

Summary and Response to Stakeholder Comments received on the ENERGY STAR Program Draft 2 Test Method for Determining Residential Dishwasher Cleaning Performance

#	Topic	Subtopic	Comment	Response
1	Test Setup		The stakeholder agrees that the test setup and instrumentation should be identical to the DOE energy test procedure because 10 CFR Part 430, Subpart B, Appendix C1 will be mandatory to determine compliance with the energy conservation standards at the time the cleanability test is performed for ENERGY STAR qualification.	DOE has maintained the 10 CFR Part 430, Subpart B, Appendix C1 setup and instrumentation in the ENERGY STAR Draft Final Test Method for Determining Residential Dishwasher Cleaning Performance (Draft Final Test Method).
2	Test Setup	Cleaning Performance Rating Conditions	The lighting requirements in IEC standard 60436 Ed. 3.1, 2009-11 and ANSI/AHAM DW-1-2010 are substantively the same. The ENERGY STAR test method should reference ANSI/AHAM DW-1-2010 section 5.10 instead of the IEC standard for consistency with the rest of the test method.	Because the scoring in the Draft Final Test Method references IEC standard 60436 Ed. 3.1, 2009-11, DOE has maintained the reference to that test procedure for the grading ¹ conditions.
3	Test Setup	Cleaning Performance Rating Conditions	The ENERGY STAR test method should reference the note in ANSI/AHAM DW-1-2010 section 5.10 to minimize variation in the test results.	The note included in ANSI/AHAM DW-1-2010 section 5.10 addresses issues that are beyond the scope of the ENERGY STAR test method. DOE and EPA cannot require a test lab to use only one technician for grading. DOE believes the instructions included in the test method and the referenced AHAM and IEC test procedures provide a basis for consistent grading.
4	Test Setup	Water Hardness	There should be a water hardness requirement in the ENERGY STAR test method and also in 10 CFR Part 430, Subpart B, Appendix C1. Water hardness can affect energy and water consumption and has an even larger impact on wash performance. DOE should promptly amend 10 CFR Part 430, Subpart B, Appendix C1 so the DOE test procedure is not improperly amended via an ENERGY STAR test method.	DOE agrees that the water hardness may impact cleaning performance, and has included a water hardness requirement in the Draft Final Test Method. DOE does not have any information indicating what impact, if any, water hardness may have on energy and water consumption, but may consider a water hardness requirement in the next DOE test procedure rulemaking.
5	Test Procedures for all Products		The stakeholder supports the adoption of a test method for cleaning performance for ENERGY STAR labeled dishwashers.	DOE appreciates the comment and continues to develop a test method for cleaning performance for the ENERGY STAR program.

¹ In the Draft Final Test Method DOE has used the term ‘grade’ or ‘grading’ instead of the term ‘score’ or ‘scoring’ that was used in the Draft 2 Test Method to refer to individual item grades.

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6	Test Procedures for all Products	Loading Requirements	The stakeholder supports the provision stating that the manufacturer's use and care guide instructions should be followed to load the unit under test (UUT).	DOE has maintained this provision in the Draft Final Test Method.
7	Test Procedures for all Products	Loading Requirements	For empty spaces between items in the load, DOE should allow manufacturers to provide a publicly available webpage address that third party laboratories can use to view the loading pattern used for ENERGY STAR qualification. Furthermore, DOE will need to indicate criteria to limit the location of open spaces. That is, open spaces should not be positioned in front of soiled load items. An open space in front of soiled load items could result in improved water spray to the adjacent soiled surface, provide more favorable cleaning performance, and, thus, offer a means of test procedure circumvention.	DOE has provided additional clarification in section 5.1.D of the Draft Final Test Method that states there shall be no empty rack spaces between similar items of a load but there may be empty spaces between different items of a load. Empty spaces between different items of a load are acceptable only if the capacity of the UUT is greater than the capacity specified in 10 CFR Part 430, Subpart B, Appendix C1 or if the manufacturer's use and care guide instructs the user to leave empty spaces. DOE has maintained instructions in the Draft Final Test Method that allow the loading pattern to be as specified in the manufacturer's use and care guide.
8	Test Procedures for all Products	Loading Requirements	The stakeholder supports the clarifications made to the Appendix A example loading patterns, but suggests a further revision to clarify that the schematics show examples of potential ways to alternate clean and soiled items.	DOE has incorporated the suggested revision in the Draft Final Test Method.
9	Grading		The stakeholder agrees with grading flatware for inclusion in the cleaning performance score, as proposed in the Draft 2 Test Method.	DOE has maintained flatware grading in the Draft Final Test Method.
10	Grading		It is problematic to mix and match soiling procedures and techniques from different test procedures. DOE should use the ANSI/AHAM DW-1-2010 grading procedure. In North America, technicians have the most experience with this grading method.	As shown in the Draft Test Method webinars, the IEC grading method combined with the AHAM soiling technique produces the most repeatable and reproducible test results. The IEC grading method is relatively similar to the AHAM grading method, so DOE believes technicians will be able to grade effectively according to the IEC method. DOE notes that its three test phases included three labs, and at each lab the technicians were able to grade effectively using the IEC method without prior training.

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11	Grading		The Draft 2 Test Method webinar showed that the IEC grading method produced more repeatable results than the AHAM grading method. DOE should provide the raw test data used to make that conclusion. The summary slides in the webinar presentation are not sufficient.	The slides in the Draft 2 Test Method Webinar Appendix include the average and standard deviation of cleaning performance scores for each test unit with the IEC and AHAM grading method. DOE has included more detailed data than are normally provided when developing an ENERGY STAR test method or DOE rulemaking. For further data requests, please contact Ashley Armstrong at DOE (Ashley.Armstrong@EE.Doe.Gov).
12	Grading		If DOE believes that repeatability or reproducibility of the AHAM grading method is an issue, there are ways to address that such as round robin testing and grader training. A video on proper procedure and grading would also be helpful and important for repeatability.	DOE found the IEC grading method to produce more repeatable and reproducible test results, and has included that approach in the Draft Final Test Method. DOE does not plan to conduct round robin or grader training related to the AHAM grading method. DOE also does not plan to create a video or other training material for the grading method. At each of the three labs used for testing, the technicians were able to grade effectively using the IEC method without prior training.
13	Cleaning Performance Score		The stakeholder agrees that the performance metric should not combine the individual per-cycle cleaning performance scores, and supports DOE's proposal to calculate the cleaning performance score at each soil level.	DOE has maintained the per-cycle cleaning performance scores in the Draft Final Test Method.
14	Cleaning Performance Score		In the explanation of Equation 1, there is no $N_{5,i}$ listed because it would likely be captured in the "100" part of the equation or omitted because it would always be multiplied by zero. The stakeholder requests that, for clarity, DOE expressly state in the ENERGY STAR test method that $N_{5,i}$ is intentionally omitted along with the reasoning. That should minimize questions to DOE about the test method when stakeholders notice that the scoring sheet goes from 0-5, but the equation only goes from $N_{0,i}$ to $N_{4,i}$.	DOE has included a note in the Draft Final Test Method to clarify that the total number of items with a grade of 5 are not included in the equation for calculating the cleaning performance score.

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15	Test Procedures for all Products	Detergent	The detergent specified in the DOE energy and water test procedure is a powder, even though the majority of consumers have abandoned powder in favor of gels and mono-dose packets during the past decade. It is important that the cleanability test replicate consumer use. The stakeholder understands that manufacturers would prefer that the energy and water test cycles also produce cleaning performance results, although even on this point, the Draft 2 Test Method proposes that cleaning performance tests and energy and water tests be run sequentially, rather than concurrently, for non-soil sensing dishwashers. On balance, the cleaning performance test should be performed with detergent that most consumers are likely to use. For that reason, ENERGY STAR should reconsider the specification of a powder detergent for its cleaning performance test method.	DOE has maintained the reference to the 10 CFR Part 430, Subpart B, Appendix C1 detergent formulation (a powder) in the Draft Final Test Method. This detergent is currently available on the market, and DOE believes it is an appropriate representation of consumer use. In the October 31, 2012 Final Rule establishing 10 CFR Part 430, Subpart B, Appendix C1 (77 FR 65942, 65965), DOE explained that it did not specify a mono-dose detergent because it may skew test results for units with either very high or low water consumption. A constant concentration of powder detergent ensures consistent dosing from unit-to-unit.
16	Test Procedures for all Products	Detergent	DOE included criteria for water hardness in the cleaning performance test method, even though no such criteria exist in the energy and water test procedure, because hard water is prevalent in many parts of the country. DOE should similarly update the detergent specification in the cleaning performance test method.	DOE included a water hardness requirement in the Draft 2 Test Method because water hardness may impact cleaning performance. This is consistent with the energy and water test procedure because 10 CFR Part 430, Subpart B, Appendix C1 does not specify a water hardness requirement during testing. Therefore, cleaning performance tests conducted with water hardness as specified in the ENERGY STAR test method would be valid tests under 10 CFR Part 430, Subpart B, Appendix C1. In contrast, 10 CFR Part 430, Subpart B, Appendix C1 does provide a detergent specification, so specifying a different detergent for cleaning performance would make those test cycles invalid according to 10 CFR Part 430, Subpart B, Appendix C1. DOE has maintained the detergent specified in 10 CFR Part 430, Subpart B, Appendix C1 in the Draft Final Test Method.
17	Test Procedures for all Products	Testing Guidance	The stakeholder would like to know if DOE provided guidance to either external lab during the testing process.	DOE provided oversight during some of the testing at each lab, but did not provide additional guidance or training beyond the information included in the test method.

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18	Training Materials		Prior to conducting round robin testing, a workshop should be held as a prerequisite activity for soiling and scoring techniques and to discuss and resolve obvious sources of variation. The workshop would be used to instruct testers on best practices and more quickly build confidence and competence. Without the workshop, additional and unnecessary variation would be imbedded during the round robin testing. Creation of a video, perhaps during the workshop, would further memorialize soiling and scoring methods and manage variation.	DOE does not plan to conduct a round robin testing program or to provide additional training materials beyond what is included in the test method. The test method should provide sufficient instruction to properly conduct the test without the need for additional training materials. At each of the three test labs, the technicians were able to grade effectively using the IEC method without prior training.
19	Repeatability and Reproducibility		To date, reproducibility of the proposed test method has not been sufficiently confirmed. DOE needs to demonstrate that the test method is in fact repeatable and reproducible. It appears from the summary data DOE provided that only a handful of dishwashers were tested at only two laboratories. This is not sufficient to determine repeatability and/or reproducibility.	DOE conducted more than 250 test cycles on 12 units at three laboratories. While this is a small sample in terms of number of units, the number of tests performed is quite large. DOE selected the test units to represent a cross-section of the products and features currently available on the market. The data from this testing show that the test method is repeatable and reproducible provided that the UUT operates consistently. DOE observed similar results across all three test labs for the units, which indicates that the test method is reproducible.
20	Repeatability and Reproducibility		From the data, the stakeholder does not believe DOE conducted sufficient testing to draw conclusions about repeatability or reproducibility.	See response to comment #19.
21	Round Robin		The raw cleaning performance test data DOE provided with the Draft 1 Test Method show significant variation. There are several potential sources for that variation. In order to assess what the source(s) of the variation could be, and to assess reproducibility in general, a round robin test is needed. DOE should organize and oversee such testing, conducted according to IEC Standard 61923 (or ASTM Standard 691) requirements for round robin testing.	The raw test data show variation in cleaning performance scores, but DOE noted that this variation typically corresponded to inconsistent unit responses (in terms of energy and water consumption) for a given soil load. DOE does not plan to organize a round robin test. DOE welcomes any data from round robin test programs that stakeholders may arrange independent of DOE.

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22	Round Robin		One source of variation noted during the test method development was “grader-to-grader” differences. Even though “grader-to-grader” variability was observed, EPA stated there was “no clear bias for high or low scores for any grade” and that “variability could be due to changes in soils”. These statements underscore the need to identify, fully understand and measure sources of variation to minimize and control their impact. If the variability is not rectified, the likelihood of significant variation is not only high, but larger than variation today in measured energy and water consumption values. To that end, round robin testing is necessary.	DOE is aware that certain factors contribute to variability in the cleaning performance test method. However, the test data in support of the Draft 2 Test Method show that the test method generated repeatable results when the test unit operated consistently. DOE does not plan to organize a round robin test program. DOE welcomes any data resulting from round robin test programs that stakeholders may arrange independent of DOE.
23	Round Robin		Estimates of reproducibility and repeatability can be made to understand the precision of measurements and manage variability. If a product is found “out of compliance” during verification testing, but close in score to the qualification level, the root cause could be the product, test method ambiguity or laboratory protocol. Without use of a reference dishwasher, round robin testing provides a means to understand test method and laboratory influence.	See the response to comment #22 regarding a round robin test program. DOE is aware that a verification test result found to be out of compliance may be due to variability, and accordingly verification testing includes a tolerance around the compliance value. Additionally, DOE investigated the use of a reference dishwasher as a means to reduce variability; however, testing showed that the reference unit did not improve the repeatability of the test method (as presented in the Draft 1 Test Method webinar).
24	Round Robin		IEC 61923 and ASTM E 691 provide techniques for planning, conducting, analyzing and treating the results of a round robin study. An exemplary round robin test was performed by the University of Bonn in 2009.	DOE does not plan to organize a round robin test program. DOE welcomes any data resulting from round robin test programs that stakeholders may arrange independent of DOE.

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25	Sampling Plan		It is confusing for the proposed sampling plan to have different requirements for soil-sensing and non-soil-sensing units. This is especially true for third-party laboratories because whether or not the unit is soil-sensing may not be readily apparent (though it will be in the manufacturer’s DOE certification statement when using 10 CFR Part 430, Subpart B, Appendix C1). The stakeholder appreciates DOE’s efforts to minimize testing burden, particularly for non-soil-sensing units, but it is also burdensome to keep track of different sampling plans.	DOE agrees that the ENERGY STAR sampling plan should harmonize with the DOE certification requirements. While DOE’s internal testing indicated that testing three units captured the variability associated with certain soil-sensing dishwashers (as was discussed in the Draft 2 Test Method), the sampling requirements in 10 CFR 429.11 and 429.19 allow for additional units to be tested at the manufacturer’s discretion above the minimum requirements of two. DOE believes that manufacturers may choose to test additional units to help capture any variability in cycle responses at a given soil load for soil-sensing dishwashers. Therefore, DOE and EPA are proposing that the number of units tested for qualification of cleaning performance be consistent with the sampling plan specified in 10 CFR Parts 429.11 and 429.19.
26	Sampling Plan		The stakeholder opposes the use of only one unit to qualify non-soil-sensing dishwashers. Doing so ignores the fact that the test method results have more variability than the results of the DOE energy and water test procedure. Thus, though it will significantly increase testing burden, the stakeholder suggests a statistical approach for both soil-sensing and non-soil sensing dishwashers.	DOE agrees that the ENERGY STAR sampling plan should harmonize with the DOE certification requirements. This will require testing at least two units for both non-soil sensing and soil-sensing units.
27	Sampling Plan		Manufacturers should be required to test the same number of units for cleanability as they test for energy and water use. That number will be two or more per DOE regulations, and will vary by manufacturer and/or model. The score for each soil level among the sample units should be determined using a statistical analysis such as that in 10 CFR 429.19. Soil load types would not be combined. This is the best approach to ensure representative qualification scores and to minimize false findings of non-compliance. Accordingly, manufacturers are willing to accept the additional test burden—it is balanced by a simpler procedure and more accurate results.	See response to comment #25.

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28	Sampling Plan		Our recommendation for qualification is that energy tests for two or more dishwashers (soil sensing and non-soil sensing) would be graded (that is, all energy test units, two or more). Scores from each soil level (heavy, medium, or low) would be individually evaluated (calculating the mean or apply a "t" statistic) to determine a score for that soil level. Each soil level would need to satisfy the minimum score required for qualification.	See response to comment #25.
29	Verification		It is unclear what the requirements will be for verification testing of cleaning performance. Verification should be similar to the verification testing scheme currently in place for ENERGY STAR products.	In the Draft Final Test Method, DOE has discussed that the verification requirements for dishwasher cleaning performance should be consistent with those currently in place for energy and water consumption tests. For DOE-covered products that are qualified based on a sample size of more than one unit, these requirements include a first test on one unit and, if the first unit tests more than 5-percent worse than the specification, testing a second sample of three units. ² Compliance in the latter case would be determined based on a calculation using the test results from the four units.
30	Verification		The verification methodology should be consistent with the existing approach used for energy and water consumption. The first dishwasher would be tested and required to be within a determined percent of the expected value. If this dishwasher does not pass this test, three additional dishwashers would be tested and statistical methods applied for purposes of determining compliance.	See response to comment #29.

² ENERGY STAR Verification Testing for Certification Bodies – Test Sample Sizes and Determining Testing Failures (Non-Lighting Products). Third Party Certification Implementation. ENERGY STAR® Products. Directive No. 2011-04. May 9, 2011. Available at http://www.energystar.gov/ia/partners/downloads/mou/ES_Product_Certification_Directive_2011_04_Test_Sample_Sizes.pdf?d4b4-4a57.

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31	Verification	Verification Tolerance	The current 5-percent tolerance for energy and water consumption will need to be different for cleanability because cleanability variation is much greater than energy or water use variation. For example, Europe has a 10-percent tolerance for cleaning.	The ENERGY STAR verification plan includes a 5-percent tolerance on required specifications. DOE notes that units with consistent operation from cycle-to-cycle typically generate individual per-cycle cleaning performance scores within a 5-percent range. Additionally, a 10-percent tolerance range would likely be broad enough that poor-performing units would be deemed compliant (depending on the final specification level).
32	Verification	Verification Tolerance	The energy and water consumption tolerance value of 5-percent may not be appropriate for a performance measure. DOE should consider a different wash performance tolerance for ENERGY STAR Version 6.0 specifications, with further refinement in time for the subsequent ENERGY STAR specification. If round robin testing is not complete in time for the Version 6.0 specifications, a larger tolerance for wash performance verification could be specified as an interim solution.	See response to comment #31.
33	Verification	Verification Tolerance	DOE needs more data documenting the repeatability and reproducibility of the test method in order to determine the appropriate verification tolerance. This highlights the need for the round robin testing. In the absence of a rigorous round robin test, the sources and magnitude of variation will not be identified. With the round robin test, a comparison could be made between energy and water consumption variation and performance variation, and an appropriate tolerance for the verification test results could be established.	See response to comment #31 regarding the proposed verification tolerance. DOE does not plan to organize a round robin test program to confirm this verification tolerance, but welcomes any data from stakeholders that supports a specific verification tolerance.