ENERGY STAR®
Specification Update

Amanda Stevens & Kristen Taddionio, US EPA
Ryan Fogle, D&R International

Learn more at energystar.gov
Agenda

- Introduction
- Specification Updates by Product Category
  - Clothes Washers
  - Dishwashers
  - Room Air Conditioners
  - Refrigerator-Freezers
- Scoping for 2011
Introduction
DOE → EPA Transition

- New challenges and opportunities
  - More products at a faster pace, frequently reviewed GAO report, Testing and verification upgrades
- Maintaining strong brand is priority
- Memorandum of Understanding explains how ENERGY STAR will prioritize specification revisions
What Triggers a Specification Review?

“For appliances and other product categories with longer-lived product models specifications will be reviewed for a possible revision at a minimum of every three years or once the market share for ENERGY STAR qualifying products reaches about 35%.”

-www.energystar.gov/mou
ENERGY STAR’s Guiding Principles

ENERGY STAR criteria are designed to balance a varied set of objectives, including:

- Significant energy and/or water savings
- Cost effective
- Energy consumption that can be measured and verified with testing
- Equivalent or enhanced functionality and performance
- Achievable through several technology options; at least one of which is non-proprietary
- Label provides meaningful differentiation
Other considerations that may be taken into account include

- Changes in federal efficiency standards
- Technological advances in energy efficiency
- Product availability
Specification Development Cycle

1. Open Specification for Revisions (as necessary)
2. Stakeholder Notification
3. Energy & Environmental Analysis
4. Market, Industry & Design Research
5. Test Methodology Development (as necessary)
7. Stakeholder Meetings
8. Post Drafts and Stakeholder Comments to Web Site
9. Final Decision Memorandum
10. Finalize Specification
11. Specification Takes Effect
12. Manufacturers Join Program as Partners and Begin Labeling Products
13. Officially Launch Specification with Industry and Stakeholders
14. Monitor Market Penetration
15. Release Subsequent Drafts with Interim Decision Memo (as necessary)

International Coordination
Specification Development Process

- Solicit informal feedback from stakeholders
- Conduct a market and engineering analysis
- Identification of appropriate test procedure(s)
- Analysis of product energy performance data
- Announce proposed ENERGY STAR criteria
- Hold stakeholder meeting
- Evaluate comments/revise proposal
- Finalize criteria
Specification Updates by Product Category
Overview

Clothes Washers
- Revised criteria will take effect January 1, 2011
- Combination washer-dryers tentatively expected to take effect the week of April 1, 2011

Dishwashers
- Criteria under revision; Draft 1 Version 5.0 just released

Room Air Conditioners
- Criteria under review

Refrigerator-freezers
- Criteria under review
Clothes Washers
Combination Washer-Dryers

- ENERGY STAR labels products based on whole-product performance.
- A combination (all-in-one) washer-dryer is functionally different from a standard clothes washer.
- By including requirements for the drying function, ENERGY STAR will take into account overall efficiency of the unit.
Combination Washer-Dryers

- Effective December 15, 2010, ENERGY STAR will resume qualifying combination washer-dryers with the following interim test procedure:
  - Manufacturers shall test clothes washer energy use in accordance with the test procedures specified under 10 CFR 430 Subpart B Appendix J1.
  - Manufacturers shall test clothes dryer energy use in accordance with the final revised test procedure published by DOE pursuant to the Supplemental Notice of Proposed Rulemaking in the Federal Register 75 FR 37594-37650 (June 29, 2010).
  - January 1: all qualifications will go through a Certification Body
Combination Washer-Dryers

- Additionally, report:
  - Remaining Moisture Content after each wash cycle
  - Water used by dryer (where applicable)
  - Water temperature and pressure
- Needed to assess potential differences among models
- Will be used for EPA analysis only
Combination Washer-Dryers
Next Steps

Week of February 13, 2011
- ENERGY STAR all-in-one requirements proposed

Week of February 27, 2011
- Stakeholder call on proposed requirements

Week of March 6, 2011
- Second Draft of Requirements proposed

Week of April 1, 2011
- ENERGY STAR requirements finalized and effective
January 1, 2011 Criteria

- In 2008, DOE announced two new clothes washer criteria
  - The first phase was implemented in July 2009
  - Second phase will be implemented January 1, 2011

- The new ENERGY STAR criteria includes
  - Modified energy factor (MEF) ≥ 2.0
  - Water factor (WF) ≤ 6.0
## Effect of 2011 Transition

<table>
<thead>
<tr>
<th></th>
<th>2009 Criteria</th>
<th>2011 Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEF</td>
<td>$\geq 1.8$</td>
<td>$\geq 2.0$</td>
</tr>
<tr>
<td>WF</td>
<td>$\leq 7.5$</td>
<td>$\leq 6.0$</td>
</tr>
</tbody>
</table>

New ENERGY STAR criteria will result in real consumer savings:

- **Annual Energy Savings:**
  - 141 kWh
  - 4.5 therms
  - 7,402 gallons of water

- **Annual Dollar Savings:** $75.50
- **Price Premium Payback:** 2 years, 8 months
- **Lifetime Savings of a 2011 Clothes Washer:** $830.50
Dishwashers
Why are dishwashers under review?

National Market Share of ENERGY STAR Qualified Dishwashers

% ENERGY STAR market share

Year

EPA
EPA Is Considering Several Issues

- Phosphate-free dishwashing detergents
- Cleaning performance
- AHAM/advocates proposal
- Market factors
- Engineering factors
Impact of Phosphate Ban on Performance

- 16 states have banned phosphates in dishwashing detergent.
- Industry agreed to ban them effective July 1, 2010
- Performance may be negatively affected without the use of phosphates in dishwasher detergent
- Feedback from manufacturing partners indicates that the lack of phosphates in detergent has not had a large effect on cleaning performance
EPA is considering including a cleanliness test to ensure ENERGY STAR qualified dishwashers do not sacrifice on performance.

Cleaning performance tests identified:
- AHAM-DW-1-2009
- NSF 184 2003 (Issue 8, Revision 1)
- Consumers Union
- AHAM-DW-1-1992
- Good Housekeeping
AHAM-Advocates Proposal

- Proposal jointly submitted to DOE by AHAM and 38 energy and water efficiency advocates proposes new federal standards

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Proposed New Standard Effective Jan. 1, 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard (≥ 8 place settings plus 6 serving pieces)</td>
<td>307 kWh/year</td>
</tr>
<tr>
<td></td>
<td>5.0 gallons/cycle</td>
</tr>
<tr>
<td>Compact (&lt; 8 place settings plus 6 serving pieces)</td>
<td>222 kWh/year</td>
</tr>
<tr>
<td></td>
<td>3.5 gallons/cycle</td>
</tr>
</tbody>
</table>
Market Factors – Product Availability

Percentage of Models that Qualify at Various Efficiency Levels

- **ENERGY STAR:** 81%
- **2011 ENERGY STAR:** 36%
- **CEE Tier 2:** 16%
- **280kWh/4.0 Gallons/Cycle:** 10%

Available Models
## Engineering Analysis

<table>
<thead>
<tr>
<th>Category</th>
<th>Detail</th>
<th>Unit Efficiency Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Current ENERGY STAR</td>
</tr>
<tr>
<td><strong>Insulation by Location</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cavity-Top &amp; Sides</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cavity-Back</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cavity-Bottom</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Door</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Water System</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td># of Main Pump Speeds</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Water Supply Tubing Loc.</td>
<td>Exterior</td>
<td>Exterior</td>
</tr>
<tr>
<td>Water Meter</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Multi-Spray / Diverter Valve</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Float Switch</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sump Pressure Transducer</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Sprayers by Cavity Location and Type</strong></td>
<td>Bottom Plastic 3-Arm Plastic 3-Arm Stainless 2-Arm</td>
<td>Plastic 3-Arm Plastic 3-Arm Stainless 2-Arm</td>
</tr>
<tr>
<td>Middle</td>
<td>Plastic 2-Arm</td>
<td>Plastic 2-Arm</td>
</tr>
<tr>
<td>Top</td>
<td>Plastic 2-Arm</td>
<td>Plastic 2-Arm</td>
</tr>
<tr>
<td><strong>Heating</strong></td>
<td>Heater Type</td>
<td>Tubular</td>
</tr>
<tr>
<td><strong>Controls</strong></td>
<td>Type</td>
<td>Electronic</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Soil Sensor</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Humidity Sensor</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Vent Technology</td>
<td>Active Door Vent</td>
<td>Fan-Assisted Vent</td>
</tr>
</tbody>
</table>
## Engineering Analysis

<table>
<thead>
<tr>
<th>Category</th>
<th>Detail</th>
<th>Unit Efficiency Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current ENERGY STAR</td>
<td>2011 ENERGY STAR</td>
</tr>
<tr>
<td>Insulation by Location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cavity-Top &amp; Sides</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cavity-Back</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cavity-Bottom</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Door</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Water System</td>
<td></td>
<td></td>
</tr>
<tr>
<td># of Main Pump Speeds</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Water Supply Tubing Loc.</td>
<td>Exterior</td>
<td>Exterior</td>
</tr>
<tr>
<td>Water Meter</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Multi-Spray / Diverter Valve</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Float Switch</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sump Pressure Transducer</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Sprayers by Cavity Location and Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottom</td>
<td>Plastic 3-Arm</td>
<td>Plastic 3-Arm</td>
</tr>
<tr>
<td>Middle</td>
<td>Plastic 2-Arm</td>
<td>Plastic 2-Arm</td>
</tr>
<tr>
<td>Top</td>
<td>Plastic 2-Arm</td>
<td>Plastic 2-Arm</td>
</tr>
<tr>
<td>Heating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater Type</td>
<td>Tubular</td>
<td>Tubular</td>
</tr>
<tr>
<td>Controls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Electronic</td>
<td>Electronic</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Soil Sensor</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Humidity Sensor</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Vent Technology</td>
<td>Active Door Vent</td>
<td>Fan-Assisted Vent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Proposed Criteria – Energy and Water

<table>
<thead>
<tr>
<th>Product Type</th>
<th>ENERGY STAR Draft 1 Version 5.0 Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard-Size Dishwashers</td>
<td>≤ 280 kWh/year</td>
</tr>
<tr>
<td></td>
<td>≤ 4.0 gallons of water per cycle</td>
</tr>
<tr>
<td>Compact Dishwashers</td>
<td>≤ 222 kWh/year</td>
</tr>
<tr>
<td></td>
<td>≤ 3.5 gallons of water per cycle</td>
</tr>
</tbody>
</table>
Proposed Criteria – Cleaning Performance

- A cleaning performance requirement will help ensure ENERGY STAR qualified models deliver efficiency with no sacrifice in performance.
- Stakeholders are invited to comment on the test procedures noted in the draft specification document.
  - AHAM-DW-1-2009
  - NSF 184 2003 (Issue 8, Revision 1)
  - Consumers Union
  - AHAM-DW-1-1992
  - Good Housekeeping
## Anticipated Schedule for Criteria Update

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 26, 2010</td>
<td>Stakeholder meeting in Washington D.C. to discuss Draft 1 specification</td>
</tr>
<tr>
<td>November 3, 2010</td>
<td>Comment period closes on Draft 1 specification</td>
</tr>
<tr>
<td>November 2010</td>
<td>Draft 2 specification proposed; stakeholder meeting or webinar; and comment period.</td>
</tr>
<tr>
<td>Early 2011</td>
<td>Final Draft specification proposed; stakeholder meeting or webinar; and comment period.</td>
</tr>
<tr>
<td>February 28, 2011</td>
<td>Final specification posted</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Final specification effective</td>
</tr>
</tbody>
</table>
Room Air Conditioners
Why is the RAC specification under review?

- High market share
  - 36% (2009 estimate)

- Specification has not been raised since 2001

- Widespread product availability
  - About half of available models are ENERGY STAR qualified
Factors EPA is Considering

- R-22 refrigerant
- AHAM/advocates proposal
- Federal standard
- Market factors
- Engineering factors
- Part-load technology and Smart Technologies
R-22 Refrigerant

- Refrigerant R-22 was phased out beginning January 1, 2010
  - Manufacturers no longer allowed to make RACs with R-22
  - Importation of RACs using R-22 is now illegal

- R-410A is the new refrigerant

- Manufacturers made this transition while maintaining a high market share and product availability
Joint Federal Standard Proposal

- Jointly submitted by AHAM and 38 energy and water efficiency advocates
- Proposes new federal standards to DOE
  - Most proposed levels for RACs are at or above current ENERGY STAR criteria
- Indicates higher levels are technologically and economically feasible
DOE is considering amendments to the federal standard for RACs and has already proposed new test procedures.

- Proposed new test procedure and standards revisions are based on combined energy efficiency ratio (CEER), which takes standby energy mode use into account.
RAC Shipments and ENERGY STAR Market Share

Room Air Conditioner Shipments and ENERGY STAR Market Share

- **Non-Qualified RACs**
- **ENERGY STAR Qualified RACs**
- **Market Share**

Shipments (millions)

ENERGY STAR Market Share (%)
## Market Share By Category

<table>
<thead>
<tr>
<th>Product Class</th>
<th>Market Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traditional RACs</strong></td>
<td></td>
</tr>
<tr>
<td>Less than 6,000 Btu/hr</td>
<td>30.68</td>
</tr>
<tr>
<td>6,000 to 7,999 Btu/hr</td>
<td>18.01</td>
</tr>
<tr>
<td>8,000 to 13,999 Btu/hr</td>
<td>33.35</td>
</tr>
<tr>
<td>14,000 to 19,999 Btu/hr</td>
<td>4.84</td>
</tr>
<tr>
<td>20,000 Btu/hr or more</td>
<td>2.83</td>
</tr>
<tr>
<td><strong>Without reverse cycle and without louvered sides</strong></td>
<td></td>
</tr>
<tr>
<td>Less than 7,999 Btu/hr</td>
<td>0.40</td>
</tr>
<tr>
<td>8,000 to 13,999 Btu/hr</td>
<td>7.96</td>
</tr>
<tr>
<td>14,000 Btu/hr or more</td>
<td>0.30</td>
</tr>
<tr>
<td><strong>With reverse cycle</strong></td>
<td></td>
</tr>
<tr>
<td>With louvered sides</td>
<td>0.90</td>
</tr>
<tr>
<td>Without louvered sides</td>
<td>0.25</td>
</tr>
<tr>
<td><strong>Casement</strong></td>
<td></td>
</tr>
<tr>
<td>Casement only/casement slider</td>
<td>0.47</td>
</tr>
</tbody>
</table>
RAC Availability

Total RAC Product Availability

Percentage of Products

Efficiency Level

- 10% (ENERGY STAR)
- 11%
- 12%
- 13%
- 14%
- 15% (CEE Tier 1)
- 20%

Percentage of Products

- 51%
- 23%
- 8%
- 5%
- 4%
- 3%
- 1%
<table>
<thead>
<tr>
<th>Design</th>
<th>Cost-Effective?</th>
<th>Already in Use?</th>
<th>Effect on Consumer</th>
<th>Other Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased depth of coil</td>
<td>No</td>
<td>Yes</td>
<td>Heavier Unit, higher costs</td>
<td>This has a practical limit; each row of coils has a lower efficiency than the previous row</td>
</tr>
<tr>
<td>Subcooler addition to condenser coil</td>
<td>Yes</td>
<td>Yes</td>
<td>Unknown</td>
<td>Low impact on efficiency</td>
</tr>
<tr>
<td>More efficient indoor blowers</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Noise</td>
<td>Space Restrictions</td>
</tr>
<tr>
<td>More efficient outdoor fans</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Noise</td>
<td>Space Restrictions</td>
</tr>
<tr>
<td>More efficient fan motors</td>
<td>No</td>
<td>Unknown</td>
<td>Noise</td>
<td></td>
</tr>
<tr>
<td>Switching power supply</td>
<td>No</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Results in approximately 50% savings in standby power; greater complexity</td>
</tr>
</tbody>
</table>
Q. Is part-load technology being considered for the new RAC criteria?

A. EPA is not planning to pursue part-load technology for RACs at this time due to lack of test procedure.

Q. Will “smart” technologies be implemented in the future ENERGY STAR criteria for RACs?

A. EPA encourages discussion on opportunities for encouraging “smarter” appliances.

Check out session later today, On the Horizon: New Opportunities for Appliance Energy Savings, for discussion on “smart” technologies including Smart Grid.
Next Steps...

- EPA is assessing criteria options
- Timing
  - Expectation is to release a Draft 1 spec by the end of October 2010
  - EPA aims to get new criteria in place for 2012 cooling season
Refrigerators-Freezers
## Current Levels

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Current ENERGY STAR Level</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-Size Refrigerators &amp; Refrigerator-Freezers</td>
<td>20% less energy than NAECA</td>
<td>Criteria as of April 28, 2008</td>
</tr>
<tr>
<td>Full-Size Freezers</td>
<td>10% less energy than NAECA</td>
<td>Criteria as of January 1, 2003</td>
</tr>
<tr>
<td>Compact Refrigerators, Refrigerator-Freezers, and Freezers</td>
<td>20% less energy than NAECA</td>
<td>Criteria as of January 1, 2003</td>
</tr>
</tbody>
</table>
Motivation for Review

- Current spec is due for an update
  - MOU calls for reviews, at a minimum, every 3 years
- High market share
  - Currently 35%
- Widespread product availability at higher efficiencies
- Updates to Federal test procedure and standards
- Concerns over the absolute energy consumption of units and comparison between product classes
Refrigerator Market Share

ENERGY STAR Market Share and Refrigerator Units Sales by Year

- **ENERGY STAR Qualified Shipments**
- **Standard Shipments**
- **ENERGY STAR Market Share**

**Shipments**

**ENERGY STAR Market Share (%)**

- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009

- 0%
- 10%
- 20%
- 30%
- 40%
- 50%
- 60%
- 70%
- 80%
- 90%
- 100%
Product Availability

Full-Size Refrigerators and Refrigerator-Freezers
Available in 2010

Efficiency Level

- ENERGY STAR (20% Better than NAECA)
- 25% Better than NAECA
- 30% Better than NAECA
- 35% + Better than NAECA

Percentage

EPA
Test Procedure Revisions

- DOE is in process of amending the federal test procedure for refrigeration products
  - First stage will try to eliminate ambiguities, clarify DOE interpretations, and account for the de facto product classes created through waiver process.
  - Second stage will try to improve harmonization with international standards, test repeatability, better reflect actual energy consumption, and incorporate the updated AHAM Standard HRF-1-2008.
    - Changes to compartment temperature settings and volume calculations will increase tested energy consumption
    - Address automatic icemaker energy use -- use 84 kWh/yr as interim value.
Updates to Federal Standards

• DOE has proposed new Federal standards for 2014
  – 20-25% for full-size refrigerator-freezers, refrigerators
  – 20-30% for full-size freezers
  – 10-25% for compact refrigerators, refrigerator-freezers, and freezers

• AHAM-Advocates Joint Proposal included recommendations for manufacturer tax credits for Refrigerators and Freezers:

<table>
<thead>
<tr>
<th>Tax Credit Amount</th>
<th>Manufactured In</th>
<th>Percent Better</th>
</tr>
</thead>
<tbody>
<tr>
<td>$150</td>
<td>2011, 2012, 2013</td>
<td>30%</td>
</tr>
<tr>
<td>$200</td>
<td>2011, 2012, 2013</td>
<td>35%</td>
</tr>
</tbody>
</table>
Other Considerations

• Addressing vulnerabilities created by criteria that are based on relative efficiency
  – Certain configurations are allowed to use substantially more energy, per cubic foot, than others.
    • ENERGY STAR is recognizing the most efficient units in a product class, not most efficiency units, overall.
  – Refrigerators are allowed to have a high absolute energy consumption, and still qualify for ENERGY STAR
    • “For product categories with large variations in product size (with impacts on energy use), overall limits for energy use may be incorporated into ENERGY STAR specifications.”

- www.energystar.gov/mou

• Opportunities to improve the life-cycle performance
Next Steps…

- EPA is assessing criteria options

**Timing**
- EPA plans to begin revision in late 2010
- Expectation is to finalize a new spec in 2011
Scoping for 2011
Anticipated 2011 Scoping

- Ranges
- PTACs
- Dryers
- Countertop Appliances

Stay Tuned!
Questions?

- Kristen Taddonio
  Taddonio.Kristen@epamail.epa.gov

- Amanda Stevens
  Stevens.Amanda@epamail.epa.gov

- Ryan Fogle
  rfogle@drintl.com