December 6, 2010

Ms. Brenda Edwards
U.S. Department of Energy
Building Technologies Program
1000 Independence Avenue, SW
Mailstop EE-2J
Washington, DC 20585

RE: Docket Number EERE-2010-BT-TP-0021 / RIN 1904-AC08: Test Procedure for Residential Clothes Washers

Dear Ms. Edwards,

This letter constitutes the comments of the Natural Resources Defense Council (NRDC), American Council for an Energy-Efficient Economy (ACEEE), and Appliance Standards Awareness Project (ASAP) in response to the Department of Energy (DOE) request for comments on the Notice of Proposed Rulemaking (NOPR) for residential clothes washers test procedures, and the public meeting held to discuss the document on October 28, 2010. We appreciate the opportunity to provide input into this important process.

Network Mode

DOE is not proposing to include the measurement of energy use in network mode in the test procedure. 75 Fed. Reg. 57569. We understand the challenges of incorporating network mode when clothes washers that include networking functions have not yet appeared on the market. However, "smart" clothes washers may become common by 2015 when the new standards become effective, and therefore it is important that the test procedure captures at a minimum the standby energy consumption associated with network mode. Zypryme's 2010 Smart Appliance Report projects that in 2015, U.S. sales of smart washers will reach $1.05 billion, accounting for 19 percent of the U.S. household smart appliance market.[1] In 2009, GE began distributing a water heater with demand response capability that can link into smart meters,[2] and GE's website indicates that they are developing a front-load washer that will automatically delay start until energy rates go down and default to the Low Energy wash cycle during high-cost periods.[3]

[1] Zypryme Research and Consulting. 2010. Smart Grid Insights: Smart Appliances. March 2010. http://www.zpryme.com/SmartGridInsights/2010_Smart_Appliance_Report_Zpryme_Smart_Grid_Insights.pdf.
[2] GE Appliances & Lighting. 2009. HD Supply Utilities Offers New GE Hybrid Water Heater with Energy Efficiency and Demand Response Capability. http://www.geconsumerproducts.com/pressroom/press_releases/company/company/HD_Supply_Utilities_2009.htm.
[3] GE Appliances. http://www.geappliances.com/home-energy-manager/appliance-energy-consumption.htm.

Whirlpool demonstrated their new smart grid-compatible clothes dryer at the 2010 International Builders' Show.[4]

We are concerned that DOE is not proposing to capture the energy use of products in network mode since this additional energy use could potentially be significant. While we do not yet have information on the technologies that may be incorporated into clothes washers to give them network functionality, it certainly seems possible that network mode could consume power continuously in the range of 2-5 W. This range of potential power consumption in network mode would translate to 18-44 kWh/year. If the energy consumption associated with network functionality is not captured to any extent in the test procedure, manufacturers will have no incentive to employ technologies that provide this feature with low power consumption.

We recognize the data limitations that DOE identifies in the NOPR that may not allow for developing a test procedure during this rulemaking that captures energy consumption when a clothes washer is actually connected to a network. 75 Fed. Reg. 57569. However, it is possible that standby power consumption will represent the majority of the total energy consumption associated with network mode. Therefore, at this time we encourage DOE to ensure that the standby test captures any standby power consumption associated with network functionality that a clothes washer would consume regardless of whether the product is actually connected to a network. To capture this energy consumption, we suggest that DOE develop a definition for inactive (standby) mode that is sufficiently broad so as to capture any standby power consumption associated with network mode that would be captured in the standby test as long as the network functionality is not disabled during the test.

Annual Energy Cost Calculation

DOE is not proposing to amend the estimated annual operating cost calculation to include the cost of energy consumed in the non-active-washing modes. 75 Fed. Reg. 57567. The EnergyGuide label is designed to communicate to consumers the estimated average annual operating cost of a given product. Since the annual operating cost for a washer that a consumer will incur includes the cost of energy consumed in all modes including self-clean, standby, off, delay start, and cycle finished modes, the operating costs of all modes should be included in the annual operating cost calculation.

In addition, we believe that the cost of energy consumed in these additional modes for many products will likely be significant compared to the total energy cost. DOE estimates that these additional non-active-washing modes combined could consume as much as 48 kWh/year. 75 Fed. Reg. 57565. The EnergyGuide label only includes the cost of the machine energy and the water heating energy, and does not include the cost of the energy required to remove the remaining moisture from the clothes, which makes the cost of energy consumed in non-active-washing modes more significant. According to the Federal Trade Commission (FTC) list of clothes washers, the most efficient washers with a capacity greater than 3 cubic feet only use

[4] PRNewswire. 2010. Whirlpool Corporation Presents Smart-Grid Compatible Clothes Dryer During International Builders' Show. http://www.prnewswire.com/news-releases/whirlpool-corporation-presents-smart-grid-compatible-clothes-dryer-during-international-builders-show-82054887.html.

about 110-130 kWh/year.[5] Therefore, for the purposes of the EnergyGuide label, the energy consumed in modes other than the active washing mode could represent up to about 40 percent of total annual energy use, which is clearly significant.

Steam Wash Cycles

We welcome DOE's recognition of so-called steam wash cycles and the attendant need for the test procedure to fully capture the energy and water consumption of this new feature. However, DOE should not define the term too literally and potentially exclude this feature in practice on some machines. The definition of "steam cycle" at 75 Fed. Reg. 57585 should include not only the injection of "steam" (vaporized water) but also any superheated water injected in the form of mist (fine droplets). Additionally, care must be taken in the resolution of the issues raised regarding non-wash cycle active modes (see below) to ensure that all energy and water resulting from steam wash cycles is accounted for, including any injections that may be made after the conclusion of the final spin cycle.

Self-Clean Cycles

Again, we welcome DOE's recognition of the energy and water consumption resulting from manufacturers' recommendations for self-cleaning or deodorizing cycles. We differ with the proposed rule in two respects. First, the definition of "self-clean mode" can be interpreted (and was so interpreted at the NOPR public meeting) as being applicable to washers that have a dedicated self-clean cycle, i.e., a cycle setting option that is explicitly dedicated to the self-clean function. However, because self-cleaning may be undertaken with an appropriate cleaning compound through the use of a standard cycle available for washing clothes, the definition should not be limited to machines equipped with an explicitly designated self-clean cycle. Any washer carrying a manufacturer's recommendation for periodic self-cleaning operations should be covered by the definition. Secondly, we agree with the recommendation made by General Electric at the NOPR public meeting that a usage factor of 12 cycles per year should not be uniformly applied to all washers, but rather that the usage factor be based on the level of usage recommended by the manufacturer, converted as necessary to the appropriate number of cycles per year for the test procedure. This will provide further encouragement for manufacturers to develop approaches to sanitizing and deodorizing issues that are less energy- and water-intensive than current practices.

Treatment of Non-Wash Cycle Active Mode

DOE notes in the NOPR that some clothes washers currently available offer energy-consuming features in cycle finished mode other than a continuous display such as a low-power fan or periodic tumbling, but the Department is not proposing to address these additional cycle finished mode functions in the test procedure. 75 Fed. Reg. 57561. The NOPR states that DOE believes that the shipment-weighted percentage of residential clothes washers with a circulation or tumbling function in cycle finished mode is less than 5 percent, and that these models are higher priced and recently introduced. However, we often see additional features that are first

[5] Federal Trade Commission. 2009 Standard Clothes Washer Energy Data. http://ftc.gov/bcp/conline/edcams/eande/appliances/data/2009/clwasher/standard_effic.pdf.

introduced to high-end products soon become commonplace across a range of products. Since the effective date for the new clothes washer standards will be 2015, we will likely see a larger percentage of products with additional energy-consuming features in cycle finished mode by the time the standards become effective. Therefore, we believe that it is not appropriate to ignore the energy consumption of these features. In addition, if these features in cycle finished mode are not captured in the test procedure, manufacturers will have no incentive to reduce the power consumption in cycle finished mode while still providing the additional functionality.

We suggest that DOE expand the definition of cycle finished mode to include any energy-consuming features following operation in active washing mode. In order to avoid the need to apply an additional testing burden to washers that only have a continuous display, DOE could specify a separate test procedure and allocate a different number of hours to cycle finished mode for washers that contain any additional energy-consuming feature(s) in cycle finished mode other than a continuous display. For these washers, the length of the test for cycle finished mode would likely need to be longer than for washers with only a continuous display so as to reasonably measure the average power consumption in cycle finished mode, and the allocation of annual hours in cycle finished mode would likely be greater.

We also support the suggestion of NEEA to fold delay start and cycle finished modes into a single energy test cycle that would also include the active wash cycle. This approach would seem to simplify the test, and it would ensure that any energy and/or water consumption that occurs after the final spin, such as the addition of steam, would be captured by the test procedure.

Allocation of Inactive/Off Mode Hours

DOE is proposing to allocate half of the inactive/off hours each to inactive and off modes for clothes washers with electronic controls plus a mechanical on/off switch. 75 Fed. Reg. 57566. We believe that it is appropriate to allocate a portion of the inactive/off hours to off mode for these machines given the potential energy-saving benefits of mechanical on/off switches that allow the consumer to reduce the power consumption of the washer when not in use. However, we are concerned about the potential for gaming if there is no specification regarding where the switch must be placed on the machine in order to receive credit. For example, a manufacturer could place a switch on the back of the machine, where it would obviously not be intended for consumer use. In this example, allocating half of the inactive/off mode hours to off mode would clearly not be appropriate. To attempt to avoid any potential gaming, we encourage DOE to specify that the switch must be placed on the front panel of the machine in order for half of the inactive/off mode hours to be allocated to off mode.

Annual Cycles

We support the Department's revised estimate of 295 annual cycles, based on RECS survey data. 75 Fed. Reg. 57570. We conducted our own analysis to verify this number, and came to near-exact agreement.

The Department briefly explained its methodology for computing the number of annual cycles using the RECS survey data in the NOPR, but not in a detailed enough way to replicate without

making our own set of assumptions. Our RECS calculations are shown below, along with our assumptions. Although the RECS data does not include enough details to provide a truly accurate average figure, we believe that the assumptions used here are reasonable and provide a reasonably accurate value for average cycles per year in the absence of better data.

Table 1 shows the assumptions made with regard to the average number of cycles per week in each of the RECS survey categories.

Table 1. Assumptions for calculating average annual cycles from RECS.

RECS category	Estimated average	Methodology
Less than or equal to 1 load	0.665	Average of 1 and 0.33. We make the assumption that the vast majority of people will not go more than 3 weeks without doing laundry, making that the lower limit (not substantiated, just an estimate).
2-4 loads	3	Average of 2 and 4.
5-9 loads	7	Average of 5 and 9.
10-15 loads	12.5	Average of 10 and 15.
More than 15 loads	18.5	Using the same interval (arbitrarily) as the next smallest category we calculate the max to be 21 loads. We then take the average of 16 and 21. This category proves to be a very small percentage of households (~2.5%), so although we have less confidence in our assumptions for this category (i.e. we have no concept of how many loads is a reasonable average for households doing more than 15 loads of laundry a week), it would not affect the overall average significantly anyway.

Using these assumptions, we arrive at a weighted average of 294.2 cycles annually, which we believe is within a reasonable margin of error of the Department's result.

Although this methodology involves some unsubstantiated assumptions, we believe it is reasonable. We agree that the RASS survey also presents drawbacks insofar as it only represents usage from one state, whereas RECS is national data. In lieu of better data, we are inclined to agree with DOE's use of RECS data to derive its estimate of average annual clothes washer cycles.

Test Load Size Specifications

Comments submitted jointly by AHAM and ACEEE dated July 20, 2010, urged the Department to "ensure that the test procedure does not contain any unwarranted bias in favor of large capacity washers." This concern was raised again by NRDC and others at the NOPR public meeting, and DOE has invited comment on this issue. 75 Fed. Reg. 57571. The undersigned organizations remain concerned about potential bias stemming from the current formulation of test load sizes.

Clothes washers with an adaptive water fill control system are evaluated with three different test load sizes. The maximum load represents 100% of machine capacity. The minimum load is specified at 3 pounds in all cases, regardless of the machine capacity. And the average load –

which dominates the outcome of the performance test for both energy and water because it is assigned a load usage factor of 74 %, compared with 14% and 12% for the minimum and maximum test loads respectively – is specified as the simple average between the minimum and maximum load. The result of this formulation is that the average load does not represent the same percentage of capacity utilization across all machine sizes, but declines as a percentage of capacity as the machine size increases. Thus, under Table 5.1, the average load uses 63% of the capacity of a 2.75 ft^3 washer while the average load uses 57% of the capacity of a 4.75 ft^3 washer. Since the energy and water consumption for the average load heavily influences the outcome of the test, we believe that testing large washers while using a smaller percentage of their total capacity than that used for a smaller washer may introduce significant bias into the test procedure. And the potential for bias will be expanded if Table 5.1 itself is expanded to include washers up to 6.0 ft^3 as proposed in the NOPR.

Table 2 below shows the energy and water consumed per pound of clothes for washer capacities ranging from 3.0 to 5.5 ft^3 based on the weighted average test load size for each capacity assuming an MEF of 2.0 and a WF of 6.0. The table shows that the allowable energy and water consumption per pound of clothes increases as the container volume increases for washers that have the same efficiency ratings. As an example, a 5.5 ft^3 washer is able to consume 10 percent more energy and water per pound of clothes than a 3.0 ft^3 washer while still achieving the same MEF and WF.

Table 2. Allowable kWh/lb and gal/lb assuming an MEF of 2.0 and a WF of 6.0.

Container volume (cu. ft.)	Minimum load (lb)	Maximum load (lb)	Average load (lb)	Weighted average load (lb)	kWh per cycle	kWh per lb	Gal. per cycle	Gal. per lb
3.0	3	12.5	7.75	7.66	1.50	0.196	18	2.35
3.5	3	14.6	8.80	8.68	1.75	0.202	21	2.42
4.0	3	16.6	9.80	9.66	2.00	0.207	24	2.48
4.5	3	18.7	10.80	10.66	2.25	0.211	27	2.53
5.0	3	20.7	11.90	11.71	2.50	0.213	30	2.56
5.5	3	22.8	12.90	12.70	2.75	0.217	33	2.60

An additional inference that can be drawn from this analysis of the structure of Table 5.1 is that due to the dependence of MEF and WF on capacity, a large capacity machine can achieve better energy and water efficiency ratings than a smaller machine even if the performance of the two machines is identical in terms of energy and water use per pound. This concern extends beyond the confines of the DOE regulatory program itself. For example, this bias could have implications for ENERGY STAR ratings if large capacity machines are able to more easily achieve ENERGY STAR certification without ensuring better real-world energy and water efficiency performance compared to smaller machines that do not meet the ENERGY STAR criteria. Therefore, it seems that clothes washer efficiency ratings using the current test procedure could potentially be misleading to consumers.

We also note that for purposes of remaining moisture content (RMC) calculations, the test procedure scales down maximum load size to a single average load size using a single, fixed

percentage of 52% regardless of machine capacity, which is a capacity utilization significantly smaller than any average load in Table 5.1. We question why the test procedure uses two different coefficients in different parts of the procedure to represent the same dimensional relationship between load sizes.

To help resolve concerns relating to a bias in the test toward large capacity washers, we recommend that DOE consider and evaluate three alternatives to the current specifications that underlie the test load sizes presented in Table 5.1.

- Alternative A -- Base the average test load size for all washers on the percentage of capacity used by the average test load of the average sized washer of the same product class. According to AHAM, the average shipment-weighted capacity in 2009 was 4.03 ft^3 for front-loaders and 3.66 ft^3 for top-loaders, yielding a capacity utilization for the average test load of 59% for front-loaders and 60% for top-loaders. Average test load weights would be derived using the same conversion factor of volume to weight shown in Table 5.1, or roughly 4 pounds per ft^3 of capacity.

- Alternative B -- Base the average test load size for all washers on the average test load size assumed in the RMC calculation, which would be 52% of maximum load size.

- Alternative C – Leave the test load sizes unadjusted in the current Table 5.1, but limit any further reduction in capacity used by the average test load for washers between 3.8 and 6.0 ft^3 to the capacity utilization of the largest machine in the current table, i.e., 59.7%, rather than allowing the average test load size to shrink to 56.1% of capacity for washers of 6.0 ft^3, as proposed in the new Table 5.1 in the NOPR (75 Fed. Reg. 57594-95).

We make no firm recommendation among these alternatives at this time, but request that DOE test a sample of top- and front-loading washers of diverse size to compare the resulting energy and water factors with test results obtained under the test procedure as proposed. Test results should be posted to the record of this rule-making. If tests using alternatives A, B, and C yield only *de minimus* differences from results obtained from the proposed test procedure, adjustments may be unnecessary. If more substantial differences emerge, DOE should consider revisions to Table 5.1 that may be needed to reduce the potential for unwarranted bias toward large capacity washers.

Load Adjustment Factor and RMC Calculation

Currently the Load Adjustment Factor is used to scale the calculated dryer energy consumption of a maximum size load to an average size load, because the current test procedure only requires that RMC be measured for a maximum size test load. The Department does not propose to change this methodology. 75 Fed. Reg. 57572. However, we believe that measuring RMC only at the maximum test load size can lead to significant discrepancies in calculated dryer energy consumption versus actual dryer energy consumption.

The Bern Clothes Washer Study found that RMC decreases with increasing load size and that this effect is more significant for top-loaders than for front-loaders.[6] The study found that for top-loaders, the average RMC for an 8 lb load was about 6 percentage points higher than the average RMC for a 16 lb load while for front-loaders, the difference in RMC for the same two load sizes was about 2 percentage points. Due to this finding, we believe that it is not adequate to measure RMC at a maximum load size and assume the same RMC would apply to an "average" load size as this approach likely underestimates actual RMC and therefore dryer energy consumption for an "average" load size. Instead, we suggest that RMC be measured for minimum, maximum, and average load sizes[7] and that dryer energy consumption be calculated for each load size using the corresponding measured RMC. A weighted average dryer energy consumption could then be calculated using the Load Usage Factors. This approach would eliminate the use of the Load Adjustment Factor and would provide consistency between the load sizes used in the wash cycle tests and the load sizes used in the calculation of dryer energy consumption.

Although this will slightly increase the test burden, we believe the increased burden will be insignificant because tests with the different size loads are already required to be run in the current test procedure. Therefore, the only addition would be an RMC measurement for each of the different load size test cycles rather than just for the maximum load test cycle.

Capacity Measurement

We support the Department's revisions to the method for measuring the volume of the clothes washer container. 75 Fed. Reg. 57574-75. This change will help ensure that only the space that is able to be filled with clothes while maintaining proper wash performance is captured in the capacity measurement. This will serve to improve the accuracy of all other calculations that depend on tub volume as an input.

New Measure of Water Consumption

For the reasons noted by DOE in the NOPR at 75 Fed. Reg. 57575, we support the inclusion of water consumption from all energy test cycles in the calculation of the integrated water consumption factor (IWF). No new equipment is required to compile this water consumption information, and the proposal will provide a more representative depiction of water consumption and facilitate the incorporation of self-clean and steam cycle water consumption into the IWF.

Water Supply Test Pressure

We agree that water supply test pressure is an important parameter for the test procedure, and that ambiguities in the specification of water supply test pressure should be resolved. We support clarifications in the points of measurement of water pressure. Additionally, we recommend that the water pressure specification be 35 psi under flow conditions, which would be more

[6] Oak Ridge National Laboratory. 1998. Bern Clothes Washer Study Final Report. http://www.energystar.gov/ia/partners/manuf_res/bernstudy.pdf.
[7] For adaptive fill models. For manual fill models, only maximum and minimum loads would be tested.

representative of real world operating conditions than any of the lesser test pressures evaluated by DOE

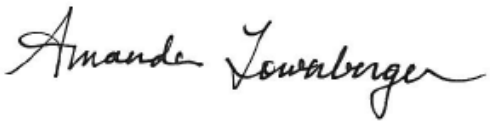
We believe that a static pressure (under non-flow conditions) of 35 psi is significantly lower than actual system operating pressures. (A test rig calibrated to maintain a static pressure of 35 psi will yield a flowing water pressure that is significantly less than 35 psi). By way of example, California-American Water Company, which serves about 630,000 people in 6 geographically and hydrologically separate service areas in Marin, Monterey, Sacramento, Placer, Ventura, Los Angeles, and San Diego Counties, reports one small subdistrict (Isleton, with 390 service connections) with an operating pressure of 40 psi, while all other service areas have average operating pressures of 60 to 80 psi. The Philadelphia Water Department reported an average operating pressure of 55 psi during Fiscal year 2008.[8] A water supply test pressure of 35 psi under flow conditions would better represent typical water supply pressures found in homes and would align the clothes washer test procedure with the dishwasher test procedure.

As proposed, the definition of "water pressure" at 75 Fed. Reg. 57586 contains both "static" and "flowing" in the same sentence. The word "static" should be removed from the definition to remove ambiguity and a potentially significant source of unintended variation in test results.

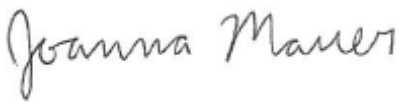
Thank you very much for considering these comments.

Sincerely,

Edward R. Osann
Senior Policy Analyst
Natural Resources Defense Council



Amanda Lowenberger
Research Staff, Buildings Program
American Council for an Energy-Efficient Economy



Joanna Mauer
Technical Advocacy Coordinator
Appliance Standards Awareness Project

[8] City of Philadelphia Annual Water audit Summary, Fiscal year 2008.