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A Response and Commentary to ENERGY STAR® Program Requirements Product Specification for Clothes Washers Eligibility Criteria 5 Draft 1, Version 8.0

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General Concerns Regarding Efficiency Increases

The Comments and Responses in this paper are in relation to Commercial Clothes Washers (CCWs) for all practical purposes. In the 2014 DOE Notice of Proposed Ruling for CCW, many utilities, environmental groups and energy associations argued for the removal of two distinct and separate product classifications. They maintained there was no significant negative impact on "consumer utility" by combining product classes for several reasons, but most importantly, because cycle times on average for top loaders are 30 minutes, and only 34 minutes for frontloaders. The DOE ruled that indeed there was "consumer utility", based on information and reasoning that genuinely warrants further research and evaluation. The issue of separate product classes deserves another round of debate. If the goal is to increase efficiency in the product market of CCW then this would be the most significant way to achieve that. Further creating a divide of significance that warrants a true separation based on "consumer utility" should be considered.

It is important to evaluate whether or not increasing efficiency requirements within Energy Star will have a negative impact on the utility of CCW frontloaders. If increasing energy efficiency and or water efficiency results in machines on the market that have significantly greater cycle times, this could impede actual market transformation towards more efficient machines. Assessing what incentives and drives the Multi-family owner, route operator, and end user should be given serious consideration so that an increased standard will not negatively affect acceptance of frontloading CCWs.

1) Definitions, G., Integrated Water Factor (IWF), LINE 56

Metrics are complicated and how the IWF is calculated is too. However, the current IWF for commercial clothes washers is misleading and minimizes the actual water consumption and thus reduces the actual water savings possible that should and can be calculated in a real world setting for this machine class. There may be potential issues related to how the commercial clothes washer IWF is calculated and the J2 testing procedures that produce the metric. The main true measurement of water efficiency and actual real world water use is the old nomenclature of gallons used per pound of laundry washed. Appendix J2 of subpart 420 of Title 10 of the Federal Code of Regulations sets the machine testing procedures for water efficiency standards evaluation. Appendix J2 determines how total weighed per cycle water consumption and water factor are ultimately calculated by utilizing a table called 'load usage factors' which weigh heavily on the average load size set at only 7.35-8.55 pounds of laundry. The 'load usage factors' determine the proportion of loads that are maximum, average, and minimum in size and determine the weighted average consumption based on these proportions. More information and savings calculations can be found in the "Washer Savings and Rebate Amount Spreadsheet" attached and under the load usage factors section of J2. Tables below too.

The J2 testing procedure is utilized for both single-family clothes washers and commercial coin-op machines even though the usage patterns in such settings is dramatically different. The average load size in a single family setting is not reflective of a pay for laundry commercial setting and thus skews the actual usage of machines tested and the resulting average gallons/cycle and water factor you'd find in product spec sheets. Actual savings would be significantly greater for Commercial Machines as the 'load usage factors' for these machines

should be much more heavily weighted toward the maximum load size which currently accounts for only 12% of all loads, with avg. load size accounting for 74% and minimum load size accounting for the remaining 14%. Actual savings would be significantly greater and assumed usage would almost double with an actual 14 pound load. Using the same 'load usage factors' for single family residential and commercial inaccurately deflates potential savings for commercial machines. Adjusting the 'load usage factors' for commercial machines would increase total usage and thus potential savings substantially and portray more realistic usage of gallons/cycle based on what the real weighted per cycle water consumption actually is in real life. Addressing this issue in the next DOE Notice of Proposed Ruling on testing methodology should be a high priority. This too is a relevant venue to bring this issue to the table. The attached "Washer Savings and Rebate Amount Spreadsheet" demonstrates the actual savings and usage of commercial machines under a more realistic scenario where load size is much greater than 7-8 pounds. Accounting for the true usage of CCWs and the increased savings that can be realized when performing an upgrade would lead to better cost benefit analysis of upgrades, better payback periods, and help with market transformation to more efficient CCWs. If the overall goal/mission of the EPA and the Energy Star Program is to increase energy and water use efficiency, then addressing this potential IWF issue with CCWs will provide significantly greater savings between the models currently available and greatly impact the adoption of HE CCWs.

To summarize details, the issue is that this J2 appendix table is used for single family residential and Coin op to obtain total weighted water usage (appears as though it's used for the energy calculations too). These are the gallons/cycle you see in spec sheets. This is the information that consumers make decisions based on. Total weighted water usage is a major component of what determines water factor! I am making an educated assumption that a machine with a 14 or 21.5 pound capacity in a coin-op setting will likely run close to full (max capacity) the majority of the time. DOE assumes usage based on loads of approximately 7-8 pounds approximately (based on avg. on Table 5.1—Test Load Sizes and the Load Usage Factors Table). Actual savings will be greater for Commercial Machines as the load usage factors for these machines I would presume should be much more heavily weighted toward the Maximum Load size so 'Fmax' should be much greater % than the current 12%. Using the same load usage factors for single family residential and commercial may be inaccurate. Adjusting the load usage factor would increase savings substantially and portray more realistic usage to the public of gallons/cycle based on what the avg. load actually is in real life.

Tables for Reference:

Table 4.1.3—Load Usage Factors

Load usage factor	**Water fill control system**	
	Manual	**Automatic**
F_{max} =	0.72	0.12
F_{avg} =		0.74
F_{min} =	0.28	0.14

Table 5.1—Test Load Sizes

Container volume		**Minimum load**		**Maximum load**		**Average load**	
cu. ft.	**liter**	**lb**	**kg**	**lb**	**kg**	**lb**	**kg**
2.80-2.90	79.3-82.1	3	1.36	11.7	5.31	7.35	3.33
2.90-3.00	82.1-85.0	3	1.36	12.1	5.49	7.55	3.42
3.00-3.10	85.0-87.8	3	1.36	12.5	5.67	7.75	3.52
3.10-3.20	87.8-90.6	3	1.36	12.9	5.85	7.95	3.61
3.20-3.30	90.6-93.4	3	1.36	13.3	6.03	8.15	3.7
3.30-3.40	93.4-96.3	3	1.36	13.7	6.21	8.35	3.79
3.40-3.50	96.3-99.1	3	1.36	14.1	6.4	8.55	3.88
3.50-3.60	99.1-101.9	3	1.36	14.6	6.62	8.8	3.99

Code of Federal Regulations

Chapter 10 — **PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS**

4.2.5 Per-cycle water consumption for Cold Wash/Cold Rinse. Calculate the maximum, average, and minimum total water consumption, expressed in gallons per cycle (or liters per cycle), for the Cold Wash/Cold Rinse cycle and defined as:

Qcmax = [HcX + CcX]	HcX= Hot Consumption max load
Qcavg = [Hca + Cca]	CcX= Cold Consumption Max load
Qcmin = [Hcn + Ccn]	

4.2.10 *Total weighted per-cycle water consumption for Cold Wash/Cold Rinse.* Calculate the total weighted per-cycle water consumption for the Cold Wash/Cold Rinse cycle, Qc_T, expressed in gallons per cycle (or liters per cycle) and defined as:

$$Qc_T = [Qc_{max} \times F_{max}] + [Qc_{avg} \times F_{avg}] + [Qc_{min} \times F_{min}]$$

where:

Qc_{max}, Qc_{avg}, Qc_{min} are defined in section 4.2.5 of this appendix.

F_{max}, F_{avg}, F_{min} are defined in Table 4.1.3 of this appendix.

4.2.11 *Total weighted per-cycle water consumption for all wash cycles.* Calculate the total weighted per-cycle water consumption for all wash cycles, Q_T, expressed in gallons per cycle (or liters per cycle) and defined as:
$Q_T = [Qm_T \times TUF_m] + [Qh_T \times TUF_h] + [Qw_T \times TUF_w] + [Qww_T \times TUF_{ww}] + [Qc_T \times TUF_c]$
where:
Qm_T, Qh_T, Qw_T, Qww_T, and Qc_T are defined in sections 4.2.6 through 4.2.10 of this appendix.
TUF_m, TUF_h, TUF_w, TUF_{ww}, and TUF_c are defined in Table 4.1.1 of this appendix.
4.2.12 *Water factor.* Calculate the water factor, WF, expressed in gallons per cycle per cubic foot (or liters per cycle per liter), as:
$WF = Qc_T/C$
where:
Qc_T = As defined in section 4.2.10 of this appendix.
C = As defined in section 3.1.7 of this appendix.
4.2.13 *Integrated water factor.* Calculate the integrated water factor, IWF, expressed in gallons per cycle per cubic foot (or liters per cycle per liter), as:
$IWF = Q_T/C$
where:
Q_T = As defined in section 4.2.11 of this appendix.
C = As defined in section 3.1.7 of this appendix.

2) Scope, B, i), LINE 79

What is the reasoning for excluding compact washers? Compact machines are notorious for their inefficiency. Savings are significant as WF for residential compact machine is 14.4 as compared to 4.7 IWF (4.5 WF) for standard sizes. It should also be noted that a significant portion of MF residences, mainly those built post 1985 have in-unit laundry residential machines and not common area laundry facilities. Many of these machines are compact units. It is estimated that 30% of apartments now have in-unit laundry, making the prevalence of compact machines reasonably detrimental to water and energy savings. Providing an incentive to manufacturers to improve their compact washer's efficiency via an energy star certification may be just what is necessary to move this washer class forward in efficiency.

2) Scope, B, v), LINE 83

Allowing clothes washers with larger capacities could be a detriment to the adoption of high efficiency machines and market transformation of the commercial clothes washer market. One of the least studied areas is number of cycles/turns per day by commercial machine type (ie: frontloader vs. toploaders). According to many in the industry one of the barriers to acceptance of commercial frontloaders is that they generate less revenue because of their larger capacity.

The fundamental nature of the CCWs currently in production creates a potential obstacle toward market transformation. Frontloaders costing on average $500-600 more than toploaders, present a significant disincentive toward upgrading to a HE CCW. However, there is another major factor at play which is the income generation of the machines. Since the majority of frontloaders are rated at greater pounds of laundry capacity and can wash approximately 20-30% more pounds of laundry than toploaders, the number of turns/cycles per day has the potential to be reduced. Since the MF coin-op market is fairly competitive, route operators claim that it is very difficult to increase cost of a wash to the consumer. With roughly 30% of all laundry being done off-site anyway, losing income from leased machines by losing customers is a significant risk.

With the possibility of reduced turns/cycles per day for frontloaders, a route operator may need to maintain their profit margin by passing the reduced income generation on to the MF owner through a less appealing contract/cost share. This means frontloader market transformation is thwarted. Unfortunately there is little evidence or studies regarding turns per day based on machine classification to back up any claims of less frequent use. Data from route operators and greater research in this area is warranted. This potential issue could be partially mitigated by raising the price of each wash by approximately $0.25-$0.50 which still means the consumer benefits from more laundry washed with less cost (if avg. cost $1.50 to $1.75). However, if increasing cost is indeed as difficult as many route operators are claiming, and there is less income generations, neither party will want to change or upgrade from a toploading machine.

Allowing such a large capacity machine into the Energy Star criteria along with continued increases in efficiency requirements could possibly cause an unintended consequence of increased machine sizes by manufacturers and actually hurt the adoption of the fronloading CCWs. Consideration should be given to the maximum capacity allowed when combining in efficiency requirements so as to not unintentionally derail this market transformation.