

POOL PUMPS CONNECTED FUNCTIONALITY – FINAL DRAFT CRITERIA

4 CONNECTED PRODUCT CRITERIA

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

4.1 Acronyms

- A) API – Application Programming Interface
- B) CPPS – Connected Pool Pump System
- C) DR – Demand Response
- D) ICD – Interface Control Document

4.2 Definitions

The following definitions are applicable to Section 4 of this specification:

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

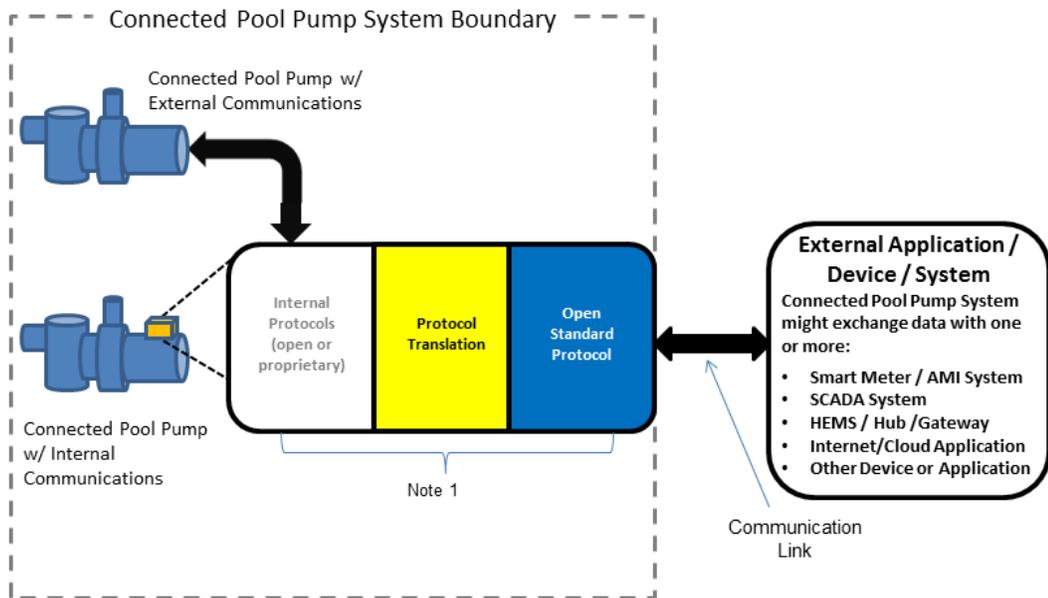


Figure 1. Connected Pool Pump System (CPPS)

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

- 25 C) Consumer Authorized Third Party: Any entity for which the consumer has provided explicit permission to
 26 access the CPPS connected functionality, in whole or in part, via a Communication Link.
- 27 D) Open Standards: Standards that are:
- 28 1. Included in the Smart Grid Interoperability Panel (SGIP) Catalog of Standards,¹ and/or
 29 2. Included in the National Institute of Standards and Technology (NIST) Smart Grid framework Tables
 30 4.1 and 4.2,² and/or
- 31 3. Adopted by the American National Standards Institute (ANSI) or another well-established
 32 international standards organization such as the International Organization for Standardization
 33 (ISO), International Electrotechnical Commission (IEC), International Telecommunication Union
 34 (ITU), Institute of Electrical and Electronics Engineers (IEEE), or Internet Engineering Task Force
 35 (IETF).
- 36 E) Premises: Land and the improvements on it.

37 **4.3 Communications**

- 38 A) The CPPS Communication Link, noted in Figure 1, shall use Open Standards for all communication
 39 layers to enable functionalities listed in Table 1.
- 40 B) An Interface Control Document (ICD), Application Programming Interface (API), or other
 41 documentation shall be made available to interested parties that at minimum, allows access to the
 42 functionalities listed in Table 1.

43 **Table 1: Functionalities Applicable to the Communications Criteria**

Functionalities
Section 4.4 Energy Consumption Reporting ICD/API/other doc. must include: <ul style="list-style-type: none"> • Accuracy • Units • Measurement Interval
Section 4.6 Operational Status, User Settings, and Messages
Section 4.8 Demand Response

44 **Notes:**

- 45 1. A CPPS that enables economical and direct communications,
 46 that comply with Sections 4.3.A and 4.3.B, on the consumer's
 47 premises is preferred; but alternative approaches, where the
 48 CPPS only complies with Sections 4.3.A and 4.3.B outside of
 49 the consumer's premises, are also acceptable.
- 50 2. A product that includes an embedded modular communications
 51 port that complies with Sections 4.3.A and 4.3.B need not be
 52 supplied with a compatible communications module.

53 ¹ http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/PMO#Catalog_of_Standards_Processes

² http://www.nist.gov/smartgrid/upload/NIST_Framework_Release_2-0_corr.pdf

54 **4.4 Energy Consumption Reporting**

55 A) Whenever pumping, the CPPS shall be capable of transmitting measured or estimated data
56 representative of its interval energy consumption to consumers and consumer authorized third parties
57 via a communication link.

58 **Note:** EPA recommends that energy consumption data be reported in watt-hours for intervals of
59 15 minutes or less, however, representative data may also be reported in alternate units, (e.g. real-
60 time power) and intervals as specified in the ICD or API detailed in Section 4.3. The CPPS may also
61 provide energy use feedback to the consumer on the product itself and use any units and format
62 (e.g., dollars/month).

63 **4.5 Remote Management**

64 A) At minimum, the CPPS shall be capable of responding to consumer authorized signals received via a
65 communication link requesting:

- 66 1. A start or stop to pumping, and
67 2. A change to motor speed and/or rate of flow.

68 **4.6 Operational Status, User Settings & Messages**

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

- 71 1. Operational status including:
72 a. On/Off/Standby, and
73 b. Motor speed, and/or rate of flow
74 2. DR status including delay load and temporary load reduction
75 3. Program schedule including schedule times and scheduled operation

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

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

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

83 **Note:** In response to stakeholder concerns that utility peak periods vary regionally, by season, and over time;
84 EPA has elected to remove peak period avoidance in this Final Draft proposal. EPA, however, continues to
85 recognize that significant grid benefits and energy cost savings can be achieved by pool pumps that limit energy
86 use during peak periods. As such, EPA plans to include "best practices" guidance on the ENERGY STAR
87 website that encourages consumers and pool professionals to program pumping schedules that maintain pool
88 health while minimizing energy consumption during peak periods associated with their utility.

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90 **4.7 Demand Response**

91 A) At a minimum, the CPPS shall be capable of responding to Consumer Authorized Third Parties by
92 providing the following three responses:

93 **1. Type 1 Response:**

- 94 a. The CPPS shall respond in accordance with Table 3 within five minutes of receipt of a
95 requesting signal on the consumer’s premises.
- 96 b. The CPPS shall ship with default settings that enable a response in accordance with
97 4.8.A.1.a for at least 4 hours.
- 98 c. The CPPS shall be able to provide at least one Type 1 response in a rolling 12-hour period.
- 99 d. The CPPS may either delay its response or not provide a response if responding would
100 compromise safety, or result in equipment damage as determined by the manufacturer.
- 101 e. The consumer shall be able to modify, disable, or override the product’s Type 1 response
102 without limitation.

103 **Table 3: Type 1 Response Requirements**

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Pump Type	Allowable Operation
Single-speed Pump	<ul style="list-style-type: none">• 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)
Multi-speed Pump	<ul style="list-style-type: none">• If in off / Standby Mode, the Pool Pump shall remain in off / Standby Mode.• If operating above the lowest available speed, the Pool Pump shall reduce operation to the lowest available speed or switch to off / Standby Mode.
Variable-speed Pump / Variable-flow Pump	<ul style="list-style-type: none">• If operating at greater than 1/3 of full-speed/flow, the Pool Pump shall reduce operation to less than or equal to 1/3 of full-Motor Speed/Rate of Flow.• If operating at less than or equal to 1/3 of full-Motor Speed/Rate of Flow, the Pool Pump shall not increase Motor Speed/Rate of Flow.

105 **2. Type 2 Response:**

- 106 a. The CPPS shall terminate pumping for the duration of the requested response period
107 within five minutes of receipt of a requesting signal on the consumer’s premises.
- 108 b. The CPPS shall ship with default settings that enable a response in accordance with
109 4.8.A.2.a for a time period of least 20 minutes.
- 110 c. The CPPS shall be able to provide at least three Type 2 responses in a rolling 24-hour
111 period.
- 112 d. The CPPS may either delay its response or not provide a response if responding would
113 compromise safety, or result in equipment damage as determined by the manufacturer.
- 114 e. The consumer shall be able to modify, disable, or override the product’s Type 2 response
115 without limitation.

116 **3. Type 3 Response:**

- 117 a. Within five minutes of receipt of a requesting signal on the consumer's premises and in
118 accordance with consumer settings, the CPPS; if idle, shall initiate pumping, and if active,
119 shall increase Motor Speed/Rate of Flow or extend pumping duration within the
120 requested response period.
- 121 b. This response shall be limited such that the CPPS terminates pumping when:
- 122 i. programmed daily pumping volume is reached (*CPPS with controls capable of*
123 *scheduling pumping operation based on total desired volume pumped*), or
 - 124 ii. programmed daily pumping duration is reached (*all other CPPS*).
- 125 No additional pumping shall occur prior to 12:00 AM the following day.
- 126 c. The CPPS is not required to respond if doing so would compromise safety as determined
127 by the manufacturer.
- 128 d. The consumer shall be able to modify, disable, or override the product's Type 3 response
129 without limitation.

130 **Note:** In response to stakeholder concerns, EPA has added five minute maximum response time criteria that
131 applies to Type 1, Type 2 and Type 3 responses. For this specification, response time is the time from the receipt
132 of the requesting signal by the CPPS on the consumer's premises to the change in loading. This revision is
133 intended to assure utilities and other interested parties that CPPSs will reliably and responsively shed load. As
134 utilities have informed EPA that pool pumps that are able to very quickly respond to grid signals enable additional
135 grid benefits, EPA encourages manufacturers to develop connected pool pumps that respond as quickly as
136 possible.

137 **4.8 Information to Installers and Consumers**

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

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6 TEST REQUIREMENTS

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Compliance with connected criteria, as specified in Section 4, shall be through examination of product and/or product documentation. In addition, DR functionality shall be verified using the ENERGY STAR Test Method to

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Validate Demand Response (Rev. TBD) once available.