



ENERGY STAR®

Residential Clothes Washers

*Draft 2 Version 7.0 Specification,
Preliminary Approach for Cleaning &
Rinse Performance Testing*

**Stakeholder Webinar
June 26, 2013**



U.S. DEPARTMENT OF
ENERGY

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Agenda



Introduction – Welcome/Goals, Overview of Specification Development	Amanda Stevens, EPA
Clothes Washer Draft 2, Version 7.0 – Presentation & Discussion	
<ul style="list-style-type: none">- Effective Date- Definitions- Product Classes, Efficiency Criteria- Reporting requirement	Amanda Stevens, EPA Ryan Fogle, D&R International
<ul style="list-style-type: none">- “Connected” Functionality	Amanda Stevens, EPA Doug Frazee, ICF International
ENERGY STAR Test Procedure Development	
<ul style="list-style-type: none">- Clothes Washer Cleaning & Rinse Performance Test	Richard Shandross, Navigant Consulting
Conclude & Next Steps	Amanda Stevens, EPA

Webinar Goals



1. Highlight proposed changes in the Draft 2, Version 7.0 specification. Discuss the preliminary approach for addressing cleaning and rinse performance of clothes washers.
2. Solicit stakeholder feedback on outstanding issues/questions identified.
3. Address stakeholder questions about process and/or changes.
4. Discuss next steps and timeline.

Specifications Development



- EPA develops ENERGY STAR product specifications using a systematic process that relies on rigorous market, engineering and pollution savings analysis, and involvement from industry stakeholders.
- EPA uses a set of six key **Guiding Principles**

ENERGY STAR Guiding Principles



1. Significant energy savings
2. Product performance maintained or enhanced
3. Purchasers can recover investment in increased efficiency within a reasonable time period
4. Efficiency achieved through one or more technologies; qualifying products offered by more than one manufacturer
5. Energy consumption can be measured and verified with testing
6. Label provides meaningful differentiation

Specification Development Cycle



Specification Development



- When developing or revising a specification, EPA balances:
 - The need to keep pace with evolution among leading products and continue to effectively differentiate for consumers.
 - Timing of new Federal standards.
 - Production cycles, other factors important to the industry.
- Key elements of the stakeholder process:
 - Consistency, transparency, inclusiveness, responsiveness, and clarity.

Clothes Washer Version 7.0 Specification Development



- EPA launched a revision to the clothes washer specification (residential clothes washer criteria) in August 2012, noting:
 - ENERGY STAR residential clothes washer market share in 2011 exceeded 60%.
 - Availability of products in the market that significantly exceed the minimum criteria.

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Effective Date for Version 7.0



- EPA is proposing an effective date of March 7, 2015 that aligns with the Federal standard/test procedure change.
 - Under the current V7.0 schedule, the earliest possible effective date would be < 1 year before the clothes washer Federal standard change.
- This later date poses additional challenges for the program in terms of anticipating advances in the clothes washer market.
 - EPA welcomes information on expected efficiency improvements and reductions in incremental cost, that might supplement the Agency's existing data set.

Update to IMEF and IWF Metrics



- The residential clothes washer efficiency requirements proposed in Draft 2 are expressed using IMEF and IWF, the new DOE metrics.
 - Revised MEF and WF requirements were developed using the current ENERGY STAR residential clothes washer dataset (posted to the specification development web site).
 - EPA worked with DOE to translate these MEF and WF requirements into IMEF and IWF using test data collected by DOE during the rulemaking process.

Product Classes



- As a general principle, the ENERGY STAR program seeks to make it simple for consumers to find the most efficient product, regardless of technology, that performs a desired function.
 - Because top and front loading clothes washers perform essentially the same function, EPA proposed in Draft 1 that they continue to be considered together for purposes of ENERGY STAR qualification.
 - For Draft 2, upon further review EPA believes there may be enough of a difference in functionality – wash time in particular – to warrant separate product classes for top- and front-loading clothes washers.
 - EPA reviewed ratings from Consumer Reports to consider wash time and other potentially relevant performance characteristics, such as vibration.
 - EPA welcomes stakeholder feedback on the Draft 2 proposal to use two separate product classes for front and top loading clothes washers.

Revisions to Definitions



- EPA added definitions for Integrated Modified Energy Factor (IMEF) and Integrated Water Factor (IWF) in support of the revised criteria and effective date.
- Proposes to delete “other commercial applications” from the Commercial Clothes Washer definition.
 - Intended to address stakeholder concern that washer-extractors installed in health care facilities will not deliver expected energy/water savings.
 - EPA is seeking feedback on the proposed change and whether there are any unintended consequences associated with this proposal.
- For clarity, footnotes have been added to provide the Code of Federal Regulation (CFR) citation for a DOE definition.
 - Footnote also notes where/how an ENERGY STAR definition differs from the DOE definition.

Proposed Efficiency Criteria



Product Category	Modified Energy Factor (MEF)	Proposed: Integrated Modified Energy Factor (IMEF)	Water Factor (WF)	Proposed: Integrated Water Factor (IWF)
Residential Top-Loader (> 2.5 cu-ft)	2.55	2.11	3.8	4.3
Residential Front-Loader (> 2.5 cu-ft)	2.80	2.38	3.5	3.7
Residential CWs (\leq 2.5 cu-ft)	2.45	2.07	4.0	4.2

- EPA and DOE translated MEF \rightarrow IMEF and WF \rightarrow IWF using test data collected by DOE during last rulemaking.
- No criteria changes to commercial clothes washers.
 - EPA and DOE will propose translated MEF and WF (Appendix J2) levels once DOE crosswalk analysis is available.

Proposed Efficiency Criteria



- Proposed ENERGY STAR criteria for Residential Clothes Washers:

Product Category	Integrated Modified Energy Factor (IMEF) _{BASE}	Integrated Water Factor (IWF)
Top-Loader (> 2.5 cu-ft)	2.11	≤ 4.3
Front-Loader (> 2.5 cu-ft)	2.38	≤ 3.7
All CWs (≤ 2.5 cu-ft)	2.07	≤ 4.2

- Equation 2 calculates the minimum IMEF, with a 5% allowance for connected functionality.

Equation 2. Calculation of Minimum IMEF

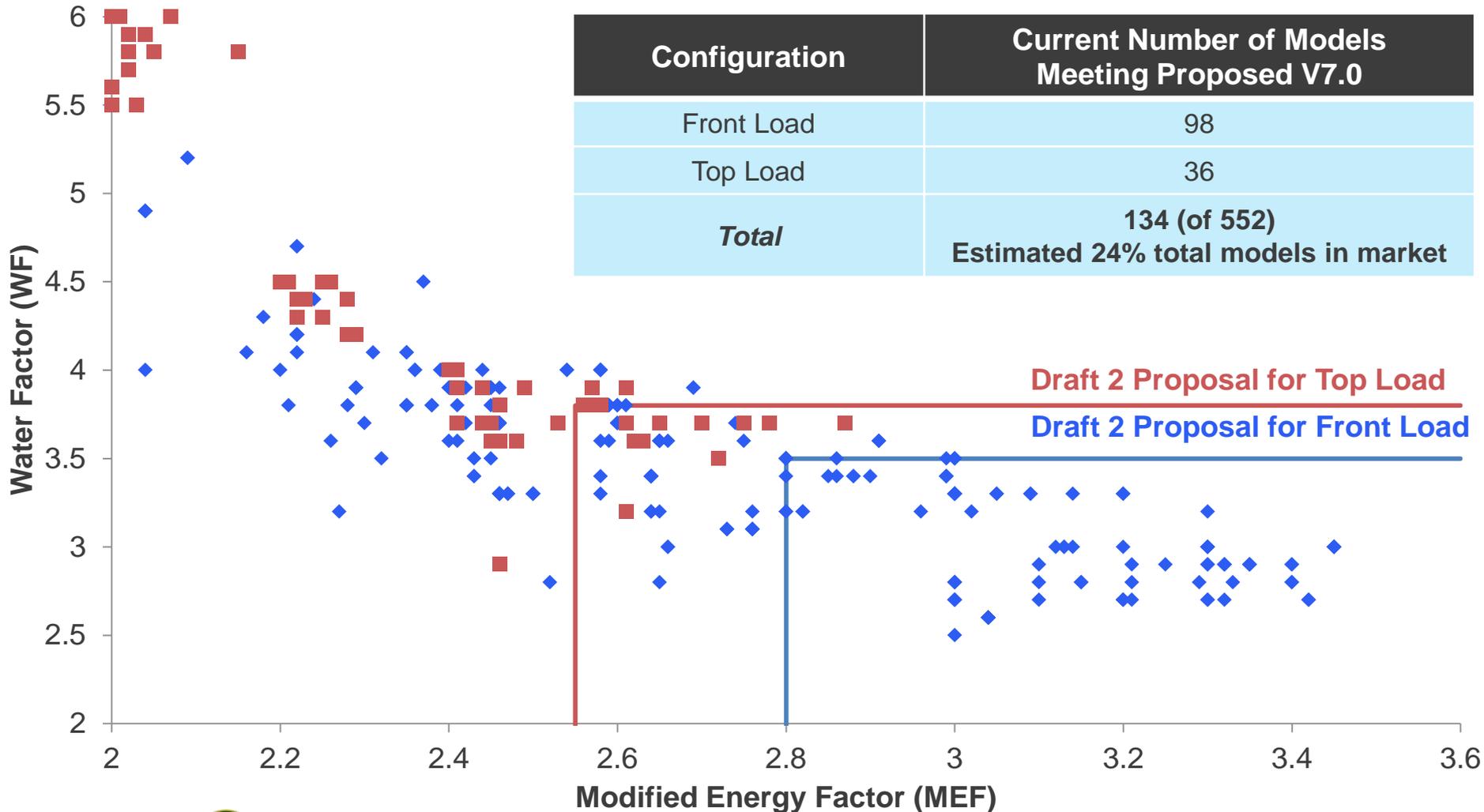
$$IMEF_{MIN} = IMEF_{BASE} - IMEF_{Adder_Connected}$$

Connected Allowance	
Product Type	IMEF _{Adder_Connected}
Residential Clothes Washers	0.05 x IMEF _{BASE}

Note: Product must be qualified using the final and validated ENERGY STAR Test Method (TBD) to use the allowance.

Residential Clothes Washer Scatter Plot

ENERGY STAR qualified models > 2.5 Cu-Ft.

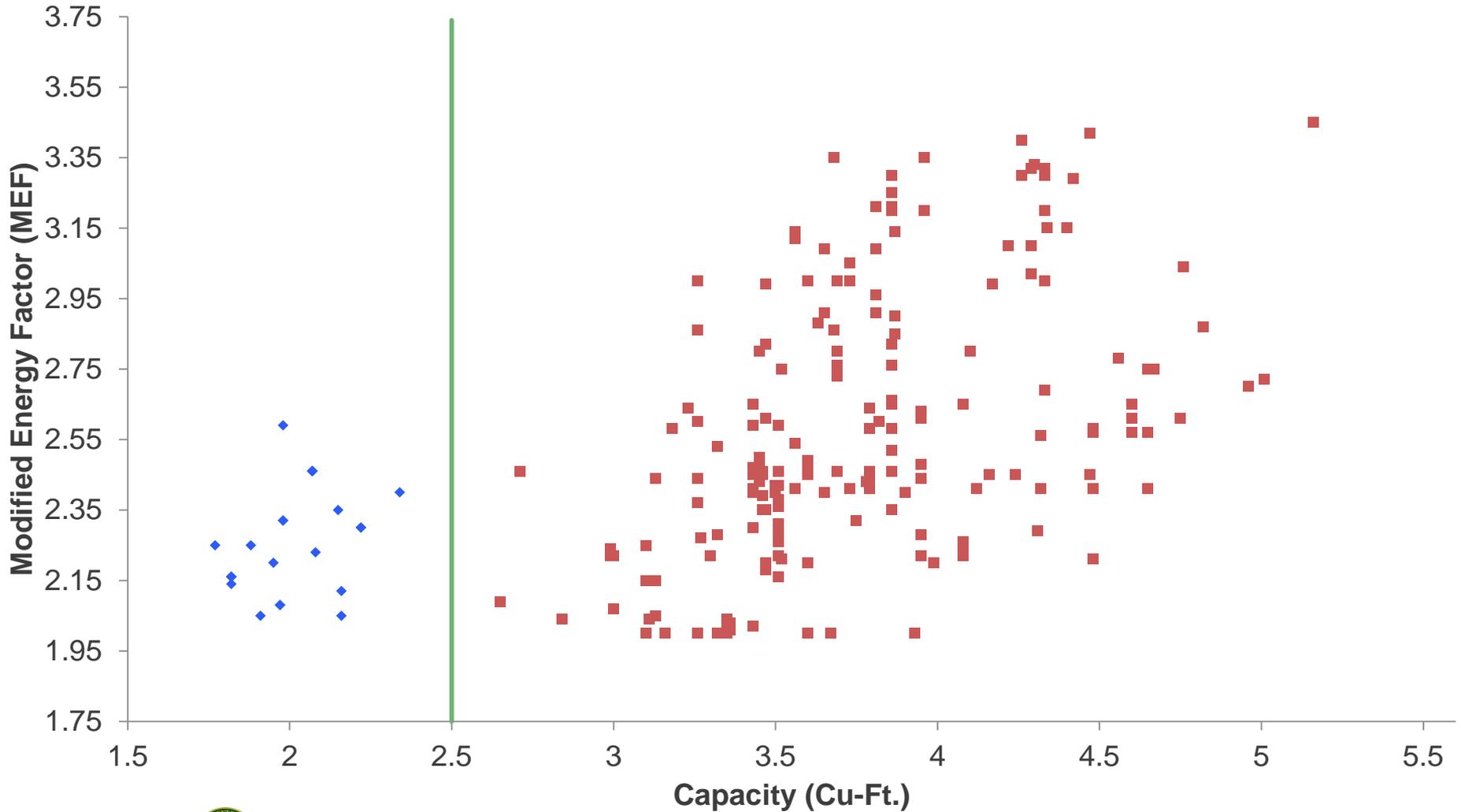


◆ Front Loaders

■ Top Loaders

Residential Clothes Washer Scatter Plot

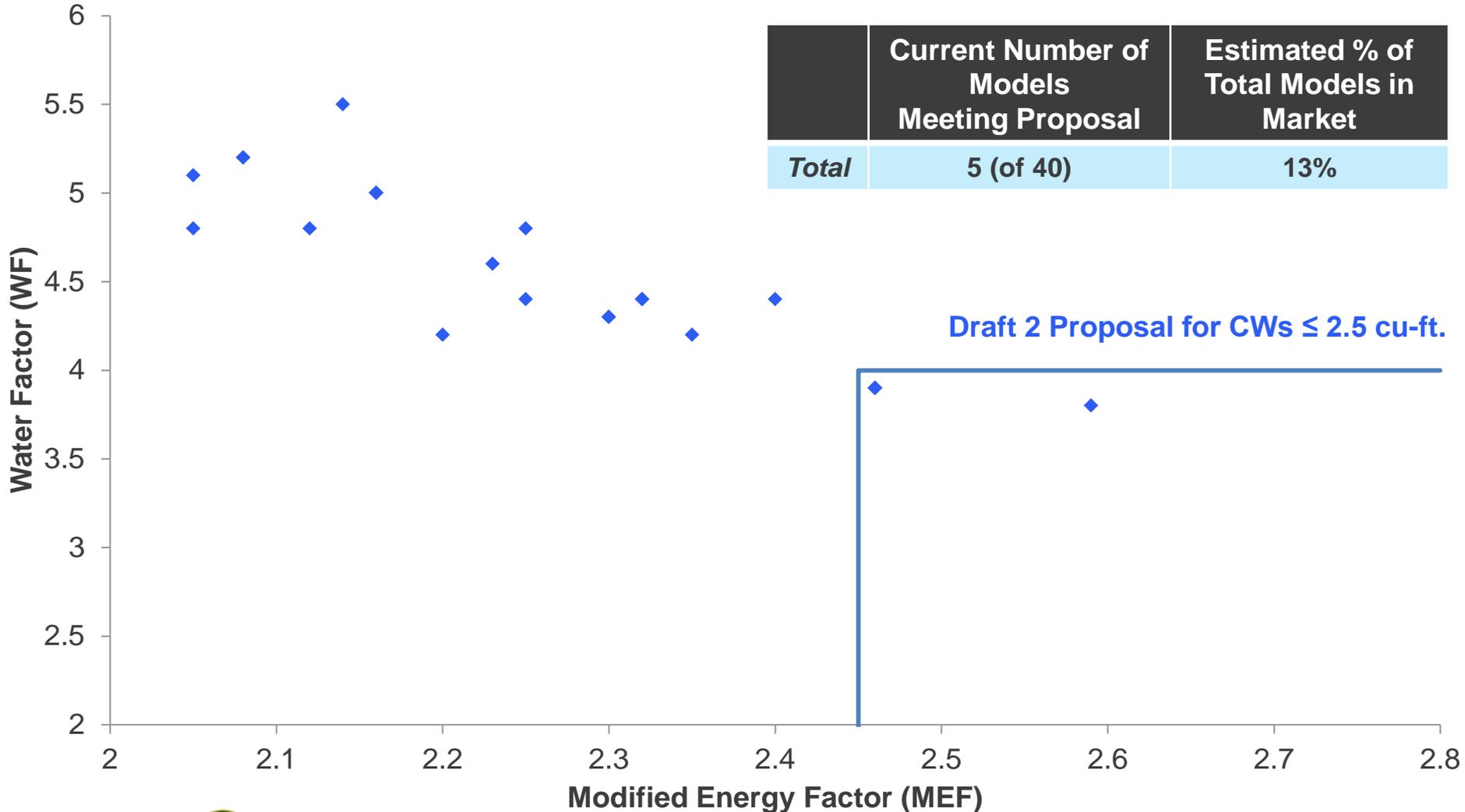
ENERGY STAR certified models, MEF vs. Capacity



◆ CWs < 2.5 Cu-Ft. ■ CWs > 2.5 Cu-Ft.

Residential Clothes Washer Scatter Plot

ENERGY STAR qualified models ≤ 2.5 Cu-Ft



◆ Front Loaders

Current Product Availability



Manufacturers	Brands
Asko (4)	Asko (4)
Electrolux (14)	Crosley (1)
GE (15)	Electrolux (4)
Kenmore (22)	Frigidaire (9)
LG (25)	GE (15)
Miele (1)	Kenmore (22)
Samsung (27)	LG (25)
Whirlpool (31)	Maytag (13)
	Miele (1)
	Samsung (27)
	Whirlpool (18)

Consumers' Energy, Water & Cost Savings, *Draft 2 Version 7.0 Criteria*



	Weighted Per-Unit Electricity Savings (\$)		Weighted Per-Unit Gas Savings (\$)		Per-Unit Water Savings (\$)		Per Unit Total Savings (\$)	
	Annual	Lifetime	Annual	Lifetime	Annual	Lifetime	Annual	Lifetime
Top Loading > 2.5 cu-ft	14.3	157	3.3	36	36.4	401	54	594
Front Loading > 2.5 cu-ft	8.2	90	1.3	15	8.7	95	18	200
Front Loading ≤ 2.5 cu-ft	2	22	.5	6	2.6	29	5	57

Assumptions: Prices of \$0.113 per kWh; \$1.064 per therm; \$0.0084 per gallon were used to estimate per-unit cost savings, annually and over an average 11-year CW lifetime.

National Savings



	Electricity (GWh/yr)	Gas (MBTU/yr)	Water (Million Gallons/yr)	Carbon Equivalent (Million lbs CO ₂ E/yr)	Cost Savings (Millions\$/yr)
Residential Clothes Washers	241	507,926	6,022	430	83

Assumptions: Assumes ENERGY STAR market penetration of 35%, annual residential clothes washer shipments of 7.3 million (based on 2012 Shipments from Appliance Magazine, March 2013).

Consumer Payback



- Pricing information gathered in April 2012 from five major appliance retailers, focused on pairs of models with similar feature sets, where one model met the ENERGY STAR V7.0 proposal and another similarly featured model did not.
- Top Loading Washers
 - Units available today that meet V7.0 for \$629-\$699.
 - Relative to a similarly featured unit not meeting the proposal, a price premium of \$60-\$160 exists (payback of 1-3 years, considering a consumers' annual savings).
 - Yields a payback of about 1-3 years relative to a consumers' annual savings.
 - The highest priced model in the small sample provided a significant number of additional features such as an eco-monitor and larger capacity, making parsing the efficiency cost very difficult if not impossible.
- Front Loading Washers
 - Units available today that meet V7.0 for \$699-719.
 - Relative to a similarly featured unit not meeting the proposal, a price premium of \$1-\$20 exists.
 - Yields a payback of about 0-3 years relative to a consumers' annual savings.

Cleaning and Rinse Performance



- EPA and DOE received a variety of stakeholder feedback on potentially addressing cleaning/rinse performance.
 - High energy/water performance requirements could negate savings if performance is not satisfactory.
 - Some high-efficiency models receive somewhat lower ratings in Consumer Reports performance testing.
 - EPA found evidence that many of the washers meeting proposed levels deliver good performance, but the Agency believes it will be important for future specifications to more comprehensively consider energy/water and cleaning/rinse performance.
- DOE is launching process to develop an ENERGY STAR cleaning and rinse performance test for clothes washers (second half of webinar).
 - Factoring in test procedure development lead time, EPA is proposing that models certified to ENERGY STAR report cleaning/rinse performance for purposes of Version 7.0. (No minimum requirement).

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Overview of Draft 2 Version 7.0

Connected Functionality



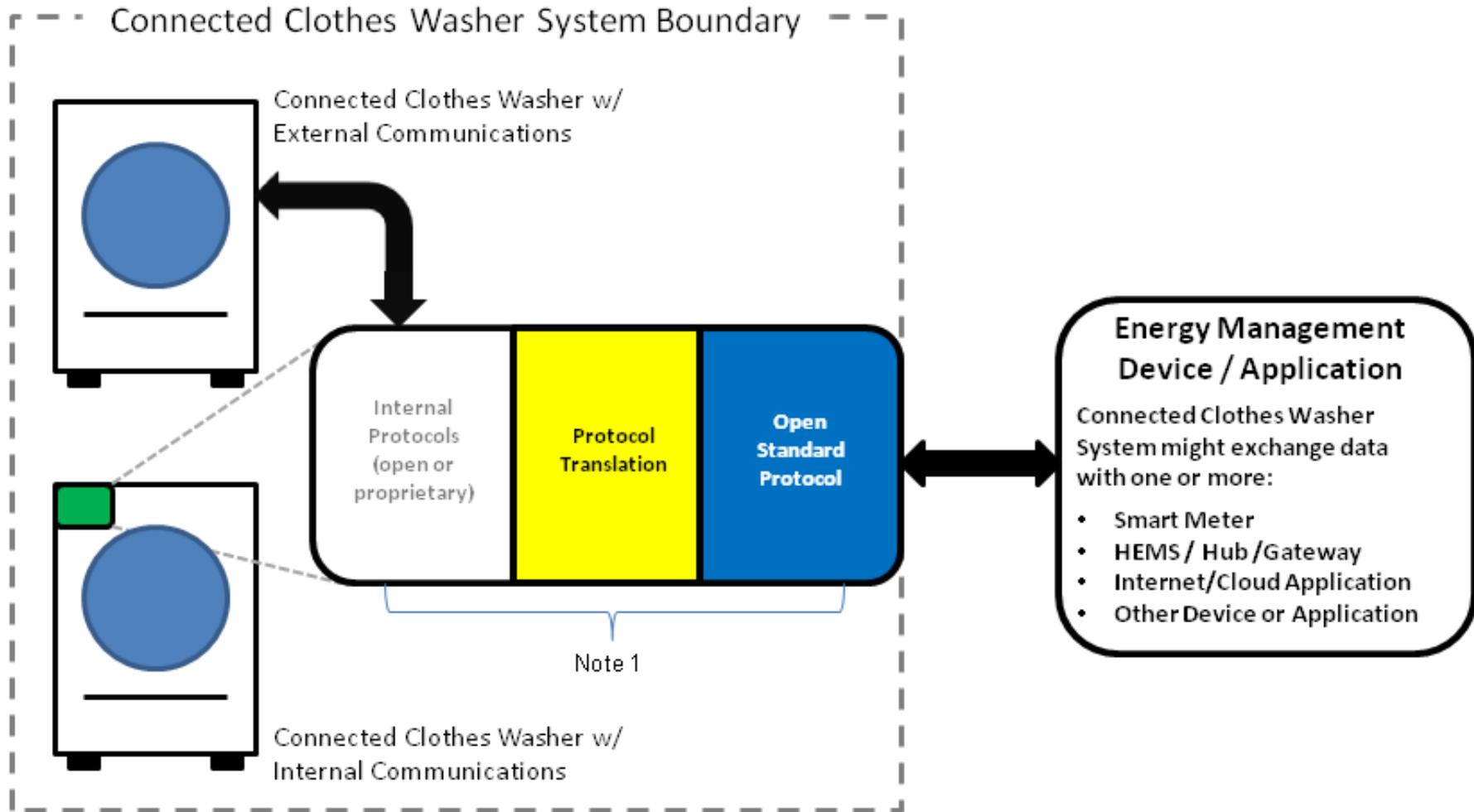
- EPA is seeking to help advance products with intelligent features in ways that deliver immediate consumer benefit and support a low-carbon electricity grid over the long term.
- Draft 2 introduces *optional* Connected Functionality (CF) criteria for residential clothes washers.
 - Builds on the CF in the final Version 5.0 residential refrigerators and freezers (R/F) specification while leveraging connected opportunities unique to residential clothes washers.
 - Consumer has full control to override product's response to a signal from a utility requesting load reduction or deferral.
 - 5% allowance for ENERGY STAR qualified products certified to optional connected criteria, including using a future (TBD) ENERGY STAR test method to validate demand response.
 - EPA will flag ENERGY STAR clothes washers that are certified as meeting all of the connected criteria (e.g., Qualified Product List).

Connected Clothes Washer System



- As with the CF for R/F, this section includes text and a diagram in order to define the connected clothes washer (CW) system:
 - Consists of all required hardware and software.
 - Communications hardware may be built-in or external.
 - Open standards required for connection with external device(s) or application(s).
 - On-premises, open standards connectivity preferred, but alternate means are acceptable.
 - Open standards & open access for 3rd party remote management is not required.

Connected Clothes Washer System



Communications & Open Access



- Aligns with the final R/F connected communications criteria:
 - Open standards:
 - In the NIST SGIP Catalog of Standards, or;
 - In the NIST Smart Grid Framework Table 4.1 or 4.2, or;
 - Adopted by ANSI or by a well recognized international SDO.
 - Communications hardware may be:
 - Built-in.
 - Proprietary external paired with module/device.
 - Open standards based port & module.
 - Open standards based port (no module) with one or more of the above.
 - Open Access – API available to interested parties for:
 - Energy Consumption Reporting.
 - Operational Status.
 - User Settings & Messages, and DR.

Consumption Reporting, Remote Management



- Also aligns with final R/F Connected Communications criteria
 - Energy consumption reporting allows implementation flexibility. API allows 3rd party access and includes reporting accuracy.
 - Remote management may be provided to 3rd parties at the discretion of the manufacturer

Operational Status, User Settings & Messages



- In addition to reporting of DR status, the Draft 2 proposes adding consumer-authorized reporting of operational status (e.g., off, delay start, cycle in process).
 - Considered important for products that are not continuously operated such that load-balancing entities are empowered to assess dispatch-able load.
- At least two types of energy-related messages required.
 - Performance issues.
 - Energy consumption that is outside the product's normal range.

Demand Response



- Builds off the recommended definition of smart clothes washer included in the AHAM / efficiency advocate petition to ENERGY STAR.
- No specific criteria for price responsiveness.
 - Lack of standardization and identified need for appliances to directly respond to price signals.
 - Stakeholders have signaled that price responsiveness may be implemented using ENERGY STAR DR criteria.
- Delay Appliance Load Capability – cycle start moved outside of delay period.
 - Defaults:
 - 4-hour minimum response.
 - Capable of responding at least 1x per rolling 24h period
 - Consumer override – before or during delay period.

Demand Response (cont)

- Temporary Appliance Load Reduction Capability – average power draw during the load reduction period reduced by at least 50%.
 - Defaults:
 - 10-minute minimum response.
 - Capable of responding at least 1x per rolling 24h period.
 - Consumer override – before or during load reduction period.

Stakeholder Feedback



- To support development of connected criteria for clothes washers, EPA is particularly interested in stakeholder feedback on:
 - Added operational status reporting criteria intended to inform load-balancing entities.
 - Proposal to not include specific price responsiveness criteria.
 - DR defaults – do opportunities exist for clothes washers to provide longer or more frequent responses, without impacting consumer expectations? What if any performance considerations need to be further considered?

Verification of Connected Functionality



- Compliance with connected functionality will be through examination of the product and/or product documentation.
- Additionally, DR functionality will be certified using a TBD ENERGY STAR test method
 - DOE is planning to develop a test that will validate the DR capabilities of a residential clothes washer, to be referenced in the V7.0 specification.
 - DOE is initiating this effort now and will be contacting manufacturers to obtain products for testing or to witness testing in manufacturer labs.
 - Products must be certified using this new ENERGY STAR test method in order to be eligible for the 5% allowance .

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Clothes Washer Cleaning/Rinsing Performance Agenda



1	Goals
2	Preliminary Approach – Overview
3	Preliminary Approach – Setup, Materials, Preparations
4	Preliminary Approach – Method and Scoring
5	Discussion

Test Method Goals



- Accurately measure clothes washer cleaning/rinsing performance
- Cleaning/rinsing performance metrics should be *relevant to certified energy and water use*, as measured by the DOE test procedure (*Appendix J2*)
- Ideally, cleaning/rinsing performance test conditions would be identical to those of the DOE *Appendix J2* test procedure
- The test method should minimize additional test burden (*Appendix J2* already requires 3-5 full laboratory work days per clothes washer)

Test Method Development Approach



- DOE identified industry and international cleaning and rinsing test methods for evaluation
- DOE compared these test methods to the *Appendix J2* test procedure to determine which were relevant
- DOE developed a preliminary approach to measuring cleaning/rinsing performance:
 - Intended to allow early stakeholder input
 - Elements of the cleaning/rinsing methodologies were combined with elements of the *Appendix J2* methodology
 - Terminology: “Proposed Test Method”

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Preliminary Approach Overview



- In practice, full harmonization between methods to measure energy/water and cleaning/rinsing cannot be achieved in a single test method
- The Proposed Test Method is a new methodology for measuring cleaning & rinsing performance
 - NOTE: Cleaning and rinsing performance testing is to be performed separately from energy and water use testing
- *Appendix J2* would still be required to measure energy & water use
- To the extent possible, DOE has maintained test conditions from *Appendix J2* in the Proposed Test Method

Existing Cleaning and Rinsing Performance Test Methods Considered



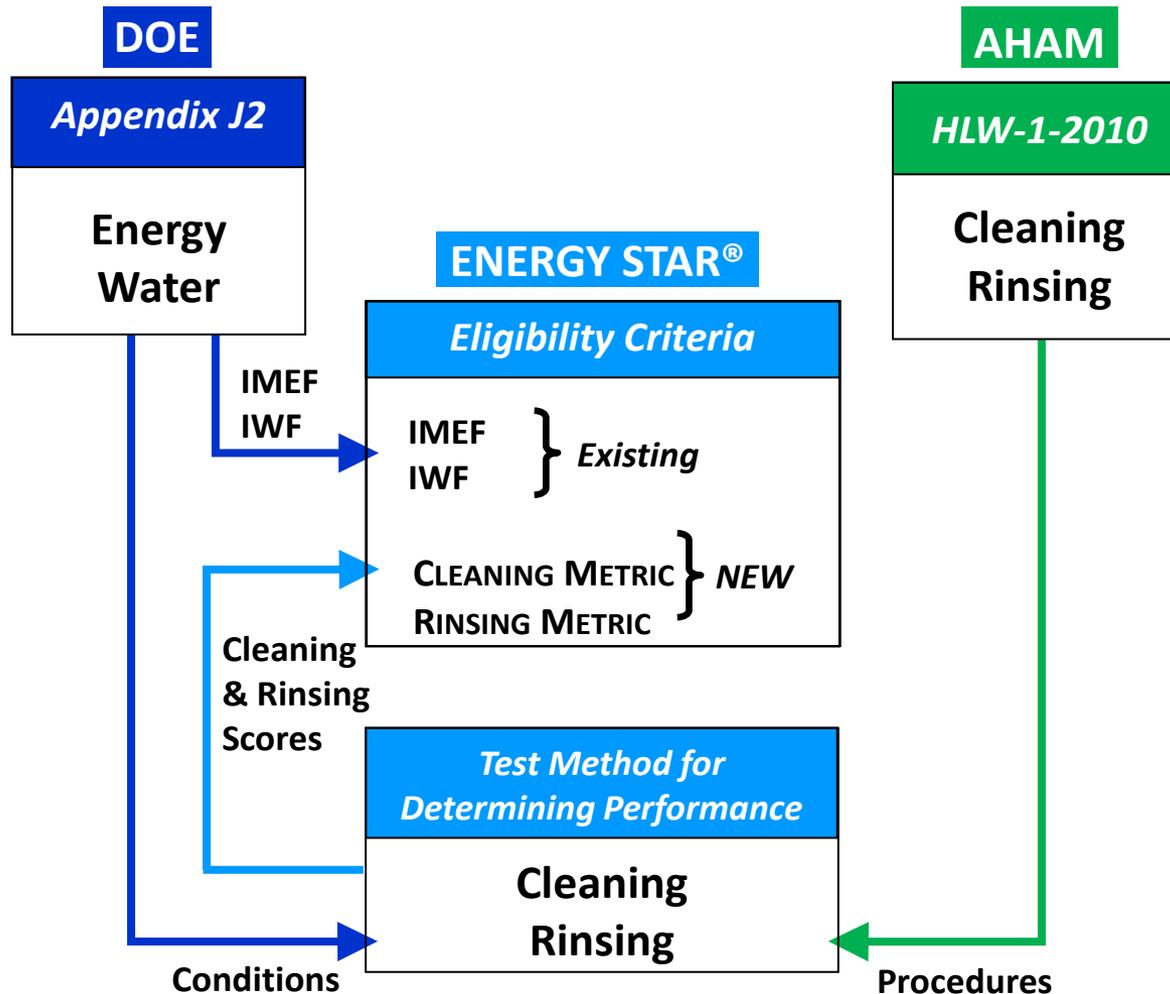
- International Electrotechnical Commission (IEC)
 - *IEC 60456*, “Clothes washing machines for household use – Methods for measuring the performance”
- Joint Australian and New Zealand Standard (AS/NZS)
 - *AS/NZS 2040.1:2005*, “Performance of household electrical appliances- Clothes washing machines”
- Association of Home Appliance Manufacturers (AHAM)
 - *HLW-1-2010*, “Performance Evaluation Procedures for Household Clothes Washers”

Selection of Suitable Cleaning and Rinsing Test Methodologies

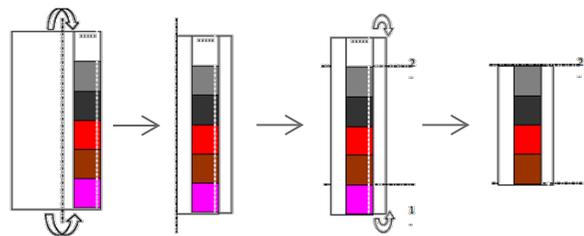


- *IEC 60456* requires parallel testing in a reference washer, which would add significant testing burden
- *AS/NZS 2040.1:2005* also requires a reference washer; not a commonly-used test method in the United States
- *HLW-1-2010* is a suitable source for the Proposed Test Method:
 - Does not require use of a reference washer for parallel testing
 - General criteria (water temperature and pressure, electrical supply, etc.) are functionally equivalent to those in *Appendix J2*
 - No specific wash cycles or settings mandated or excluded
 - Commonly-used and accepted tests in the United States

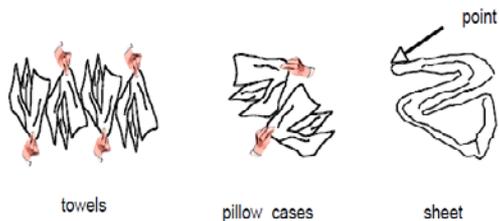
Proposed Structure of ENERGY STAR Test Method



Basic AHAM Cleaning/Rinsing Test Method



Attach stained strips to towels & prepare



Fold



Load



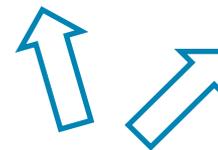
Wash



DRY (evap. or iron)



Measure reflectance for cleaning performance



Measure UV absorbency for rinsing performance



Proposed Sections of *HLW-1-2010* to be Used

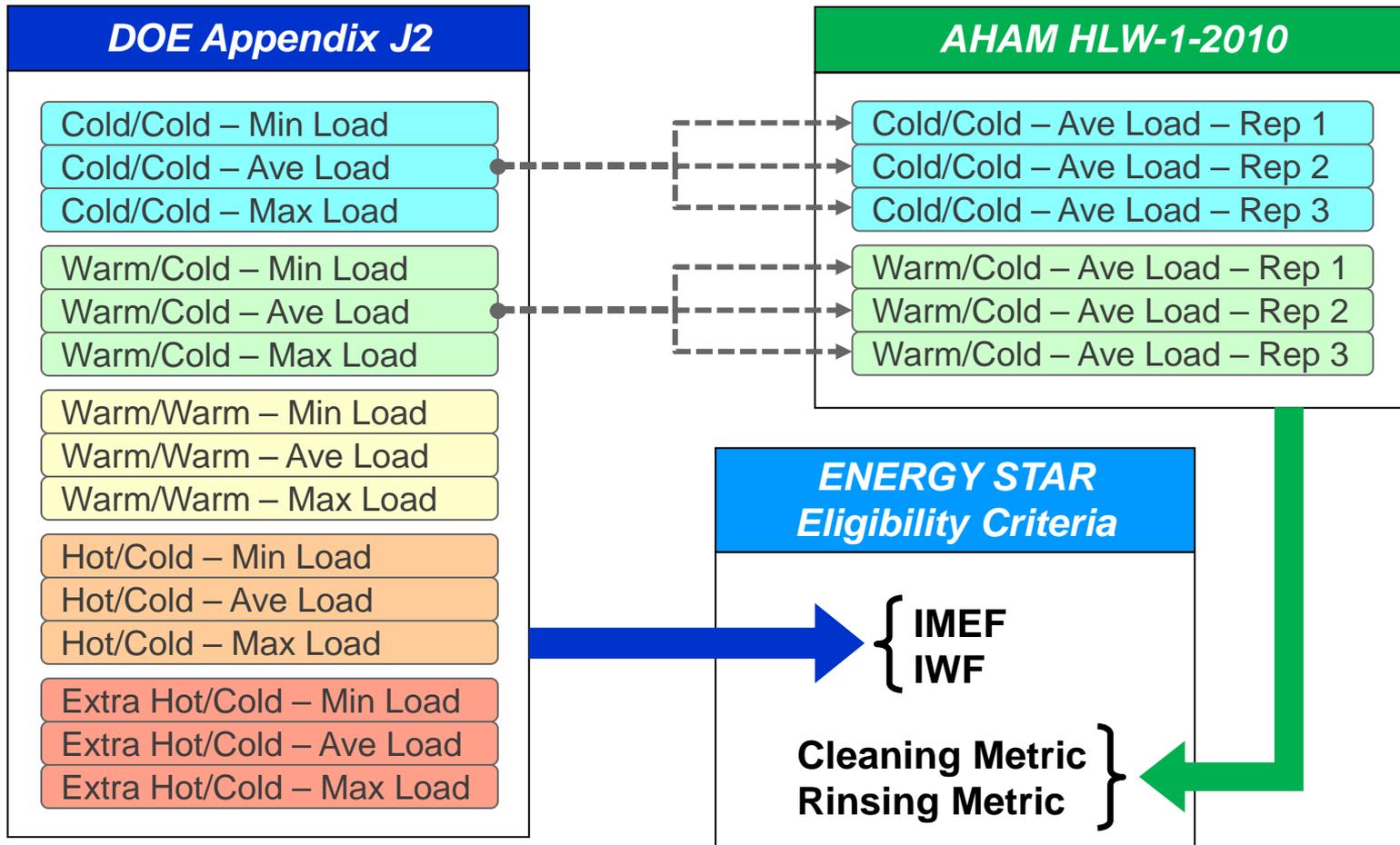


- General:
 - Section 3 – DEFINITIONS
 - Section 4 – GENERAL TEST CONDITIONS (Note: selected items not covered by *Appendix J2* conditions)
 - Section 5 – FOLDING AND LOADING THE TEST LOAD
- Cleaning performance:
 - Section 6 – SOIL/STAIN REMOVAL TEST
 - Annex A – TEST MATERIALS AND TEST EQUIPMENT
- Rinsing performance:
 - Annex E – PERFORMANCE EVALUATION PROCEDURES FOR HOUSEHOLD CLOTHES WASHERS – RINSING EFFECTIVENESS TEST

Proposed Test Cycles for ENERGY STAR Test Method



These cycles are run with detergent



Clothes Washer Cleaning/Rinsing Performance Agenda



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Throughout this webinar, bold paragraph headers refer to the corresponding *sections of the ENERGY STAR Proposed Test Method*

- Additional terms defined:

- **3.B.1** Load Treatment Clothes Washer

- A dedicated clothes washer used solely for the purpose of pretreatment and normalization of base loads.

- **3.B.2** Total Cleaning Score

- A measure of soil/stain removal that represents an average of individual cleaning scores from test strip swatches of different stain

Proposal:

Laboratory Conditions and Equipment



- Some, but not all, of the provisions from *Appendix J2* are incorporated (details are in Preliminary Approach)
- New conditions:
 - **4.1.D** Supply water hardness (DOE test procedure does not specify)
- New equipment:
 - **4.2.A** Weight (base load scale plus detergent scale)
 - **4.2.B** Tristimulus spectrophotometer (for cleaning performance)
 - **4.2.G** UV spectrometer (for rinsing performance)
 - **4.3.A** Load treatment clothes washer
 - **4.3.C** Equipment to fasten test strips to base load
 - **4.3.D** Rinsing performance test equipment (wholly incorporating *HLW-1-2010, Annex E, §2*)

Invited Comments: Laboratory Conditions and Equipment



- DOE invites comment on the benefits and test burden of requiring more accurate base load weighing equipment as specified by *HLW-1-2010*

Proposal: Base Load Composition



- 4.4.A&B Base load and stuffer load composition
 - Two options identified for load specifications —
 - Option A – *HLW-1-2010*
 - Same as *IEC 60456* Cotton Base Load
 - Base load: 100% cotton bed sheets, pillow cases, and towels
 - Stuffer load: 100% cotton hemmed rectangles
 - Option B – *Appendix J2*
 - “DOE Energy Test Cloth”
 - Base load: 50% cotton/50% polyester fabric test cloths
 - Stuffer load: 50% cotton/50% polyester fabric test cloths

Issue: Base Load Composition



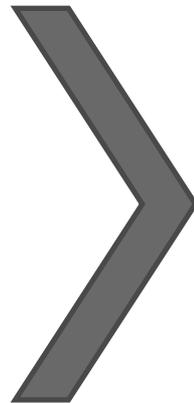
- Why can't identical loads be used for *Appendix J2* and the ENERGY STAR cleaning/rinsing performance test method?
- Fabric article characteristics for *Appendix J2* and *HLW-1-2010* are tailored to the different needs and methods of each test:

Test objectives and needs

- purpose
- applicability
- scope
- potential burden
- ...

Methods

- handling
- preparing
- loading
- measuring
- ...



Fabric characteristics

- type
- dimensions
- shape
- other properties

Discussion: Base Load Composition



Characteristic	Option A: <i>HLW-1-2010</i> Cotton Base Load	Option B: <i>Appendix J2</i> Energy Test Cloth
Functional goals	<ul style="list-style-type: none"> • Reproducible and repeatable results for cleaning and rinsing performance (and other performance measures) 	<ul style="list-style-type: none"> • Simulate average of fabric blends laundered by consumers • Consistent / repeatable moisture retention for Remaining Moisture Content (RMC) test
Material	<ul style="list-style-type: none"> • 100% cotton 	<ul style="list-style-type: none"> • 50% cotton / 50% polyester
Consistency with <i>Appendix J2</i> test conditions	<ul style="list-style-type: none"> • 100% cotton absorbs more water than a synthetic blend • Clothes washers with automatic water fill may consume more water 	<ul style="list-style-type: none"> • Equivalent test load composition and clothes washer water consumption

Discussion: Base Load Composition (continued)



Characteristic	Option A: <i>HLW-1-2010</i> Cotton Base Load	Option B: <i>Appendix J2</i> Energy Test Cloth
Type / shape	<ul style="list-style-type: none"> • Bed sheets, pillowcases, towels 	<ul style="list-style-type: none"> • Rectangular fabric cloths
Dimensions	<ul style="list-style-type: none"> • Bed sheets: 94" x 63" • Pillowcases: 31" x 31" • Towels: 39" x 20" 	<ul style="list-style-type: none"> • Rectangular cloth: 36" x 24"
Folding and loading sequence	<ul style="list-style-type: none"> • Specific methodologies that could be used unchanged 	<ul style="list-style-type: none"> • No methodologies • New procedures would need to be evaluated and researched
Test strip attachment	<ul style="list-style-type: none"> • Specific methodologies that could be used unchanged 	<ul style="list-style-type: none"> • N/A (no test strips) • New procedures would need to be developed

Discussion: Base Load Composition (continued)



Characteristic	Option A: <i>HLW-1-2010</i> Cotton Base Load	Option B: <i>Appendix J2</i> Energy Test Cloth
Age profile	<ul style="list-style-type: none"> • Average article age in a load must be 29-51 cycles • Implies complex age tracking system 	<ul style="list-style-type: none"> • No average article/load age
Maximum usage	<ul style="list-style-type: none"> • 84 test cycles 	<ul style="list-style-type: none"> • 60 test cycles
Material procurement	<ul style="list-style-type: none"> • Common fabric characteristics, available through multiple distributors in the U.S. 	<ul style="list-style-type: none"> • Unique weave, manufactured only overseas • Distributed by a single U.S. supplier • Test cloth shortages in recent years

Invited Comments: Base Load Composition



- DOE requests comments on these general issues:
 1. Should the ENERGY STAR test method require using *HLW-1-2010* base load materials (Option A) or *Appendix J2* test cloth (Option B) for the base load?
 2. What is the impact of test substrate on cleaning/rinsing performance test results, including the effects of article...
 - type
 - size
 - shape

Invited Comments: Base Load Composition (continued)



- General issues (cont'd):
 3. What are the relative differences in testing cost and burden between using AHAM base load material and using DOE energy test cloth?
 4. The *HLW-1-2010* folding and loading requirements include Mechanical Action (MA) test swatches, which are only needed if the MA test is done
 - Since the MA test is not being performed, is there any need to require MA swatches?

Invited Comments: Base Load Composition (continued)



- Additionally, if DOE test cloths were required (Option B):
 1. What is the appropriate amount of detergent to use?
 - Note that *IEC 60456* requires different amounts of detergent for 100% cotton and synthetic blend loads
 2. What fabric age requirements should be applied?
 3. Would the presence of synthetic material in the base load necessitate differences in test methodology from *HLW-1-2010*?
 - For example, in *IEC 60456* the default base load size, average article age, and test strip attachment requirements differ between cotton and blended load types

Invited Comments: Base Load Composition (continued)



- If DOE test cloths were required (cont'd):
 4. What supply issues would you expect for the energy test cloth if cleaning/rinsing tests also required their use?
 5. What are the key attributes of folding, loading, and test strip attachment to consider when developing new procedures?

Proposal: Base Load Size



- 4.5.D Base load size
 - Adaptive fill machines: “average” load size*
 - Manual fill machines: “maximum” load size*

* As defined in *Appendix J2, Table 5.1*

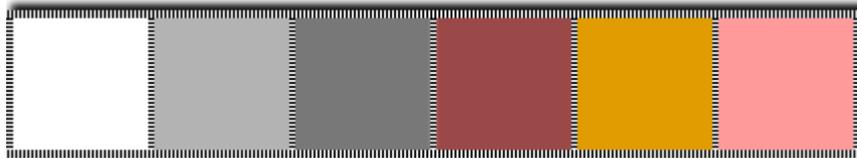
Issue and Invited Comments: Base Load Size



- The proposed load sizes are those with the highest consumer usage factors in *Appendix J2*:
 - Adaptive fill machines – “average” load size is selected for 74% of all wash loads
 - Manual fill machines – “maximum” load size is selected for 72% of all wash loads
- DOE invites comment on the appropriateness of using the “average” or “maximum” load sizes for measuring cleaning and rinsing performance

Proposal: Test Strips

- 4.4.C Soil/stain test strips
 - Per *HLW-1-2010 Annex A, § § A.6 and A.7*

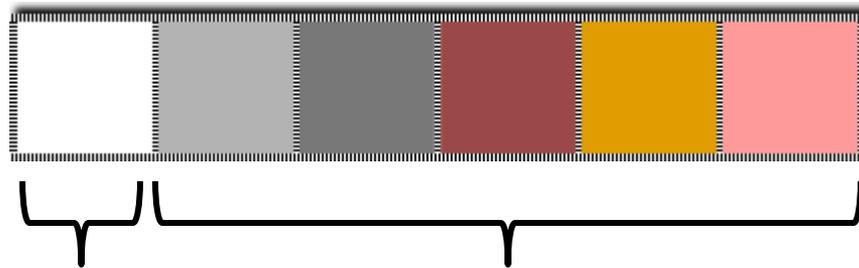


AHAM test strip. Swatches, from left to right:
unsoiled, sebum, charcoal, blood, cocoa, wine

Issue: Use of a Single Test Strip for Both Cleaning and Rinsing Tests



- *HLW-1-2010* has incompatible test strip marking requirements for the cleaning and rinsing performance tests
 - The cleaning test *requires* marking the unsoiled swatch
 - The rinsing test *prohibits* marking the unsoiled swatch



Acceptable area to mark for **cleaning** Acceptable area to mark for **rinsing**

Invited Comments: Use of a Single Test Strip



- DOE requests comments and information:
 - Methods stakeholders may have used to perform both the Soil/Stain Removal and Rinsing Effectiveness Tests in a single test cycle, using the same set of soil/stain strips
 - Suggested methods of marking or otherwise identifying test strips so that both reflectance (cleaning) and absorbance (rinsing) measurements can be made accurately

Clothes Washer Cleaning/Rinsing Performance Agenda



1	Goals
2	Preliminary Approach – Overview
3	Preliminary Approach – Setup, Materials, Preparations
4	Preliminary Approach – Method and Scoring
5	Discussion

Proposal: Test Cycles

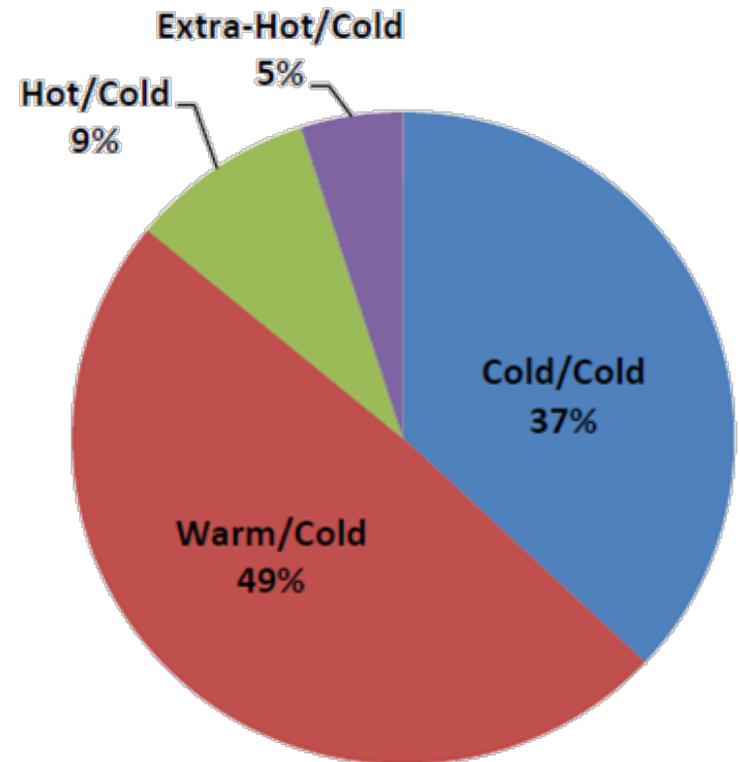


- 5.1 Test Cycles
 - Use the cold wash/cold rinse and warm wash/cold rinse cycles of the energy test cycle according to *Appendix J2*

Issue: Test Cycles



- *Appendix J2* requires testing these wash/rinse temperature combinations, if available on the unit:
 - Cold / Cold
 - Warm / Cold
 - Warm / Warm
 - Hot / Cold
 - Extra-hot / Cold
- Weighting represents estimates of average consumer usage of each combination



Discussion: Test Cycle Approaches Considered



Approach	Cycles Required	Advantages	Disadvantages
<p>PROPOSED Test a <i>minimal number of temperature combinations that, together, represent a <u>majority of consumer cycle selections</u></i></p>	<ul style="list-style-type: none"> • Cold/Cold • Warm/Cold 	<ul style="list-style-type: none"> • Reduced test burden • Represents 86% of consumer cycle selections • Testing would take place under the most challenging conditions for cleaning performance (cold/cold) 	<ul style="list-style-type: none"> • Does not represent the complete set of conditions tested under <i>Appendix J2</i> • There may be other cycles with worse cleaning and/or rinsing performance (but the usage factor would be low)

Discussion: Test Cycle Approaches (continued)



Approach	Cycles Required	Advantages	Disadvantages
Test the temperature combination likely to have the <u>lowest soil/stain removal score</u>	<ul style="list-style-type: none">• Cold/Cold	<ul style="list-style-type: none">• Significantly reduced test burden• Testing would take place under conditions likely to be most challenging for cleaning performance	<ul style="list-style-type: none">• Does not represent the complete set of conditions tested under <i>Appendix J2</i>• This cycle may not have the lowest cleaning score in some cases

Discussion: Test Cycle Approaches (continued)



Approach	Cycles Required	Advantages	Disadvantages
Test the temperature combination with the <u>highest weighting factor</u> in <i>Appendix J2</i>	<ul style="list-style-type: none">• Warm/Cold	<ul style="list-style-type: none">• Significantly reduced test burden• Represents the cycle most commonly selected by consumers	<ul style="list-style-type: none">• Does not represent the complete set of conditions tested under <i>Appendix J2</i>• Does not test the conditions likely to result in the lowest cleaning score

Discussion: Test Cycle Approaches (continued)



Approach	Cycles Required	Advantages	Disadvantages
<p>Test <i>all</i> wash/rinse temperature combinations required by <u>Appendix J2</u></p>	<ul style="list-style-type: none"> • Cold/Cold • Warm/Cold • Warm/Warm • Hot/Cold • Extra-hot/ Cold 	<ul style="list-style-type: none"> • Most closely represents cleaning/ rinsing performance of the clothes washer under <i>Appendix J2</i> test conditions 	<ul style="list-style-type: none"> • Maximum test burden option: Three replications per test condition would result in up to 15 total tests per unit (4-5 days)

Invited Comments: Test Cycles



- DOE invites stakeholder comment:
 - Does DOE's proposed approach represent an appropriate tradeoff between minimizing test burden and maintaining test conditions that are as representative as possible of those in *Appendix J2*?
 - Does the proposed approach appropriately represent consumer usage patterns?

Test Replications



- **5.2 Replications**
 - For each wash and rinse temperature combination perform three (3) replications of the test
 - Use the same base load for each replication
 - These requirements are from *HLW-1-2010* (at § 6.5.1)
- DOE invites stakeholder comment:
 - Is performing three replications of each test cycle necessary and sufficient to provide repeatable and reproducible test results?

Measuring Cleaning Performance



- **5.3.A** Perform the Soil/Stain Removal Test in accordance with *HLW-1-2010, § 6.6*
- **5.3.B** After washing data are recorded, calculate a Total Cleaning Score for each test cycle per *HLW-1-2010, § 6.7*
- **6.1** Total Cold Wash Cycle Cleaning Score
- **6.2** Total Warm Wash Cycle Cleaning Score

- **3.B.3 Residual Detergent Score**

“A measure of rinsing performance that represents the amount of residual detergent remaining in the load after a complete wash cycle, per pound of load. Equal to the Rinse Score calculated with *equation 8-8 of Annex E of HLW-1-2010*. A lower Residual Detergent Score represents greater detergent removal during rinsing.”

- *HLW-1-2010*'s Rinse Score is a measure of residual detergent present in washed articles after the rinsing cycle is completed
 - A lower value of Rinse Score represents better clothes washer performance
 - Thus, “Rinse Score” terminology may be counter-intuitive
 - DOE proposes to use the *HLW-1-2010* Rinse Score for the ENERGY STAR test method, but is renaming it as “Residual Detergent Score” for clarity

Proposal:

Measuring Rinsing Performance



- **5.4.A** Perform the Rinsing Effectiveness Test in accordance with *HLW-1-2010, Annex E*
 - Note the test is performed under same conditions and procedures as the cleaning performance test, except for measuring the test strip
- **5.4.B** Calculate the following metrics for each test cycle
 - Residual Detergent Score: Use *HLW-1-2010, Annex E, § 8.2, eqn. 8-8*
 - Standard Deviation of the Residual Detergent Score: Use *HLW-1-2010, Annex E, § 8.2, eqn. 8-9*
- **6.3** Cold Wash Cycle Residual Detergent Score
- **6.4** Warm Wash Cycle Residual Detergent Score

Issue: Rinsing Performance Proposed Test Method



- According to *HLW-1-2010*:
 - AHAM's current Rinsing Effectiveness Test is intended
“solely for internal engineering development purposes
and shall not be used to prove or disprove rinsing
effectiveness claims for marketing and/or other purposes”
 - The precision and bias of the current Rinsing Effectiveness
measurement is still under investigation

Discussion: Rinsing Performance Proposed Test Method



- Despite these potential limitations, DOE:
 - Believes that the methodology of *HLW-1-2010* represents the best available means to measure clothes washer rinsing performance at this time
 - Proposes to incorporate provisions of the *HLW-1-2010* Rinsing Effectiveness Test into the ENERGY STAR test method
- AHAM is currently developing a revised version of the Rinsing Effectiveness Test, which DOE will consider incorporating when published

Invited Comments: Rinsing Performance Proposed Test Method



- DOE invites stakeholder comments on:
 1. The appropriateness of having an ENERGY STAR rinsing performance test method based on the AHAM *HLW-1-2010* Rinsing Effectiveness Test
 2. DOE's proposal to rename the rinsing performance metric from "Rinse Score" to "Residual Detergent Score" for the ENERGY STAR test method
 3. Information regarding the precision and bias of the *HLW-1-2010* Rinsing Effectiveness method

Performance Metrics for ENERGY STAR Clothes Washer Specification



- DOE proposes that clothes washers' cleaning and rinse performance will be characterized using the Cleaning Scores and Residual Detergent Scores, respectively
- DOE requests comments and information regarding whether these metrics are appropriate for determining cleaning and rinsing performance
- EPA anticipates that manufacturers use these metrics to report cleaning and rinse performance data, as part of certification to Version 7.0

Clothes Washer Cleaning/Rinsing Performance Agenda



1	Goals
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Discussion

Introduction – Welcome/Goals, Overview of Specification Development	Amanda Stevens, EPA
Clothes Washer Draft 2, Version 7.0 – Presentation & Discussion	
<ul style="list-style-type: none"> - Effective Date - Definitions - Product Classes, Efficiency Criteria - Reporting requirement 	Amanda Stevens, EPA Ryan Fogle, D&R International
<ul style="list-style-type: none"> - “Connected” Functionality 	Amanda Stevens, EPA Doug Frazee, ICF International
ENERGY STAR Test Procedure Development	
<ul style="list-style-type: none"> - Clothes Washer Cleaning & Rinse Performance Test 	Richard Shandross, Navigant Consulting
Conclude & Next Steps	Amanda Stevens, EPA

Anticipated Timeline for Version 7.0 Spec Revision



June 5, 2013	Draft 2, Version 7.0 Specification Released
June 26, 2013	Stakeholder Webinar (Today)
July 31, 2013	Comment Period Closes on Draft 2 Specification
September 2013	**Final Draft Specification Distributed and Comment Period
October 2013	Final V7.0 Specification Released

- ** Depending on the stakeholder feedback received on the Draft 2, a Draft 3 proposal may also be issued which would impact the anticipated schedule.
- EPA and DOE welcome all partner and stakeholder comments **by July 31, 2013**
- Comments should be submitted in writing to: appliances@energystar.gov

Anticipated Timeline for CW Cleaning/Rinse Performance Test Method



June 26, 2013	Stakeholder Webinar (today)
July 10, 2013	Comment Period Closes on Preliminary Approach
March, 2014	Draft 1 Test Method Distributed
April, 2014	Draft 1 Stakeholder Webinar

Questions/Discussion

Contacts



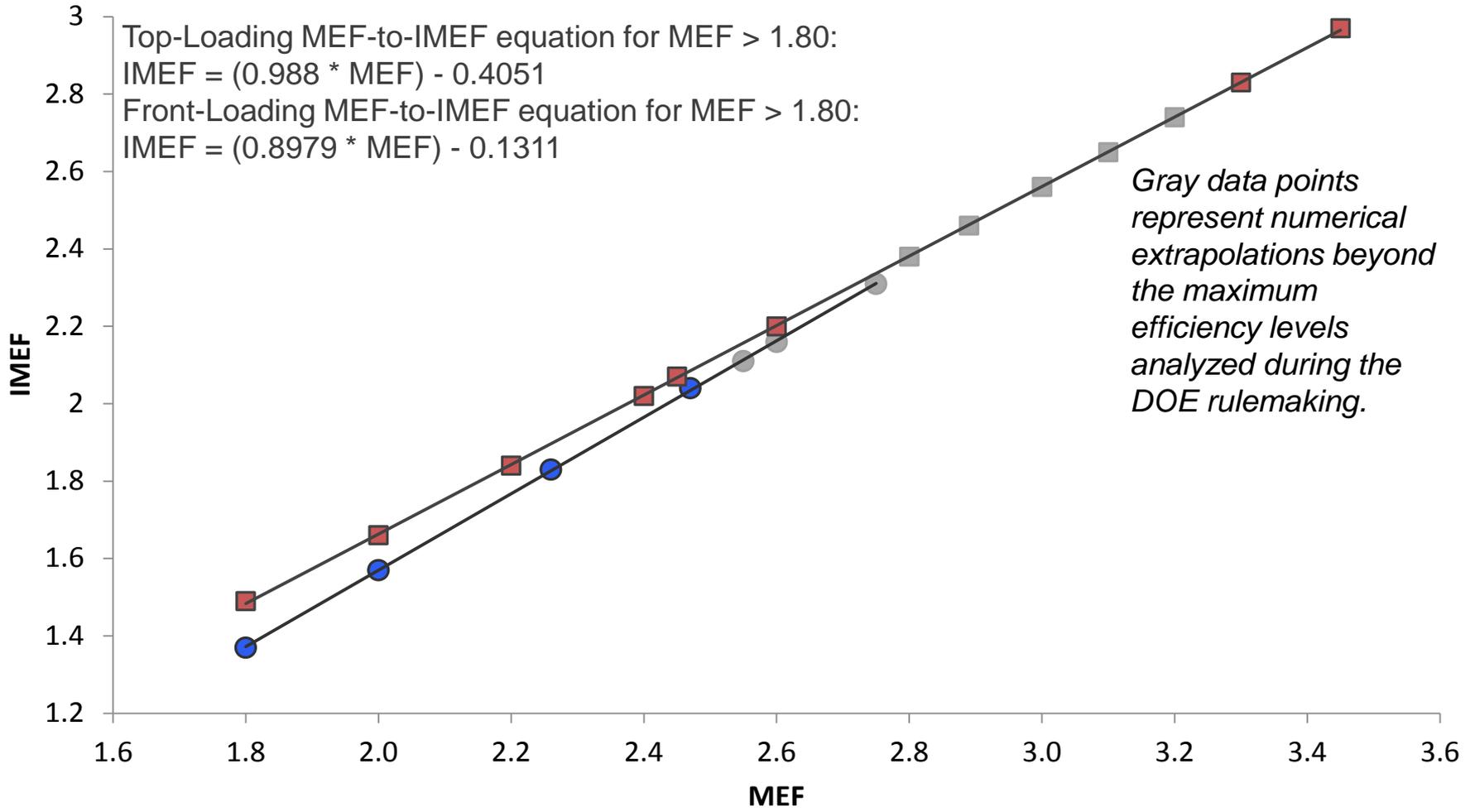
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Test Method:

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MEF to IMEF Crosswalk



WF to IWF Crosswalk

