Proposed ENERGY STAR Manufactured Homes
Version 2.1 Program Requirements

Presented on August 11, 2022
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
Current ENERGY STAR Program Requirements for 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 = \(\sim 10\%\)
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.
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](https://www.federalregister.gov/documents/2022/05/31/2022-10926/energy-conservation-program-energy-conservation-standards-for-manufactured-housing)
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”

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Envelope &amp; Glazing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall Insulation</td>
<td>R-13</td>
<td>R-21</td>
<td>R-21</td>
</tr>
<tr>
<td>Floor Insulation</td>
<td>R-22</td>
<td>R-22</td>
<td>R-33</td>
</tr>
<tr>
<td>Ceiling Insulation</td>
<td>R-33</td>
<td>R-33</td>
<td>R-38</td>
</tr>
<tr>
<td>Door U-factor</td>
<td>0.40</td>
<td>0.40</td>
<td>0.30</td>
</tr>
<tr>
<td>Window U-factor</td>
<td>0.38</td>
<td>0.30</td>
<td>0.28</td>
</tr>
</tbody>
</table>

- OR achieve an overall coefficient of heat transmission ($U_o$) that does not exceed:
  - Single-section $U_o$ 0.076 0.065 0.056
  - Multi-section $U_o$ 0.070 0.063 0.053

<table>
<thead>
<tr>
<th><strong>Water Fixtures</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathroom faucets ≤ 1.5 gallons per minute (gpm)</td>
<td></td>
</tr>
<tr>
<td>Showerheads ≤ 2.0 gpm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Thermostat &amp; Ductwork</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Programmable thermostat shall be installed.</td>
<td></td>
</tr>
<tr>
<td>Ducts in floor cavities shall be enclosed by floor insulation. Ducts in attics shall be fully buried in attic insulation.</td>
<td></td>
</tr>
<tr>
<td>Crossover ducts and other ducts in unconditioned space shall be insulated to R-8.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Mandatory Setup Requirements</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electric Heat Pump Package</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating &amp; Cooling Equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heat Pump</td>
<td>(\geq 7.5 \text{ HSPF2} / 14.3 \text{ SEER2})</td>
<td>(\geq 7.5 \text{ HSPF2} / 14.3 \text{ SEER2})</td>
<td>(\geq 7.5 \text{ HSPF2} / 14.3 \text{ SEER2})</td>
</tr>
<tr>
<td><strong>High-Efficiency Gas / Propane Equipment Package</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating &amp; Water Heating Equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas / Propane Furnace</td>
<td>(\geq 90 \text{ AFUE})</td>
<td>(\geq 95 \text{ AFUE})</td>
<td>(\geq 95 \text{ AFUE})</td>
</tr>
<tr>
<td>Gas / Propane Water Heater</td>
<td>(\geq 0.93 \text{ UEF})</td>
<td>(\geq 0.93 \text{ UEF})</td>
<td>(\geq 0.93 \text{ UEF})</td>
</tr>
<tr>
<td><strong>Hybrid Water Heater Package</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Heating Equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hybrid (Heat Pump) Water Heater</td>
<td>(\geq 3.30 \text{ UEF})</td>
<td>(\geq 3.30 \text{ UEF})</td>
<td>Not Available</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th></th>
<th>Climate Zone 1</th>
<th></th>
<th>Climate Zone 2</th>
<th></th>
<th>Climate Zone 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>New DOE Code</td>
<td>ENERGY STAR v2.1</td>
<td>New DOE Code</td>
<td>ENERGY STAR v2.1</td>
<td>New DOE Code</td>
<td>ENERGY STAR v2.1</td>
</tr>
<tr>
<td>Tier 1</td>
<td>Tier 2</td>
<td></td>
<td>Tier 1</td>
<td>Tier 2</td>
<td>Tier 1</td>
<td>Tier 2</td>
</tr>
<tr>
<td>Wall</td>
<td>R-13</td>
<td>R-13</td>
<td>R-13</td>
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</tr>
<tr>
<td>Ceiling</td>
<td>R-22</td>
<td>R-13</td>
<td>R-22</td>
<td>R-19</td>
<td>R-22</td>
<td>R-30</td>
</tr>
<tr>
<td>Floor</td>
<td>R-22</td>
<td>R-30</td>
<td>R-33</td>
<td>R-22</td>
<td>R-33</td>
<td>R-38</td>
</tr>
<tr>
<td>Door U-factor</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
</tr>
<tr>
<td>Window U-factor</td>
<td>1.08</td>
<td>0.32</td>
<td>0.30</td>
<td>0.50</td>
<td>0.30</td>
<td>0.35</td>
</tr>
<tr>
<td>Window SHGC</td>
<td>0.70</td>
<td>0.33</td>
<td>0.25</td>
<td>0.60</td>
<td>0.25</td>
<td>N/A</td>
</tr>
<tr>
<td>$U_o$ - Single Section</td>
<td>0.110</td>
<td>-</td>
<td>0.076</td>
<td>0.091</td>
<td>-</td>
<td>0.056</td>
</tr>
<tr>
<td>$U_o$ - Multi-Section</td>
<td>-</td>
<td>0.082</td>
<td>0.070</td>
<td>-</td>
<td>0.066</td>
<td>0.055</td>
</tr>
</tbody>
</table>

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Envelope $U_o$ Equivalents

**Single-Section**
- Climate Zone 1: 25-31% better than code Tier 1
- Climate Zone 2: 29% improvement
- Climate Zone 3: 25%

**Multi-Section**
- Climate Zone 1: 15%
- Climate Zone 2: 5%
- Climate Zone 3: 5%

- 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

### Energy Cost Savings (%)

<table>
<thead>
<tr>
<th></th>
<th>Climate Zone 1</th>
<th>Climate Zone 2</th>
<th>Climate Zone 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single-Section Package</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric Heat Pump</td>
<td>18%</td>
<td>17%</td>
<td>22%</td>
</tr>
<tr>
<td>High Efficiency Gas Eqpt.</td>
<td>13%</td>
<td>10%</td>
<td>12%</td>
</tr>
<tr>
<td>Hybrid Water Heater</td>
<td>16%</td>
<td>11%</td>
<td>-</td>
</tr>
</tbody>
</table>

Target ≥ 10%
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](http://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](mailto: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.
ENERGY STAR Residential New Construction

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