Pool Pumps & Motors

Codes and Standards Enhancement (CASE) Initiative
For PY 2012: Title 20 Standards Development

REVISED Data Request Response for
Pool Pumps & Motors

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1 Background

On July 29st, 2013, the California Investor Owned Utilities (Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), Southern California Gas (SCG), San Diego Gas & Electric (SDG&E)), herein referred to as the CA IOUs, submitted a Codes and Standards Enhancement (CASE) Report for pool pumps and motors.[1] On January 15th, 2014 the California Energy Commission (CEC) hosted an online webinar to discuss the proposals it had received and what additional information was needed for CEC staff to develop their staff reports for a number of products, including pool pumps and motors. On March 3rd, 2014 CEC issued a formal data request for additional information for pool pumps and motors.[2] On May 23rd the CA IOUs docketed a data request response addressing the CEC's questions.[3] Shortly after, the CA IOUs began engaging with the Association of Pool and Spas Professional (APSP) -15 Committee's Task Force for CEC pool energy efficiency standards which includes pool pump and motor manufacturers. The CA IOUs and the APSP-15 Task Force met numerous times in July and August of 2014 working to further address many of the issues in the original CEC data request and in the CA IOUs' original response.

Below are the CA IOUs' updated responses to the CEC's data request with significant input and feedback from the APSP-15 Task Force. We hope these responses add clarity to the previously submitted CA IOU CASE Report. Also included in this response are suggested code language changes and reporting requirements.

Additionally, while this data request response only pertains to pool pumps and pool pump motors, the CA IOUs would like to reiterate that we support additional Title 20 changes related to pools. These changes, documented in the July 29th, 2013 CASE Report, include variable speed pool pump controller requirements and a test and list requirement for pool lights and pool pump controllers. We look forward to including these topics in the upcoming rulemaking along with pool pump motors.

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[1] http://www.energy.ca.gov/appliances/2013rulemaking/documents/proposals/12-AAER-2F_Residential_Pool_Pumps_and_Replacement_Motors/California_IOUs_Response_to_the_Invitation_to_Submit_Proposals_for_Pool_and_Spas_2013-07-29_TN-71756.pdf

[2] http://www.energy.ca.gov/appliances/2013rulemaking/documents/12-AAER-2F/2014-03-05_pool_pumps.pdf

[3] http://www.energy.ca.gov/appliances/2013rulemaking/documents/comments/12-AAER-2F_Residential_Pool_Pumps_and_Replacement_Motors/12-AAER-2F_CA_IOU_Pool_Pump_and_Motors_Data_Request_Response_2014-05-23_TN-73044.pdf

2 Data Request and Responses

1. Test Procedure

CEC REQUEST

The Energy Commission is interested in updating its test procedures for (1) pool pump motors and (2) pool pump and motor combinations to improve repeatability of results and reliability in measuring the products' relative efficiency. Specifically, staff recognizes flaws in the current test procedure's lack of standardized piping and dynamic head. Staff is interested in updating the test procedure to use a standard size piping (such as 1 1/2 inches inside diameter) in an adjustable apparatus to specific dynamic head. The output of an updated test procedure would be the energy factor of a pump at full and at half speed.

The Energy Commission requests stakeholders provide in comment:

a. A proposed updated test procedure that improves the current test procedure as described above, and a discussion of the technical merit and feasibility of the new test procedure.

b. If the improvements described above are not feasible, please provide suggestions for an alternative test procedure that more reliably identifies the efficiency of (1) pool pump motors and (2) pool pump and motor combinations.

c. Any suggested dynamic head testing points for single, double, multiple, and variable speed pumps and motors.

CA IOU RESPONSE

Response to Items a, b, & c

The CA IOUs believe the current pool pump test procedure accurately captures the efficiency of pool pumps and does not need to be changed. The CEC test procedure and CEC developed system curves A, B &C are widely accepted by the pool industry, as they have been incorporated into the ANSI-IECC–APSP-15 Standard. They are also used as the basis for ENERGY STAR and appliance standards in the states of Arizona, Washington, and Connecticut. In the CASE report, we noted some minor changes, such as updating the HI 1.6-2000: Centrifugal Pump Test procedure to HI 1.6-2011. We also proposed new testing, listing and reporting requirements which can be found in Appendix B.

However, the CA IOUs' original CASE Report mentioned that in order to measure motor efficiency at different speeds the IEEE-114-2010 test procedure would need to be modified. The current challenge is that the IEEE-114-2010 test procedure is a motor efficiency test for motors which operate at full speed. Because the torque presented to a pool pump motor follows the pump affinity laws, it is not accurate to test motors at the same torque at full speed as would be for half speed, lowest speed, etc. For example, at half speed, the torque should be ¼th of the torque presented at full speed. The CA IOUs worked with industry partners and identified the Canadian Standards Association (CSA) C747-09 test procedure "Energy efficiency test methods for small motors" as a test procedure well suited for pool pump motors of all designs.

The CA IOUs' recommendation is that motor efficiency should be tested per CSA 747-09 standards using the following speeds and torque settings based on motor design as described below in Table 2.1. The CA IOUs

believe these speeds and associated loads represent common pool pump motor conditions and do not place an unreasonable testing burden on manufacturers.

Table 2.1: Proposed Test and List Requirements for Pool Pump Motors

Motor Design/ Speed	Full Speed 3450 RPM*	3/4 Speed 2600 RPM*	1/2 Speed 1725 RPM*	1/4 Speed 900 RPM*
Single Speed	X			
Dual Speed	X		X	
Variable Speed	X	X	X	X
Multi-Speed**	X	X	X	X
* Tolerance of +/- 50 RPMs ** If no preset speeds exist within tolerance then test to nearest preset speed.				

Table 2.2: Proposed Torque Settings for Testing Pool Pump Motors

Speed (RPMs)		Torque Settings (N-m)	Total Horsepower Rating (THP)
RPM_{Full}	Full Speed (RPM)	T_1 (per Sect. 6.5 of CSA C747-2009)	$THP_{Nameplate}$
$RPM_{3/4}$	Three Quarter Speed (if applicable) (RPM)	$T_{3/4}=(RPM_{3/4}/RPM_{Full})^2 * T_1$	$THP_{3/4}=(RPM_{3/4}/RPM_{Full})^3 * THP_{Nameplate}$
$RPM_{1/2}$	Half Speed (if applicable) (RPM)	$T_{1/2}=(RPM_{1/2}/RPM_{Full})^2 * T_1$	$THP_{1/2}=(RPM_{1/2}/RPM_{Full})^3 * THP_{Nameplate}$
$RPM_{1/4}$	Quarter Speed (if applicable) (RPM)	$T_{1/4}=(RPM_{1/4}/RPM_{Full})^2 * T_1$	$THP_{1/4}=(RPM_{1/4}/RPM_{Full})^3 * THP_{Nameplate}$
RPM_X	Other Preset Speeds (if applicable) (RPM)	$T_X=(RPM_X/RPM_{Full})^2 * T_1$	$THP_X=(RPM_X/RPM_{Full})^3 * THP_{Nameplate}$

For example, a two speed motor (with low speed at half speed) should be tested at the following torque points:

T_1: The load at full speed according to Section 6.5 of CSA C747-2009:

$T_{1/2}$: The calculated load at ½ of the nameplate speed per Table 2.2.

The $T_{½}$ load shown in Table 2.2 is based on following general affinity law equation as described in Section 6.6 of CSA C747-2009. In the above example, the torque presented to the motor at half speed is ¼ of the torque presented to the motor at full speed.

For all tested and listed speeds, the CA IOUs have proposed a tolerance of plus or minus 50 RPMs . For multi-speed motors, if the desired motor speeds are unable to meet the proposed tolerance, then it should be tested to the nearest possible speed to ¼ and ¾ speeds.

2. Additional Efficiency Data from Updated Test Procedure

CEC REQUEST

The Energy Commission is interested in collecting additional and updated efficiency data (post-2010) for pool pump motors and pool pump and motor combinations. Specifically, the Energy Commission seeks data from any updated test procedure described above. The Energy Commission is also interested in data that characterizes the efficiencies of commercial pool pump motors and pool pump and motor combinations.

CA IOU RESPONSE

The CA IOUs do not support changing the pool pump test procedure as the existing pump test procedure is the

best for all intended purposes of Title 20. However, we do support changes to the motor efficiency test procedure as is described above in Section 1. The CA IOUs have observed that some manufacturers are already testing and reporting their motor efficiency in a similar manner for speeds less than full output, whereas other manufacturers are not. We believe the changes proposed above will provide clarity for all manufacturers.

Regarding commercial pool pump motors, the CA IOUs estimate that 75% of commercial pool pump equipment is residential scale equipment and therefor the efficiency of a majority of commercial motors is captured by the CEC and APSP pool pump &motor databases. We do not propose that CEC set standards for large commercial pool pump motors at this time.

3. Proposed Efficiency Standards

CEC REQUEST

The Energy Commission seeks input on the efficiency standards and reporting requirements of a proposed pool pump standards, including:

a. New or updated performance efficiency standards recommended for motors, along with supporting documentation and feasibility of standards. Please address how the suggested standards affect different size motors.

b. Discussion of the feasibility of performance standards such as energy factor measured at a specific head for pumps and motors versus prescriptive approaches.

c. Any suggested energy factors and the corresponding dynamic head as standards for single, double, multiple, and variable speed pumps and motors.

d. Any suggested changes to the current reporting requirements (Title 20, Section 1606, Table X (G)), to ensure compliance with the standards suggested above in response to Data Request 3. a, b, and c.

CA IOU RESPONSE

Response to Item a

The CA IOUs continue to support replacing the current prescriptive pool pump motor design regulation with a performance-based one for single phase pool pump motors under 5HP. We have been working with pool pump motor manufacturers to understand their concerns and some of the technical constraints of pool pump motors of different designs and sizes. Based on the information gathered through this outreach, we propose that new and replacement pool pump motors under 5 THP (motor capacity) should meet minimum performance efficiency levels as follows below in Table 2.3. Note that these standard levels are slightly different than what the CA IOUs originally proposed in the July 29th, 2013 CASE Report. The changes we have made are a reflection of the CA IOUs' engagement with the APSP-15 Task Force for CEC standards.

Table 2.3: CA IOU Proposed Minimum Efficiency Standards for Pool Pump Motors

Proposed Minimum Efficiency according to modified CSA C747-09 Test Procedure		
Motor Design	**High Speed (3450 RPM)**	**Half Speed (1725 RPM)**
Single Speed	0.06*ln(Total HP) + 0.7	N/A
Dual Speed	70%	0.06*ln(Total HP) + 0.6
Variable/ Multi-Speed	80%	0.06*ln(Total HP) + 0.75

In terms of how the standards affect different sizes of motors, it depends on the motor design, but generally the smaller motors tend to be less efficient due friction and windage losses that inherently make smaller motors less efficient. The CA IOUs' updated proposed standards reflect this reality in a balanced way.

For variable speed motors, most models in the CEC database qualify at the proposed high speed levels regardless of size. However, based on industry feedback, the CA IOUs have slightly modified our original low-speed efficiency requirement, giving a slight break to smaller variable speed motors at half speed.

For dual-speed motors, most models are fairly efficient at high speed, but operate very inefficiently at low speed. There are significant savings opportunities to improve this efficiency such as running a cap-start cap-run configuration at low speed; however the CA IOUs also understand there are technical constraints for improving low speed efficiency across the board as there are inherent friction and windage losses at low power levels at low speed. Therefore the CA IOUs have modified our original proposed standard level to relax the minimum efficiency requirements at the lower power levels. The effect is that most motors qualify at high speed, while many motors with inefficient low speed operation would not qualify. There are however many cost effective qualifying models which due qualify at low speed.

Overall, the greatest savings will come from increasing the efficiency of small single-speed motors (1 to 1.5 THP range) as these motors are sold in high volumes for small aboveground and in-ground pools, booster pumps and auxiliary applications. While this updated proposal relaxes the standards slightly for motors under 1 THP due to technical friction and windage constraints described above, we have proposed increasing the single speed motor efficiency above 1 THP. We believe increasing the efficiency requirements for larger motors will offset a relaxation of stringency for smaller motors as significant savings will come from small single speed pool pump motors used on commercial pools which are single phase and under 5HP due to their long duty cycles.

Response to Items b & c

Currently, the CEC's two, multi, or variable speed standard for residential filtration pumps is technically a motor standard. While switching to Energy Factor could align with ENERGY STAR, at this time, we support CEC maintaining the current motor standard as Energy Factor cannot be applied to replacement motors. This will allow for simplicity and clarity in the Title 20 pool pump and motor standards.

Response to Item d

The CA IOUs also propose:

- *Extending the motor efficiency standard to cover all single phase dedicated purpose pool pump motors under 5 HP (whether new (including OEM), or for replacement, whether residential or not, and whether for filtration or not)*

- *Requiring reporting of performance data (motor efficiency, energy factor, flow, apparent power, etc.) for pumps and motors (as applicable) for the following speeds[4]:*
    - *Full Load Speed (RPM)*
    - *Three Quarters Speed (if applicable) (RPM)*
    - *Half Speed (if applicable) (RPM)*
    - *Quarter Speed (if applicable) (RPM)*
    - *Other Factory Preset Set Speeds (if applicable) (RPM)*

The CA IOUs also support the creation of two separate databases: one for replacement pool pump motors and one for pool pump and motor combinations. APSP currently organizes their databases in this format and we believe this will best serve the users of the CEC appliance database.

In summary, the CA IOUs propose pool pump motors be tested at full, ¾, ½ and ¼ speed (as applicable) and that the standards proposed would only apply at full and ½ speed (if applicable). For all speeds, a tolerance of plus or minus 50 RPM is allowed as different controllers allow different increments of adjustment. For multi-speed motors, if the desired motor speeds are unable to meet the proposed range, then it should be tested to the nearest possible speed to ¼ and ¾ speeds.

Table 2.4: CA IOU Proposed Standard Applicability Overview

CA IOU Proposed Standards Applicability Overview				
Motor Design/ Speed	Full Speed 3450 RPM*	3/4 Speed 2600 RPM*	1/2 Speed 1725 RPM*	1/4 Speed 900 RPM*
Single Speed				
Dual Speed				
Variable Speed				
Multi-Speed**				
* Tolerance of +/- 50 RPMs ** If no preset speeds exist within range then test to nearest preset speed.				
	Test/ List Only			
	Test/ List & Minimum Efficiency Requirement			
	No Test/ List or Minimum Efficiency Requirement			

For further details about the CA IOUs' proposed standards and reporting requirements please see Appendix B below.

[4] See Appendix A for more information. Proposed speeds for which data should be tested and reported are slightly different (simplified) from original IOU CASE proposal.

4. Market for Rebuilt or Refurbished Pool Pump Motors

CEC REQUEST:

Pool pump motors are frequently rebuilt or refurbished and are cost-competitive with newer and more efficient motors. The Energy Commission is therefore interested in any data related to the volume and extent that these motors are used in the current market. The Energy Commission is interested in any suggested approaches to ensure the rebuilt or refurbished motors are efficient, and whether representative local offices could certify them to meet suggested standards.

CA IOU RESPONSE

The CA IOUs commend the CEC for looking for additional savings from pool pump motors and wish to work with the CEC and industry to ensure any rebuilt or refurbished motors meet any new proposed CEC performance standards. To do so, the CA IOUs propose modifying the existing "Pool pump motor" definition to clarify that the CEC standards should apply to new and rebuilt motors.

- *"Pool pump motor" means a motor served by single phase power with a Total Horse Power rating less than or equal to 5.0 that is used as a replacement pool pump motor or as part of any pool pump and motor combination which is sold as new from the manufacturer or is rebuilt or refurbished and offered for sale in the marketplace.*

The intention of this definition change is to clarify that the pool pump motor standards should be applicable to new pool pump motors and rebuilt/refurbished pool pump motors and thus excluding repaired pool pump motors.

APPENDIX A: Proposed Title 20 Language: 1604 (g)(3)(4)

1604 (g) Section 1604. Test Methods for Specific Appliances. Pool Heaters, Portable Electric Spas, Residential Pool Pump and Motor Combinations, and Replacement Residential Pool Pump Motors, Pool Pump Controls, and LED Pool Lights.

…

(3) Test Method for Residential Pool Pump and Motor Combinations

The test method for residential pool pumps and motor combinations is as follows:
(A) Reported motor efficiency shall be verifiable by test method described in Section1604 (g)(4).
(B) ANSI/HI 1.6-~~2000~~ 2011 shall be used for the measurement of pump efficiency.
(C) Tests shall be conducted using unmodified, manufactured, and fully assembled pump, including strainer basket when applicable.

~~(C)~~ (D) Three system curves shall be calculated:

Curve A: $H = 0.0167 \times F^2$
Curve B: $H = 0.050 \times F^2$
Curve C: $H = 0.0082 \times F^2$

Where:
H is the total system head in feet of water.
F is the flow rate in gallons per minute (gpm).

~~(D)~~ (E) For each curve (A, B, ~~or~~ and C), the pump head shall be adjusted until the flow and head lie on the curve. The following shall be tested and reported ~~(i) for each curve for single-speed pumps or (ii) for each curve at both highest and lowest speeds for two-, multi-, or variable-speed pumps for the intersect point of the pump performance curve with each system curve.~~ for the intersect point of the pump performance curve with each system curve:

Where the Energy Factor (EF) is calculated as: EF = Flow (gpm) * 60 / Power (watts)

1. Motor nominal speed (RPM)
2. Flow (gallons per minute)
3. Power and apparent power (watts and volt amps)
4. Energy Factor (gallons per watt hour)
5. Motor efficiency (percent %)

(i) For single-speed, two-speed or multi-speed pumps with fixed, non-adjustable speeds, test and report performance at the intersect point of the pump performance curve with each system curve (CEC Curves A, B and C). Intersect data shall be reported for each speed and system curve.

(ii) For two-, multi-, or variable-speed pumps with adjustable speeds, test and report performance at the intersect point of the pump performance curve with each system curve (CEC Curves A, B and C). Intersect data shall be reported for the full output, half, lowest operational, and the best efficiency speeds.

(4) Test Method for Pool Pump Motors

The test method for pool pump motors is as follows:

(A) Each pool pump motor shall be tested and in accordance with CSA-C747-2009 with modified torque settings at different speeds as is shown in Table X and Y.

(i) Single-speed, two-speed , multi-speed and variable speed pool pump motors should be tested at the speeds shown below in Table X.

Table X: Testing Criteria for Pool Pump Motors

Motor Design/ Speed	Full Speed 3450 RPM*	3/4 Speed 2600 RPM*	1/2 Speed 1725 RPM*	1/4 Speed 900 RPM*
Single Speed	X			
Dual Speed	X		X	
Variable Speed	X	X	X	X
Multi-Speed**	X	X	X	X
* Tolerance of +/- 50 RPMs ** If no preset speeds exist within tolerance then test to nearest preset speed.				

(ii)) Torque settings and horsepower ratings for single-speed, two-speed , multi-speed and variable speed pool pump motors should be calculated as shown below in Table Y.

Table Y: Torque Settings for Pool Pump Motors

Speed (RPMs)		**Torque Settings (N-m)**	**Total Horsepower Rating (THP)**
RPM_{Full}	Full Speed (RPM)	T_1 (per Sect. 6.5 of CSA C747-2009)	$THP_{Nameplate}$
$RPM_{3/4}$	Three Quarter Speed (if applicable) (RPM)	$T_{3/4}=(RPM_{3/4}/RPM_{Full})^2 * T_1$	$THP_{3/4}=(RPM_{3/4}/RPM_{Full})^3 * THP_{Nameplate}$
$RPM_{1/2}$	Half Speed (if applicable) (RPM)	$T_{1/2}=(RPM_{1/2}/RPM_{Full})^2 * T_1$	$THP_{1/2}=(RPM_{1/2}/RPM_{Full})^3 * THP_{Nameplate}$
$RPM_{1/4}$	Quarter Speed (if applicable) (RPM)	$T_{1/4}=(RPM_{1/4}/RPM_{Full})^2 * T_1$	$THP_{1/4}=(RPM_{1/4}/RPM_{Full})^3 * THP_{Nameplate}$
RPM_X	Other Preset Speeds (if applicable) (RPM)	$T_X=(RPM_X/RPM_{Full})^2 * T_1$	$THP_X=(RPM_X/RPM_{Full})^3 * THP_{Nameplate}$

The torque T_1 should be set in accordance to CSA-C747-2009.

(iii))For motors sold with controls (integrated or not), the motor should be tested with the test leads connected in between the control and the power source in order to accurately measure the efficiency of the motor and built-in control system. For motors sold without controls, the motors should be tested with the leads connected directly to the motor leads.

1605.3 (g) Pool Heaters, Portable Electric Spas, Residential Pool Pump and Motor Combinations, and Replacement Residential Pool Pump Motors.

(5) Residential Pool Pump and Motor Combinations, and Replacement Residential Pool Pump Motors.

(A) **Motor Efficiency.**

1. Pool pump motors manufactured on or after January 1, 2006 may not be split-phase or capacitor start - induction run type.

2. Pool pump motors manufactured on or after January 1st 2017 must meet the minimum efficiency standards set in Table Z below.

Table Z: Minimum Pool Pump Motor Efficiency

Minimum Efficiency according to modified CSA C747-09 Test Procedure		
Motor Design	**High Speed (3450 RPM)**	**Half Speed (1725 RPM)**
Single Speed	0.06*ln(Total HP) + 0.7	N/A
Dual Speed	70%	0.06*ln(Total HP) + 0.6
Variable/ Multi-Speed	80%	0.06*ln(Total HP) + 0.75

(B) **Two-, Multi-, or Variable-Speed Capability.**

1. **Residential Pool Pump Motors.** Residential pool pump motors with a pool pump motor capacity of 1 HP or greater which are manufactured on or after January 1, 2010, shall have the capability of operating at two or more speeds with a low speed having a rotation rate that is no more than one-half of the motor's maximum rotation rate. The pump motor must be operated with a pump control that shall have the capability of operating the pump at least at two speeds.

2. **Pump Controls.** Pool pump motor controls manufactured on or after January 1, 2008 that are sold for use with a two- or more speed pump shall have the capability of operating the pool pump at least at two speeds. The control's default circulation speed setting shall be no more than one-half of the motor's maximum rotation rate. Any high speed override capability shall be for a temporary period not to exceed one 24-hour cycle without resetting to default settings.

APPENDIX B: Section 1606. Filing by Manufacturers; Listing of Appliances in Database.

	Appliance	**Required Information**	**Permissible Answers**
G	Residential Pool Pump and Motor Combinations ~~and Replacement Residential Pool Pump Motors~~	Pump Motor Construction	PSC, Capacitor Start-Capacitor Run, ECM, Capacitor Start-induction run, split-phase, Permanent magnet synchronous motor, 3-phase
		Pump Motor Design	Single-speed, dual-speed, multi-speed, variable-speed
		Frame	
		Nameplate Horsepower	
		Motor Service Factor	
		Motor Capacity (Total Horsepower)	
		Full Output Speed (in RPM)	
		¾ speed (if applicable, in RPM)	
		½ Speed (if applicable, in RPM)	
		¼ Speed (if applicable, in RPM)	

		Motor has Capability of Operating at Two or More Speeds with the Low Speed having a Rotation Rate that is No More than One-Half of the Motor's Maximum Rotation Rate		Yes, no
		~~Unit Type~~		~~Residential Pool Pump and Motor Combination, Replacement Residential Pool Pump Motor~~
		Pump and Motor combination includes integral controller		Yes, no
		This information must be reported for each tested speed, as applicable.	Rated Horsepower	
			Power Factor (%)	
			Input Watts	
			Amps	
			Motor Efficiency (%)	
			Flow for Curve 'A' (in gpm)	
			Power for Curve 'A' (in watts)	
			Energy Factor for Curve 'A' (in gallons per watt-hour)	
			Flow for Curve 'B' (in gpm)	
			Power for Curve 'B' (in watts)	
			Energy Factor for Curve 'B' (in gallons per watt-hour)	
			Flow for Curve 'C' (in gpm)	
			Power for Curve 'C' (in watts)	
			Energy Factor for Curve 'C' (in gallons per watt-hour)	
	Replacement Pool Pump Motors	Motor Construction		PSC, Capacitor Start-Capacitor Run, ECM, Capacitor Start-induction run, split-phase, Permanent

				magnet synchronous motor, 3-phase
		Motor Design		Single-speed, dual-speed, multi-speed, variable-speed
		Frame		
		Nameplate Horsepower		
		Motor Service Factor		
		Motor Capacity (Total Horsepower)		
		Full Output Speed (in RPM)		
		¾ speed (if applicable, in RPM)		
		½ Speed (if applicable, in RPM)		
		¼ Speed (if applicable, in RPM)		
		Motor has Capability of Operating at Two or More Speeds with the Low Speed having a Rotation Rate that is No More than One-Half of the Motor's Maximum Rotation Rate		Yes, no
		Motor includes integral controller		Yes, no
		This information must be reported for each speed listed above, as applicable.	Rated Horsepower	
			Input Watts	
			Amps	
			Power Factor (%)	
			Motor Efficiency (%)	
	Pool Pump Controllers	Standby Power Demand in Watts		
		Power Factor (%)		
		Controller has ability to control each of the following motor designs.	Variable Speed Motor	Yes, no
			Dual Speed Motor	Yes, no
			Multi-Speed Motor	Yes, no

* "Identifier" information as described in Section 1602(a).

1 = Voluntary for federally-regulated appliances