



ENERGY STAR® Program Requirements Product Specification for Pool Pumps

Eligibility Criteria Draft 2, Version 2.0 and Version 3.0

1 Following is the **Draft 2, Version 2.0/Version 3.0 product** specification for ENERGY STAR certified Pool
2 Pumps. A product shall meet all of the identified criteria if it is to earn the ENERGY STAR.

3 **1 DEFINITIONS**

4 Provided below are definitions of the relevant terms in this document. In Sections 1.1-1.4, all definitions
5 reference the definitions section of the DOE Test Procedure for Dedicated Purpose Pool Pumps at 10
6 CFR 431.462, except 1.2F, Pool Pump Replacement Motors, which has no comparable DOE definition.

7 **1.1 General**

- 8 A) Pump: equipment designed to move liquids (which may include entrained gases, free solids, and
9 totally dissolved solids) by physical or mechanical action and includes a bare pump and, if
10 included by the manufacturer at the time of sale, mechanical equipment, driver, and controls.
- 11 B) Dedicated Purpose Pool Pump: comprises self-priming pool filter pumps, non-self-priming pool
12 filter pumps, waterfall pumps, pressure cleaner booster pumps, integral sand-filter pool pumps,
13 integral-cartridge filter pool pumps, storable electric spa pumps, and rigid electric spa pumps.
- 14 C) Pool Filter Pump: means an end suction pump that:
- 15 a. Either:
- 16 i. Includes an integrated basket strainer, or;
- 17 ii. Does not include an integrated basket strainer for operation, but requires a
18 basket strainer for operation, as stated in manufacturer literature provided with
19 the pump; and
- 20 b. May be distributed in commerce connected to, or packaged with, a sand filter, removable
21 cartridge filter, or other filtration accessory, so long as the filtration accessory are
22 connected with consumer-removable connections that allow the filtration accessory to be
23 bypassed.
- 24 D) Control: any device that can be used to operate the driver. Examples include, but are not limited
25 to, continuous or non-continuous controls, schedule-based controls, on/off switches, and float
26 switches.
- 27 E) Variable Speed Drive: equipment capable of varying the speed of the motor.
- 28 F) Freeze Protection Control: controls that, at certain ambient temperature, turn on the dedicated-
29 purpose pool pump to circulate water for a period of time to prevent the pool and water in
30 plumbing from freezing.
- 31 G) Full-Flow Rate: flow rate, in gallons per minute, at maximum speed on curve C.
- 32 H) Pool Pump Timer: means a pool pump control that automatically turns off a dedicated-purpose
33 pool pump after a run-time of no longer than 10 hours.

34 **1.2 Pump Types**

- 35 A) Self-Priming Pump: means a pump that either is a self-priming pool filter pump or a pump that:
- 36 a. Is designed to lift liquid that originates below the centerline of the pump inlet;

- 37 b. Contains at least one internal recirculation passage; and
- 38 c. Requires a manual filling of the pump casing prior to initial start-up, but is able to re-prime
- 39 after the initial start-up without the use of external vacuum sources, manual filling, or a
- 40 foot valve.
- 41 B) Self-Priming Pool Filter Pump: a pool filter pump that is certified under NSF/ANSI 50-2015
- 42 (incorporated by reference, see 10 CFR §431.463) to be self-priming or is capable of re-priming
- 43 to a vertical lift of at least 5.0 feet with a true priming time less than or equal to 10.0 minutes,
- 44 when tested in accordance with section F of appendix B or C of 10 CFR 431, and is not a
- 45 waterfall pump.
- 46 Note: Pumps designated Inground Pool Pumps in previous ENERGY STAR specifications are
- 47 now considered Self-Priming-Pool Filter Pumps.
- 48 C) Non-Self-Priming Pool Filter Pump: a pool filter pump that is not certified under NSF/ANSI 50-
- 49 2015 (incorporated by reference, see 10 CFR §431.463) to be self-priming and is not capable of
- 50 re-priming to a vertical lift of at least 5.0 feet with a true priming time less than or equal to 10.0
- 51 minutes, when tested in accordance with section F of appendix B or C of 10 CFR 431, and is not
- 52 a waterfall pump.
- 53 Note: Pumps designated Aboveground Pool Pumps in previous ENERGY STAR specifications
- 54 are now considered Non-Self-Priming Pool Filter Pumps.
- 55 D) Rigid Electric Spa Pump: an end suction pump that does not contain an integrated basket strainer
- 56 or require a basket strainer for operation as stated in manufacturer literature provided with the
- 57 pump and that meets the following three criteria:
- 58 a. Is assembled with four through bolts that hold the motor rear endplate, rear bearing,
- 59 rotor, front bearing, front endplate, and the bare pump together as an integral unit;
- 60 b. Is constructed with buttress threads at the inlet and discharge of the bare pump; and
- 61 c. Uses a casing or volute and connections constructed of a non-metallic material.
- 62 E) Storable Electric Spa Pump: a pump that is distributed in commerce with one or more of the
- 63 following:
- 64 a. An integral heater; and
- 65 b. An integral air pump.
- 66 F) Pool Pump Replacement Motor: A motor designated as a specific replacement part intended for
- 67 pool pump model(s) as specified by pump manufacturer and/or a motor designed and marketed
- 68 to consumers for use as a pool pump motor.
- 69 G) Pressure Cleaner Booster Pump: An end suction, dry rotor pump designed and marketed for
- 70 pressure-side pool cleaner applications, and which may be UL listed under ANSI/UL 1081-2016,
- 71 "Standard for Swimming Pool Pumps, Filters, and Chlorinators.
- 72 H) Waterfall Pump: A waterfall pump is a pool filter pump with maximum head less than or equal to
- 73 30 feet, and a maximum speed less than or equal to 1,800 rpm.

74 **1.3 Product Sub-Types**

- 75 A) Single-speed Dedicated Purpose Pool Pump: A dedicated purpose pool pump that is capable of
- 76 operating at only one speed.
- 77 B) Two-speed Dedicated Purpose Pool Pump: a dedicated-purpose pool pump that is capable of
- 78 operating at only two different pre-determined operating speeds, where the low operating speed
- 79 is less than or equal to half of the maximum operating speed and greater than zero, and must be
- 80 distributed in commerce either:
- 81 a. With a pool pump control (e.g., variable speed drive and user interface or switch) that is
- 82 capable of changing the speed in response to user preferences; or

- 83 b. Without a pool pump control that has the capability to change speed in response to user
84 preferences, but is unable to operate without the presence of such a pool pump control.
- 85 C) Multi-speed Dedicated Purpose Pool Pump: a dedicated-purpose pool pump that is capable of
86 operating at more than two discrete, pre-determined operating speeds separated by speed
87 increments greater than 100 rpm, where the lowest speed is less than or equal to half of the
88 maximum operating speed and greater than zero, and must be distributed in commerce with an
89 on-board pool pump control (i.e., variable speed drive and user interface or programmable
90 switch) that changes the speed in response to pre-programmed user preferences and allows the
91 user to select the duration of each speed and/or the on/off times.
- 92 D) Variable-speed Dedicated Purpose Pool Pump: a dedicated-purpose pool pump that is capable of
93 operating at a variety of user-determined speeds, where all the speeds are separated by at most
94 100 rpm increments over the operating range and the lowest operating speed is less than or
95 equal to one-third of the maximum operating speed and greater than zero. Such a pump must
96 include a variable speed drive and be distributed in commerce either:
- 97 a. With a user interface that changes the speed in response to pre-programmed user
98 preferences and allows the user to select the duration of each speed and/or the on/off
99 times; or
- 100 b. Without a user interface that changes the speed in response to pre-programmed user
101 preferences and allows the user to select the duration of each speed and/or the on/off
102 times, but is unable to operate without the presence of a user interface.
- 103 E) Integral Cartridge Filter Pool Pump: An integral cartridge filter pool pump is a pump that requires
104 a removable cartridge filter, installed on the suction side of the pump, for operation; and the
105 cartridge filter cannot be bypassed.
- 106 F) Integral Sand Filter Pool Pump: An integral sand filter pool pump is a pump distributed in
107 commerce with a sand filter that cannot be bypassed for testing.

108 1.4 Product Ratings

- 109 A) Rated Horsepower (HP): The rated horsepower is the product of the measured full load speed
110 and torque, determined based on the maximum continuous duty motor power output rating
111 allowable for the motor's nameplate ambient rating and insulation class, as determined in
112 accordance with the test procedure in 10 CFR §431.464(b) and applicable sampling plans in 10
113 CFR §429.59. May be less than Total Horsepower where the Service Factor is > 1.0, or equal to
114 Total Horsepower where the Service Factor = 1.0. Also known as Nominal Horsepower.
- 115 B) Service Factor: A multiplier applied to Rated Horsepower of a motor to indicate the percent above
116 Nominal Horsepower at which a pump motor may operate continuously without exceeding its
117 allowable insulation class temperature limit, provided the other design parameters such as rated
118 voltage, frequency, and ambient temperature are within limits, as determined in accordance with
119 the test procedure in 10 CFR §431.464(b) and applicable sampling plans in 10 CFR §429.59.
- 120 **Note:** In accordance with E.3.3, Appendix B to 10 CFR 431 Subpart Y, Service Factor shall be
121 1.0 for residential applications (Single phase AC or DC Motors).
- 122 C) Total Horsepower: The product of the Rated Horsepower and the Service Factor of a motor used
123 on a Pool Pump (also known as Service Factor Horsepower, SFHP) based on the maximum
124 continuous duty motor power output rating allowable for nameplate ambient rating and motor
125 insulation class, as determined in accordance with the test procedure in 10 CFR §431.464(b) and
126 applicable sampling plans in 10 CFR §429.59. Total Horsepower = Rated Horsepower x Service
127 Factor. For example, a 1.5 HP pump with a 1.65 Service Factor produces 2.475 HP (Total
128 Horsepower) at the maximum Service Factor point.
- 129 D) Rated Hydraulic Horsepower (h_{hp}): The pump output power (in HP) as determined in accordance
130 with the test procedure in 10 CFR §431.464(b) and applicable sampling plans in 10 CFR §429.59.
131 This measurement is the pump power output on reference Curve C at maximum operating speed
132 and full impeller diameter.

133 **1.5 Testing and Certification**

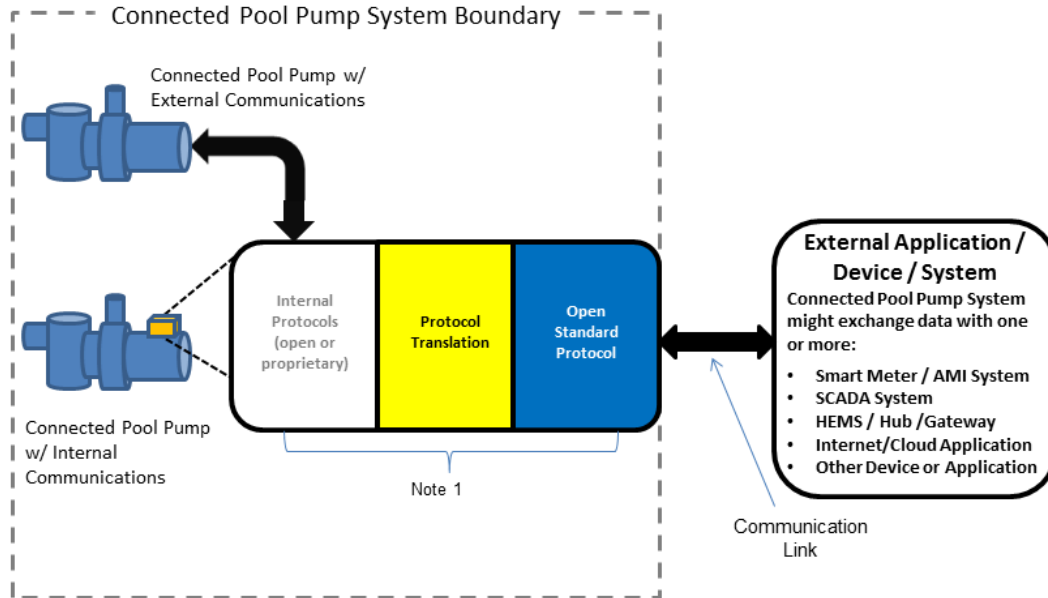
- 134 A) Pump Performance Curve: A curve comparing the Total Head in feet of water to the Rate of Flow
135 in gallons per minute (GPM) for a given pump at a given Motor Speed.
- 136 B) System Curves: System Curve: An equation that defines the relationship between flow and head
137 in a fixed hydraulic network. System Curves A, B, and C represent different standard plumbing
138 systems. The curves are used to help size a pump based on the pool size, pipe system, and pool
139 features present in a given pool system. They are plotted on the same graph as Pump
140 Performance Curves, which compare Rate of Flow (Q) to Total Head (H). The System Curve
141 equations are the following, where H is total system head in feet of water and Q is flow in GPM:
- 142 a. Curve A: $H = 0.0167 * Q^2$
- 143 b. Curve B: $H = 0.050 * Q^2$
- 144 c. Curve C: $H = 0.0082 * Q^2$
- 145 C) Normal Operating Point: Point that corresponds to the rate of flow, total head, and energy
146 consumption at which a pump will operate given a specific system curve and a specific pump
147 speed. It corresponds to the point of intersection of the pump performance and system curves.
- 148 D) Rate of Flow (Q): The total volume throughput per unit of time. For the ENERGY STAR Pool
149 Pump Test Method, Rate of Flow is expressed as GPM.
- 150 E) Motor Speed (n): The number of revolutions of the motor shaft in a given unit of time. For the
151 ENERGY STAR Pool Pump Test Method, Motor Speed is expressed as revolutions per minute
152 (RPM).
- 153 F) Head (H): Energy content of the liquid at any given point in the system, expressed in units of
154 energy per unit weight of liquid. For residential pool pumps, the measuring unit for Head is feet of
155 water.
- 156 G) Standby Mode: A reduced power state in which the unit is connected to an ac main power source
157 and pump controls/timers remain On, but the motor remains idle, and no water is being pumped
158 through the system.
- 159 H) Energy Factor (EF): The volume of water pumped in gallons per watt-hour of electrical energy
160 consumed by the pump motor (gal/Wh).
- 161 I) Weighted Energy Factor (WEF): A measurement of pump efficiency based on performance at
162 one or two operating points, which are uniquely defined for each DPPP variety and speed
163 configuration. The performance measurements at different operating points are weighted to
164 represent real world use. WEF is measured in thousand gallons per kilowatt hour (kgal/kWh). See
165 the *DOE Test Procedure for Dedicated Purpose Pool Pumps* for additional calculation details: [10](#)
166 [CFR 431.464\(b\)](#).
- 167 J) Basic Model: means all units of a given class of pump manufactured by one manufacturer, having
168 the same primary energy source, and having essentially identical electrical, physical, and
169 functional (or hydraulic) characteristics that affect energy consumption, energy efficiency, water
170 consumption, or water efficiency.¹
- 171 **Note**: Models having a different color, rated horsepower (not total horsepower), or union fitting
172 type may be considered a single basic model.

173 **Note**: EPA received comments from multiple stakeholders to include the prescriptive requirements for
174 freeze protection and timers on integral cartridge and sand filter pumps. EPA has added the DOE
175 definitions for freeze protection controls, timer, integral cartridge filter pump, and integral sand filter pump
176 to the specification.

¹ DOE Test Procedure for Dedicated Purpose Pool Pumps, Final Rule, [10 CFR 431 Subpart Y, Appendix B and C](#).

177 **1.6 Connected Products**

- 178 A) Communication Link: As shown in Figure 1, the mechanism for bi-directional data transfers
179 between the CPPS and one or more external applications, devices or systems.
- 180 B) Connected Pool Pump System (CPPS): As shown in Figure 1, includes the ENERGY STAR
181 certified pool pump, integrated or separate communications hardware, and additional hardware
182 and software required to enable connected functionality.



183
184 **Figure 1.** Connected Pool Pump System (CPPS)

185 **Note:** Communication device(s), link(s) and/or processing that enables Open Standards-
186 based communication between the CPPS and external application / device / system(s).
187 These elements, either individually or together, could be within the pump/controller, and/or
188 an external communication module, a hub/gateway, or in the Internet/cloud.

- 189 C) Consumer Authorized Third Party: Any entity for which the consumer has provided explicit
190 permission to access the CPPS connected functionality, in whole or in part, via a Communication
191 Link.
- 192 D) Open Standards: Standards that are:
- 193 1. Included in the Smart Grid Interoperability Panel (SGIP) Catalog of Standards,² and/or
194 2. Included in the National Institute of Standards and Technology (NIST) Smart Grid Framework
195 Tables 4.1 and 4.2,³ and/or
196 3. Adopted by the American National Standards Institute (ANSI) or another well-established
197 international standards organization such as the International Organization for
198 Standardization (ISO), International Electrotechnical Commission (IEC), International
199 Telecommunication Union (ITU), Institute of Electrical and Electronics Engineers (IEEE), or
200 Internet Engineering Task Force (IETF).
- 201 E) Premises: Land and the improvements on it.
- 202 F) Demand Response Override-ability: The capability for a user to modify the Demand Response
203 functionality of their DR equipped and activated product, to opt out of a scheduled and/or active

² http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/PMO#Catalog_of_Standards_Processes

³ http://www.nist.gov/smartgrid/upload/NIST_Framework_Release_2-0_corr.pdf

204 DR event the product would otherwise respond to. Any system that allows event override without
205 canceling program enrollment would meet this definition, but overrides that can be activated per
206 event or programmed for particular times or conditions are preferred over blanket overrides that
207 remain active until cancelled.

208 G) Time-Stamped Demand Reponse Override Notification: A message capable of being sent to a
209 Consumer Authorized Third Party which signifies a particular instance of a Demand Response
210 Override, and at minimum includes the time or interval of the override or a reference to the event
211 that is being overridden.

212 1.7 Acronyms

- 213 A) ac: Alternating Current
- 214 B) ANSI: American National Standards Institute
- 215 C) API: Application Programming Interface
- 216 D) APSP: Association of Pool and Spa Professionals
- 217 E) CPPS: Connected Pool Pump System
- 218 F) DR: Demand Response
- 219 G) EF: Energy Factor
- 220 H) °F: Degrees Fahrenheit
- 221 I) gal: gallons
- 222 J) GPM: Gallons per minute
- 223 K) H: Head
- 224 L) HP: Horsepower
- 225 M) hhp: Rated Hydraulic Horsepower
- 226 N) Hz: hertz
- 227 O) ICD: Interface Control Document
- 228 P) n: Motor Speed
- 229 Q) NSPI: National Spa and Pool Institute
- 230 R) Q: Rate of Flow
- 231 S) RPM: Revolutions per minute
- 232 T) UUT: Unit under test
- 233 U) V: volts
- 234 V) W: watts
- 235 W) WEF: Weighted Energy Factor
- 236 X) Wh: watt-hours

237 2 SCOPE

238 2.1 Included Products

239 Products that meet the definition of a Self-Priming Pool Filter Pump (similar to former Inground Pump
240 category), Non-Self-Priming Pool Filter Pump (similar to former Aboveground Pump category),
241 Pressure Cleaner Booster Pump or Pool Pump Replacement Motor, as specified herein, are eligible
242 for ENERGY STAR certification, with the exception of products listed in Section 2.2. Only those pool

243 pumps that are single phase and with a Rated Hydraulic Horsepower (hhp) of >0 and <2.5 hhp can
 244 certify as ENERGY STAR under this specification.

245 **2.2 Excluded Products**

246 Waterfall Pumps, Storable Electric Spa Pumps, and Rigid Electric Spa Pumps, as defined in Section
 247 1, are not eligible for ENERGY STAR under this specification.

248 **Note:** EPA received one comment noting that the 2.5 hhp cutoff for large pumps did not include the end
 249 point (<2.5 hhp) in the DOE Energy Conservation Standards and Test Procedure for Pool Pumps. EPA
 250 confirmed this is the case, and updated the specification accordingly.

251 EPA revised the Excluded Products section: updated definitions in Section 1 eliminate the case where
 252 Two-speed/Multi-Speed pumps are sold without pump controls, removing the need for a separate controls
 253 requirement.

254 **3 CERTIFICATION CRITERIA**

255 **3.1 Energy Efficiency Requirements**

256 A) The Weighted Energy Factor of the pump must meet the criteria provided in Table 1, below.
 257
 258

Table 1: Pool Pump Weighted Energy Factor Criteria (on Curve C)

Pump Sub-Type	Size Class	Version 2.0 Energy Efficiency Level (Effective TBD 2018)	Version 3.0 Energy Efficiency Level (Effective July 19, 2021)
Self-Priming (Inground) Pool Pumps	Small (hhp < 0.711)	$WEF \geq -1.30 \times \ln(\text{hhp}) + 4.95$ <i>for hhp > 0.13</i> $WEF \geq 7.60$ <i>for hhp ≤ 0.13</i>	$WEF \geq -2.45 \times \ln(\text{hhp}) + 8.40$ <i>for hhp > 0.13</i> $WEF \geq 13.40$ <i>for hhp ≤ 0.13</i>
Self-Priming (Inground) Pool Pumps	Large (hhp ≥ 0.711)	$WEF \geq -2.30 \times \ln(\text{hhp}) + 6.59$	$WEF \geq -2.45 \times \ln(\text{hhp}) + 8.40$
Non-Self-Priming (Aboveground) Pool Pumps	Extra Small (hhp ≤ 0.13)	$WEF \geq 4.92$	$WEF \geq 4.92$ (same as Version 2.0)
Non-Self-Priming (Aboveground) Pool Pumps	Standard Size (hhp > 0.13)	$WEF \geq -1.00 \times \ln(\text{hhp}) + 3.85$	$WEF \geq -1.00 \times \ln(\text{hhp}) + 3.85$ (same as Version 2.0)
Pressure Cleaner Booster Pumps	All	$WEF \geq 0.45$	$WEF \geq 0.51$
Pool Pump Replacement Motors	TBD	TBD	TBD

259
 260 B) Pump controls: Pump controls intended for use with a Multi-speed or Variable-speed Pump shall
 261 have a default filtration speed setting of no more than one-half of the motor's maximum rotation
 262 rate. Any high-speed override capability shall be for a temporary period not to exceed one 24-
 263 hour cycle without resetting to default settings.

- 264 C) Freeze Protection: All dedicated-purpose pool pumps distributed in commerce with freeze
265 protection controls must be shipped either with freeze protection disabled, or with the following
266 default, user-adjustable settings:
- 267 a. The default dry-bulb air temperature setting for activating freeze protection is no greater
268 than 40 °F; and
- 269 b. The default run time setting shall be no greater than 1 hour (before the temperature is
270 rechecked); and
- 271 c. The default motor speed shall not be more than half of the maximum available speed.
- 272 D) Timers for Integral Filter Pumps: All Integral Sand Filter Pool Pumps and Integral Cartridge Filter
273 Pool Pumps shall be distributed in commerce with a timer with maximum 10 hour timeout, which
274 is either integral to the pump or a separate component shipped with the pump.

275 **Note:** EPA received multiple comments from stakeholders in support of increasing the efficiency
276 requirements on self-priming pumps to EL6, due to current product availability, benefits for preparing the
277 marketplace to adopt the 2021 standards, and industry agreement on the DOE calculation approach. EPA
278 reviewed the submitted comments and data, and is proposing to raise the large pump self-priming
279 requirement to EL6 in this draft.

280 EPA has received several comments in support of adding freeze protection requirements and
281 requirements for timers on integral cartridge and sand filter pumps. EPA is proposing to add the DOE
282 freeze protection requirements as written in the DPPP standard. EPA has reviewed the timer
283 requirements in the DPPP standard, and is also proposing to add these prescriptive requirements, for
284 integral sand and cartridge filter pumps.

285 Replacement Motors:

286 EPA received stakeholder feedback on replacement motors, including comments on current and future
287 approaches to testing and setting requirements, such as dry motor testing (CSA 747) and Motor WEF.
288 EPA notes that no currently published government or industry test procedure for replacement motors will
289 work seamlessly alongside a WEF-based efficiency metric in the near term. A DOE-Industry working
290 group is anticipated to fill this test method gap in the near future, with the development of a new Pool
291 Pump Replacement Motor Test Procedure.

292 Therefore, EPA plans to wait for the testing infrastructure needed to set replacement motor requirements.
293 EPA intends to monitor the marketplace, and once data becomes available, revise the specification to
294 incorporate these procedures.

295 **3.2 Significant Digits and Rounding:**

- 296 A) All calculations shall be carried out with directly measured (unrounded) values.
- 297 B) Unless otherwise specified, compliance with specification limits shall be evaluated using directly
298 measured or calculated values without any benefit from rounding.
- 299 C) As specified in 10 CFR 431.464(b): WEF, EF, maximum head, vertical lift, and true priming time
300 are rounded to the nearest tenths place. Rated Hydraulic Horsepower is reported to the nearest
301 thousandths place. All other values are rounded to the hundredths place.

302 **4 CONNECTED PRODUCT CRITERIA**

303 This section presents connected criteria for ENERGY STAR certified pool pumps. Compliance with
304 Section 4 criteria is optional. ENERGY STAR certified pool pumps that comply with all Section 4 criteria
305 will be identified on the ENERGY STAR website as having 'Connected' functionality.

306 **4.1 Communications**

- 307 A) The CPPS Communication Link, in Figure 1, shall use Open Standards for all communication
308 layers to enable functions listed in Table 2.
- 309 B) An Interface Control Document (ICD), Application Programming Interface (API), or other
310 documentation shall be made available to interested parties that, at minimum, allows access to
311 the functions listed in Table 2.
312
313

314 **Table 2: Functions Applicable to the Communications Criteria**

Functions
Section 4.2 Real-time Power Reporting ICD/API/other doc. must include: <ul style="list-style-type: none"> • Accuracy • Units If Energy Consumption Reporting is also provided, ICD/API/other doc. must include: <ul style="list-style-type: none"> • Accuracy • Units • Measurement Interval
Section 4.4 Operational Status, User Settings, and Messages
Section 4.5 Demand Response

315 **Notes:**

- 316 1. A CPPS that enables economical and direct
317 communications that comply with 4.1.A and 4.1.B on the
318 consumer's premises is preferred; but alternative
319 approaches, where the CPPS only complies with 4.1.A
320 and 4.1.B outside of the consumer's premises are also
321 acceptable.
- 322 2. A product that includes an embedded modular
323 communications port that complies with 4.1.A and 4.1.B
324 need not be supplied with a compatible communications
325 module.

326 **4.2 Real-time Power Reporting**

327 Whenever pumping, the CPPS shall be capable of transmitting measured or estimated data
328 representative of its real-time power draw to consumers and consumer authorized third parties via a
329 communication link. The CPPS may optionally also transmit measured or estimated data
330 representative of its interval energy consumption.

331 **Note:** Real-time power shall be reported in watts. If provided, EPA recommends that energy
332 consumption data be reported in watt-hours for intervals of 15 minutes or less; however,
333 representative data may also be reported in alternate intervals as specified in the ICD or API detailed
334 in Section 4.1. The CPPS may also provide energy use feedback to the consumer on the product
335 itself and use any units and format (e.g., dollars/month).

336 **4.3 Remote Management**

337 At minimum, the CPPS shall be capable of responding to consumer authorized signals received via a
338 communication link requesting:

- 339 A) A start or stop to pumping, and
- 340 B) A change to motor speed and/or rate of flow.

341 **4.4 Operational Status, User Settings & Messages**

342 A) At minimum, the CPPS shall be capable of providing the following information to consumers and
343 consumer authorized third parties via a communication link:

- 344 1. Operational status including:
 - 345 a. On/Off/Standby, and
 - 346 b. Motor speed and/or rate of flow
- 347 2. DR status including:
 - 348 a. Inactive
 - 349 b. Active – Type 1
 - 350 c. Active – Type 2
 - 351 d. Active – Type 3
 - 352 e. Time-stamped DR override notification

353 **Note:** Signals may vary by DR infrastructure used; for example, Open ADR 2.0 stores
354 long term DR enrollment in EiAvail and short term Opt-out in EiOpt messages. The EiOpt
355 message would contain the ID of the product, reason for Opt-out, and time interval of
356 Opt-out.
357

- 358 3. Program schedule including schedule times and scheduled operation

359 B) The CPPS shall be capable of providing at least two types of messages relevant to optimizing its
360 energy consumption, either:

- 361 1. On the product (e.g. pool pump and/or controller), and/or
- 362 2. Transmitted to consumers and consumer authorized third parties via a communication link.

363 **Note:** For example, messages relevant to energy consumption for Pool Pumps might
364 address a fault condition, a reminder to clean/flush the filter, or a report of energy
365 consumption that is outside the product's normal range.

366 **4.5 Demand Response**

367 At a minimum, the CPPS shall be capable of responding to Consumer Authorized Third Parties by
368 providing the following three responses:

369 A) **Type 1 Response:**

370

- 371 1. Within ten seconds of receipt of a requesting signal on the consumer’s premise, the CPPS
 372 shall respond in accordance with Table 3.
- 373 2. The CPPS shall ship with default settings that enable a response for at least 4 hours.
- 374 3. The CPPS shall be able to provide at least one response in a rolling 12-hour period.
- 375 4. The CPPS may either delay its response or not provide a response if responding would
 376 compromise safety or result in equipment damage as determined by the manufacturer.
- 377 5. The CPPS shall be capable of supporting DR event override-ability.

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Note: Signals may vary by DR infrastructure used; for instance, in Open ADR 2.0, this requirement would translate to the need of the CPPS to be able to create short term EiOpt events if needed by the user, to override long term (EiAvail) DR enrollment status.

Table 3: Type 1 Response Requirements

Pump Type	Response Subtype	Allowable Operation
Single-speed Pump	-	Pump may operate in any sequence for up to 1/3 of the response period duration (e.g. up to 1-hour and 20-minutes for a 4-hour response period)
Two-speed / Multi-speed Pump	A	If operating at greater than half of its full-flow rate, the Pool Pump shall reduce flow rate to less than or equal to half of the full-flow rate or switch to off / Standby Mode.
	B	If in off / Standby Mode, the Pool Pump shall remain in off / Standby Mode.
Variable-speed Pump	A	If operating at greater than 1/3 of its full-flow rate, the Pool Pump shall reduce operation to less than or equal to 1/3 of full-flow rate.
	B	If operating at less than or equal to 1/3 of full-flow rate, the Pool Pump shall not increase flow.

384 B) **Type 2 Response:**

- 385 1. Within ten seconds of receipt of a requesting signal on the consumer’s premises, the CPPS
 386 shall terminate pumping for the duration of the requested response period.
- 387 2. The CPPS shall ship with default settings that enable a response of least 20 minutes.
- 388 3. The CPPS shall be able to provide at least three responses in a rolling 24-hour period.
- 389 4. The CPPS may either delay its response or not provide a response if responding would
 390 compromise safety or result in equipment damage as determined by the manufacturer.
- 391 5. The CPPS shall be capable of supporting DR event override-ability.

392 C) **Type 3 Response:**

- 393 1. Within ten seconds of receipt of a requesting signal on the consumer's premises and in
394 accordance with consumer settings, the CPPS shall
- 395 a. If idle, initiate pumping at a rate appropriate for regular filtration, and
- 396 b. If active, shall increase the rate of flow by at least 10% of Full Flow Rate from the current
397 flow rate, or extend pumping duration within the requested response period. The CPPS
398 shall not increase flow to a rate outside the proper operating conditions of equipment
399 and/or filtration systems connected to the pump, as determined by the manufacturer. For
400 example, if manufacturer recommendations specify a maximum recommended flow rate
401 for filtration operations, a Type 3 signal should not bring the pump above this specified
402 maximum flow rate.
- 403 2. This response shall be limited such that the CPPS terminates pumping when:
- 404 a. Programmed daily pumping volume is reached (*CPPS with controls capable of*
405 *scheduling pumping operation based on total desired volume pumped*), or
- 406 b. Programmed daily pumping duration is reached (*all other CPPS*).
- 407 3. The CPPS is not required to respond if doing so would compromise safety or result in
408 equipment damage as determined by the manufacturer.
- 409 4. The CPPS shall be capable of supporting DR event override-ability.
410

411 **Note:** EPA is proposing to change the Demand Response requirements for pool pumps from RPM based
412 requirements to flow based requirements. The primary driver of this change is to allow testing by
413 measuring flow, as is typically done when testing pool pumps. A revised test method with more traditional
414 flow based measurements will be easier for manufacturers and test labs to implement, reducing testing
415 burden. Additionally, flow rate and RPM are linked by physical equations, thus current RPM requirements
416 are easily translated to the new flow based requirements. This has the added benefit of writing
417 requirements based on the parameter with the most utility to the consumer, the pump operating flow.

418 Additionally, EPA is gathering stakeholder and industry feedback on Type 3 responses, which are
419 designed to support load shifting in low demand periods. Version 1.0 does not specify the amount of
420 increase in activity for a Type 3 response, particularly for a pump that is already active. EPA is proposing
421 to set a minimum incremental response within the pump operating conditions and manufacturer
422 recommended operating ranges. For idle pumps, EPA proposes specifying initiating flow at a rate
423 appropriate for filtering. EPA welcomes feedback on this proposal.

424 **4.6 Information to Installers and Consumers**

425 If additional modules, devices, services, and/or supporting infrastructure are required in order to activate
426 the CPPS's communications capabilities, installation instructions and a list of these requirements shall be
427 made available at the point of purchase and prominently displayed in the product literature. It is also
428 suggested that information be provided on the product packaging and on the product. These instructions
429 shall provide specific information on what must be done to activate these capabilities (e.g. a product
430 package or product label might briefly state "This product has Wi-Fi capability and requires Internet
431 connectivity and a wireless router to enable interconnection with external devices, systems or
432 applications.").

433 5 ADDITIONAL REQUIREMENTS

434 5.1 Additional reporting requirements

- 435 A) The Energy Factor, Flow, and Power using Curves A, B, and C shall be reported for all products
436 at Max Speed on each of the curves.
437
- 438 B) The Power Factor at each load point shall be reported for all products on Curve C, as collected
439 in the DOE Test Procedure (10 CFR 431.464(b)).

440 **Note:** EPA received input from stakeholders that the Curve A/B/C information at max speed is useful to
441 installers and consumers for sizing a pool pump to their installation, especially if that installation is using
442 2" (Curve A) or 1.5" (Curve B) plumbing. EPA requested information on the testing burden of this
443 collection requirement, and received information indicating that the tests are easy to implement alongside
444 testing with the DOE DPPP Test Procedure, and this data is a collection requirement for other regulatory
445 organizations. EPA is proposing to continue to collect Curve A/B/C data.

446 EPA received stakeholder input that Power Factor is a reporting requirement in the DOE DPPP Test
447 Procedure at tested load points. EPA is proposing to collect this information as it carries no additional
448 testing burden and provides information valuable to utilities, efficiency organizations, installers, and
449 consumers.

450 EPA has removed the marking requirements sections, as updated product definitions exclude the case
451 where Two-speed/Multi-speed/Variable-speed pumps are sold without controls in a manner that allows
452 their install at an end use location without controls.

453 6 TEST REQUIREMENTS

454 6.1 Number of Units Required for Testing

- 455 A) Representative Models shall be selected for testing per the following requirements:
- 456 1) For certification of an individual product model, the Representative Model shall be equivalent
457 to that which is intended to be marketed and labeled as ENERGY STAR.
- 458 2) For certification of a Product Family, any model within that Product Family can be tested and
459 serve as the Representative Model. When submitting Product Families, manufacturers
460 continue to be held accountable for any efficiency claims made about their products,
461 including those not tested or for which data was not reported.
- 462 B) The following sampling plan shall be used for the purposes of testing for ENERGY STAR
463 certification: at least two units of each Representative Model are tested, meeting DOE sampling
464 plan minimum requirements in 10 CFR §429.59.

465 **Note:** EPA is continuing to seek clarification on sampling plan options with DOE, and will update the
466 specification if an additional sampling plan option is needed.

467 6.2 Test Methods

468 When testing Pool Pumps, the following test methods shall be used to determine ENERGY STAR
469 certification.

Table 4: Test Method for ENERGY STAR Certification

ENERGY STAR Requirement	Test Method Reference
Weighted Energy Factor (kgal/kWh); Power Factor; Freeze Protection; Curve A/B/C Flow and Power	DOE Test Procedure for Dedicated Purpose Pool Pumps, (See 10 CFR 431.464(b))
Standby Mode Testing	Section 6.3 of ENERGY STAR Pool Pumps Test Method (Rev. Jan-2013)
Demand Response	ENERGY STAR Pool Pumps Test Method to Validate Demand Response (Rev. TBD-2018)

471

472 **Note:** EPA received stakeholder comments noting that the DOE DPPP Test Procedure sampling
473 requirements require at least 2 pumps to be tested in order to meet the sampling procedure minimums in
474 the standard. EPA has confirmed this is the case, and updated the Draft 2 specification to require 2 basic
475 model pumps to be tested against the DOE DPPP Test Procedure. Alternately, stakeholders are allowed
476 to submit 4 pumps, which simultaneously meets the DOE enforcement requirements and exceeds the
477 minimum sampling plan requirements.

478

479 EPA has clarified that the Standby Power testing requirement may be conducted against the ENERGY
480 STAR Pool Pumps Test Method.

481

482 EPA notes that an update of the ENERGY STAR Pool Pumps Test Method to Validate Demand
483 Response is underway. It is possible that it may be included in the Version 2 Pool Pumps Specification
484 prior to the Version 2 effective date.

485

486 Compliance with the DOE Test Procedure is required on February 5, 2018, for representations of energy
487 use or efficiency with respect to Dedicated Purpose Pool Pumps.

488 **6.3 Compliance with Connected Criteria**

489 Compliance with connected criteria, as specified in Section 4, shall be through examination of product
490 and/or product documentation. In addition, DR functionality shall be verified using the ENERGY
491 STAR Pool Pumps Test Method to Validate Demand Response, TBD-2018.

492 **7 EFFECTIVE DATE**

493 The ENERGY STAR Pool Pump specification shall take effect on **TBD**. To certify for ENERGY STAR, a
494 product model shall meet the ENERGY STAR specification in effect on the model's date of manufacture.
495 The date of manufacture is specific to each unit and is the date on which a unit is considered to be
496 completely assembled.

497 **Note:** EPA anticipates finalizing the Version 2.0 specification by Winter of 2018, with an effective date in
498 Fall of 2018. Version 3 will have an effective date of July 19., 2021 which will coincide with the effective
499 date of the DOE Dedicated Purpose Pool Pump Regulation.

500 **8 FUTURE SPECIFICATION REVISIONS**

501 EPA reserves the right to change the specification should technological and/or market changes affect its
502 usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the
503 specification are arrived at through industry discussions. In the event of a specification revision, please
504 note that the ENERGY STAR certification is not automatically granted for the life of a product model.

505 **9 REFERENCES**

- 506 1) ANSI/NSPI – 5 2003. Residential Inground Swimming Pools
- 507 2) ANSI/APSP – 4 2007. Standard for Aboveground/Onground Residential Swimming Pools
- 508 3) ANSI/NSPI – 6 1999. Residential Portable Spas
- 509 4) ANSI/UL 1081-2016. Standard for Swimming Pool Pumps, Filters, and Chlorinators
- 510 5) ANSI/NSF 50-2016a. Equipment for Swimming Pools, Spas, Hot Tubs, and Other Recreational
511 Water Facilities