into the Design Approval Primary Inspection Agency's (DAPIA)-approved packages, the plant Quality Control Manual, and the Manufacturer's Installation Manual.
3. Once certified, plants may produce and install ENERGY STAR certified homes.
4. Some ENERGY STAR certified manufactured homes are subject to verification requirements for features that are installed after the home leaves the plant.
5. Plants report homes to their QAP and ensure that an ENERGY STAR label is affixed.
6. The QAP conducts periodic field evaluations and documentation audits.

Learn more and find a list of QAPs at www.energystar.gov/manufacturedhomes.

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DOE/HUD Code Updates for Manufactured Homes

Updated DOE/HUD Code for Manufactured Housing

- Two tiers based on size:
 - Tier 1**, for single-sections = 16% energy cost savings over prior code
 - Tier 2**, for multi-sections = 34% energy cost savings over prior code. Approximately equivalent to IECC 2021.
- Published in Federal Register on May 31, 2022; compliance date of May 31, 2023.
- Final rule: <https://www.federalregister.gov/documents/2022/05/31/2022-10926/energy-conservation-program-energy-conservation-standards-for-manufactured-housing>

HUD Code Climate Zones

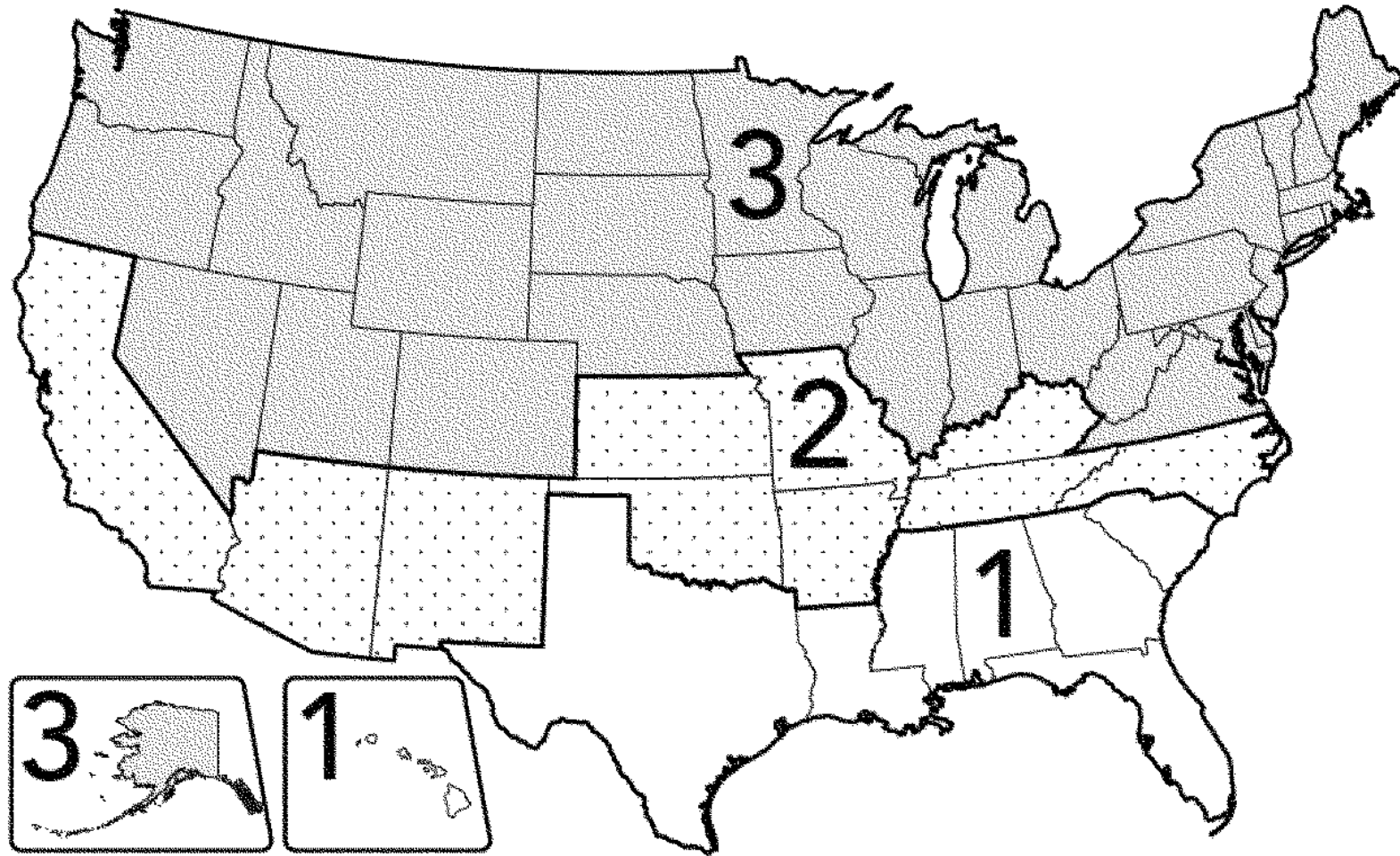


Figure III.1 U_o Zones in the HUD Code

A wide-angle photograph of a large industrial manufacturing facility. The ceiling is high with numerous yellow overhead cranes. In the foreground, a worker in a green shirt and orange shorts is pushing a blue cart. The floor is concrete with yellow safety markings. In the background, there are various pieces of machinery and structural elements of the building.

EPA's Development Process for New ENERGY STAR Manufactured Housing Program Requirements

General Development Principles for the New Program Requirements

- Maintain at least 10% savings for each package; in each climate zone; and for each size (single, multi-section)
- Retain the successful core program structure from Version 2 and keep it easy to understand.
- Complications:
 - Tiered structure of new code
 - Stringency of the new code
 - Significant one-time improvement
 - Short implementation timeline of the new code



**Proposal for ENERGY STAR
Manufactured Homes Version 2.1**

Proposed Version 2.1 Summary

All homes meet these requirements:

- Unified envelope table using either:
 - Prescriptive table
 - U_o Equivalent
- New: Low-flow water fixtures
- Same thermostat, ductwork, and “Mandatory Setup Requirements”

Exhibit 1: Requirements for All Certified Manufactured Homes

Climate Zone ⁵	1	2	3
Envelope & Glazing			
<ul style="list-style-type: none"> • Insulation and glazing U-factor levels shall comply with one of the following options: <ul style="list-style-type: none"> • Meet or exceed the following performance levels: 			
Wall Insulation	R-13	R-21	R-21
Floor Insulation	R-22	R-22	R-33
Ceiling Insulation	R-33	R-33	R-38
Door U-factor	0.40	0.40	0.30
Window U-factor	0.30	0.30	0.28
<ul style="list-style-type: none"> • OR achieve an overall coefficient of heat transmission ⁶ (U_o) that does not exceed: 			
Single-section U_o	0.076	0.065	0.056
Multi-section U_o	0.070	0.063	0.053
<ul style="list-style-type: none"> • The solar heat gain coefficient of fenestration shall not exceed: ⁷ 			
SHGC	0.25	0.25	N/A
Water Fixtures			
<ul style="list-style-type: none"> • Bathroom faucets \leq 1.5 gallons per minute (gpm) • Showerheads \leq 2.0 gpm 			
Thermostat & Ductwork			
<ul style="list-style-type: none"> • Programmable thermostat shall be installed. • Ducts in floor cavities shall be enclosed by floor insulation. Ducts in attics shall be fully buried in attic insulation. • Crossover ducts and other ducts in unconditioned space shall be insulated to R-8. 			
Mandatory Setup Requirements			
<ul style="list-style-type: none"> • Marriage line seal: For multi-section homes only, the marriage line areas must be filled with a continuous, non-porous insulating gasket creating a permanent air barrier in the ceiling, walls, and floor. Acceptable gaskets can be one- or two-part systems, including proprietary gaskets, foams, insulation wrapped in poly and insulation covered by butyl or other long-life tape on one side. There should be no visible gaps or tears. The marriage line seal shall be installed at the plant and be protected against damage during shipping. • Duct Installation: For multi-section homes only, the crossover ducts must be installed such that all seams and joints are tightly sealed against leakage and the ducts do not rest on the ground. 			

Proposed Version 2.1 Summary

In addition, Multi-Section homes must choose one:

1. Electric Heat Pump Package
2. High Efficiency Gas Equipment Package (now with tankless gas water heater)
3. New: Heat Pump Water Heater Package (note: only available in CZ 1 & CZ 2)

Exhibit 2: Additional Requirements for Multi-Section Certified Manufactured Homes

For multi-section homes, in addition to meeting the requirements in Exhibit 1, select one of these packages and satisfy its requirements:

Climate Zone ⁵	1	2	3
Electric Heat Pump Package			
Heating & Cooling Equipment			
Heat Pump ⁶	≥ 7.5 HSPF2 / 14.3 SEER2	≥ 7.5 HSPF2 / 14.3 SEER2	≥ 7.5 HSPF2 / 14.3 SEER2
High-Efficiency Gas / Propane Equipment Package			
Heating & Water Heating Equipment			
Gas / Propane Furnace	≥ 90 AFUE	≥ 95 AFUE	≥ 95 AFUE
Gas / Propane Water Heater	≥ 0.93 UEF	≥ 0.93 UEF	≥ 0.93 UEF
Hybrid Water Heater Package			
Water Heating Equipment			
Hybrid (Heat Pump) Water Heater	≥ 3.30 UEF	≥ 3.30 UEF	Not Available ⁹

Benefits of Version 2.1 Proposal

- Cornerstone of Version 2.1 is a consistent, well-insulated envelope that outperforms the most stringent code insulation and window requirements by at least 25% for single-sections and 5% for multi-sections.
- The simple structure carries over the basic building blocks from the successful Version 2.0.
- **10-18%** energy cost savings compared to the code.

Envelope Requirements

Climate Zone 1

	New DOE Code		ENERGY STAR v2.1
	Tier 1	Tier 2	
Wall	R-13	R-13	R-13
Ceiling	R-22	R-13	R-22
Floor	R-22	R-30	R-33
Door U-factor	0.40	0.40	0.40
Window U-factor	1.08	0.32	0.30
Window SHGC	0.70	0.33	0.25
U_o - Single Section	0.110	-	0.076
U_o - Multi-Section	-	0.082	0.070

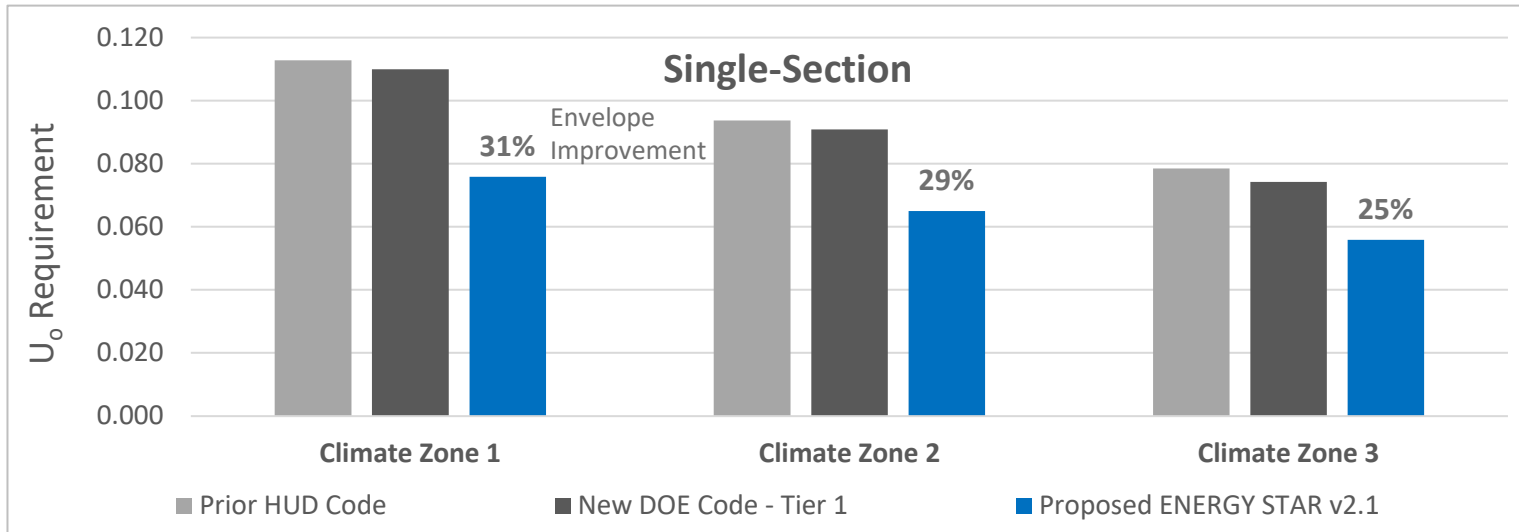
Climate Zone 2

	New DOE Code		ENERGY STAR v2.1
	Tier 1	Tier 2	
Wall	R-13	R-21	R-21
Ceiling	R-19	R-19	R-22
Floor	R-22	R-30	R-33
Door U-factor	0.40	0.40	0.40
Window U-factor	0.50	0.30	0.30
Window SHGC	0.60	0.25	0.25
U_o - Single Section	0.091	-	0.065
U_o - Multi-Section	-	0.066	0.063

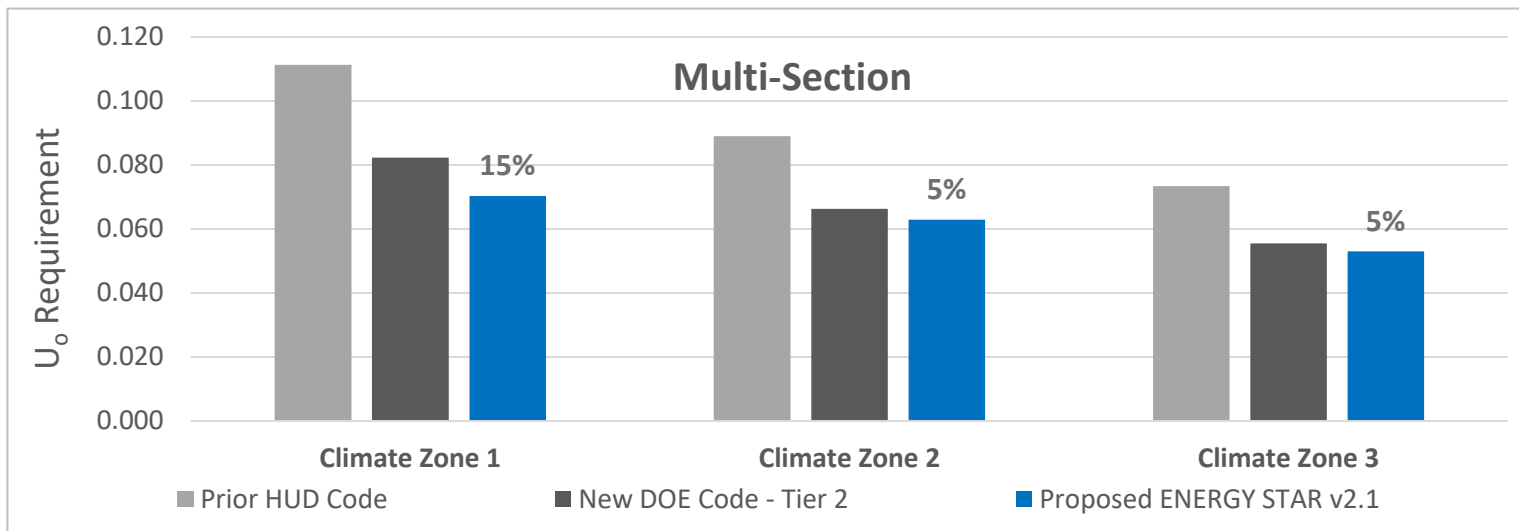
Climate Zone 3

	New DOE Code		ENERGY STAR v2.1
	Tier 1	Tier 2	
Wall	R-19	R-21	R-21
Ceiling	R-22	R-30	R-33
Floor	R-22	R-38	R-38
Door U-factor	0.40	0.40	0.30
Window U-factor	0.35	0.30	0.28
Window SHGC	N/A	N/A	N/A
U_o - Single Section	0.074	-	0.056
U_o - Multi-Section	-	0.055	0.053

Envelope U_o Equivalents



- For single-sections, envelope is **25-31%** better than code Tier 1
- For multi-sections, envelope is **5-15%** better than Tier 2
- Note: All U_o values have been recalculated in accordance with latest DOE methodology



Low-Flow Fixture Requirements

- Bathroom Faucets: 1.5 gallons per minute (GPM)
- Showerheads: 2.0 GPM
- WaterSense labeled fixtures are not required, but they are recommended and do satisfy this requirement

Key Stakeholder Question:

Are there implementation challenges to including this measure in 100% of ENERGY STAR homes? If so, would a measure like high-efficiency lighting be more suitable?

Thermostats, Ductwork, and Mandatory Setup Requirements

Thermostat & Ductwork

- Programmable thermostat shall be installed.
- Ducts in floor cavities shall be enclosed by floor insulation. Ducts in attics shall be fully buried in attic insulation.
- Crossover ducts and other ducts in unconditioned space shall be insulated to R-8.

Mandatory Setup Requirements

- **Marriage line seal:** For multi-section homes only, the marriage line areas must be filled with a continuous, non-porous insulating gasket creating a permanent air barrier in the ceiling, walls, and floor. Acceptable gaskets can be one- or two-part systems, including proprietary gaskets, foams, insulation wrapped in poly and insulation covered by butyl or other long-life tape on one side. There should be no visible gaps or tears. The marriage line seal shall be installed at the plant and be protected against damage during shipping.
- **Duct Installation:** For multi-section homes only, the crossover ducts must be installed such that all seams and joints are tightly sealed against leakage and the ducts do not rest on the ground.

Electric Heat Pump Package

Applicable to multi-section homes only

- Package updated with efficiencies match upcoming federal appliance standard, effective January 1, 2023:
 - Historic metrics: 8.8 HSPF / 15 SEER (equivalent)
 - New metrics: 7.5 HSPF2 / 14.3 SEER2

High Efficiency Gas/Propane Equipment Package

Applicable to multi-section homes only

- Same furnace requirement as Version 2.0
- Addition of a high-efficiency gas/propane tankless water heater with a minimum efficiency of 0.93 UEF
 - Over 80% of ENERGY STAR certified tankless gas/propane water heaters meet this level

Hybrid (Heat Pump) Water Heater Package

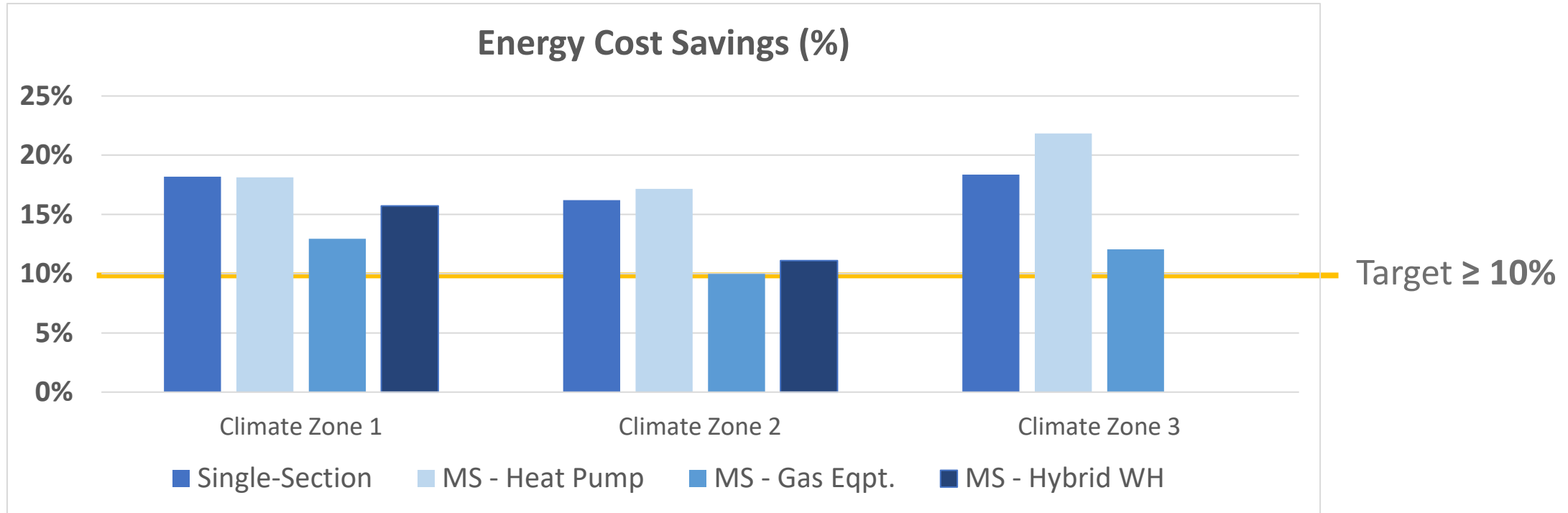
Applicable to multi-section homes only

- A heat pump water heater (a.k.a “hybrid” water heater) with minimum efficiency of UEF 3.30
 - This level matches the ENERGY STAR products specification, so all ENERGY STAR integrated heat pump water heaters qualify. 213 models are currently available.
- Option package available in Climate Zones 1 and 2 only.
 - Insufficient savings are available from this package in Climate Zone 3.

Key Stakeholder Question:

Are there additional measures with significant energy savings potential that should be considered to augment the Hybrid (Heat Pump) Water Heater package, particularly in CZ 3?

Energy Savings Results



		Climate Zone 1	Climate Zone 2	Climate Zone 3
Single-Section Package		18%	16%	18%
Multi-Section Packages	Electric Heat Pump	18%	17%	22%
	High Efficiency Gas Eqpt.	13%	10%	12%
	Hybrid Water Heater	16%	11%	-

The image shows a large industrial facility, likely a manufacturing plant or warehouse. The ceiling is high with yellow overhead cranes. In the foreground, a worker wearing a green shirt and orange shorts is pushing a blue cart. There are various pieces of equipment, including a red cart and a yellow safety barrier. The background shows a multi-level structure with a balcony and more industrial equipment.

Stakeholder Comment Period

Stakeholder Comment Timeline

- **Draft 1 Stakeholder Comment Period:** August 1st through August 29th.
 - Visit www.energystar.gov/partner_resources/residential_new/stakeholder_feedback to view the draft program requirements and this webinar's slides.
 - Submit written comments using the **Stakeholder Comment Form** to energystarhomes@energystar.gov.
- **Tentative Final Spec Released/Draft 1 Response to Comments:** October 2022 (depending on comments received).
- **Proposed Implementation Date:** Homes produced on or after May 31, 2023.

The image shows a large industrial or manufacturing facility. In the background, there are several yellow overhead cranes mounted on a high ceiling. Below them, there are various pieces of machinery and structural elements. In the foreground, a worker wearing a bright green shirt and orange shorts is pushing a blue cart. The floor is concrete, and there are yellow safety markings. A red metal structure is visible in the lower left corner. A semi-transparent teal banner is overlaid across the middle of the image, containing the text "Q&A".

Q&A

ENERGY STAR Residential New Construction

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