

**DOCKETED**

<b>Docket Number:</b>	20-FDAS-01
<b>Project Title:</b>	Flexible Demand Appliance Standards
<b>TN #:</b>	245758
<b>Document Title:</b>	SkyCentrics Comments on Pool Pump Control and Flexible Appliance Standards
<b>Description:</b>	N/A
<b>Filer:</b>	System
<b>Organization:</b>	SkyCentrics
<b>Submitter Role:</b>	Public
<b>Submission Date:</b>	8/31/2022 2:40:53 PM
<b>Docketed Date:</b>	8/31/2022

*Comment Received From: SkyCentrics  
Submitted On: 8/31/2022  
Docket Number: 20-FDAS-01*

**SkyCentrics Comments on Pool Pump Control and Flexible Appliance Standards**

*Additional submitted attachment is included below.*



August 31, 2022

Commissioner J. Andrew McAllister, Ph.D.  
California Energy Commission  
Dockets Office, MS-4  
Re: Docket No. 20-FDAS-01  
1516 Ninth Street  
Sacramento, CA 95814

**RE: SkyCentrics, Inc. Comments on Pool Pump Controllers and Flexible Appliance Standards**

Dear Commissioner McCallister:

SkyCentrics, Inc. (SkyCentrics) appreciates the opportunity to provide comments on the California Energy Commission's ("CEC" or "Commission") Workshop on Pool Pump Controllers and Flexible Appliance Standards. Pool Pump Controllers as well as heat pump water heaters ("HPWHs") play an essential role in two important California policy priorities: a) reducing the carbon footprint of our homes and buildings as the State moves from gas water heaters to electric water heaters; and b) helping to manage the integration of increasing amounts of renewable energy as pool pumps and HPWHs shift load and in the case of HPWHs, serve as thermal energy storage devices. The Commission's adoption of alternative compliance measures for pool pump controllers and HPWH demand management systems advance the policies that will ensure that California policies support California's desire to lower carbon emissions more quickly and cost effectively. We look forward to working with the Commission to overcome the challenges ahead to create a decarbonized grid and lower GHG emissions.

**About SkyCentrics**

SkyCentrics is a third-party Demand Response provider providing last mile connectivity to appliances and building loads using the open standards OpenADR, CTA-2045, and Volttron, founded in 2013 and headquartered in Berkeley, California. The company provides Demand Response (DR) services to utilities throughout the United States, as well as enabling other Demand Response providers and aggregators to connect to appliances that provide CTA-2045 ports through our OpenADR cloud and our cloud REST API and our recently released GEB Tool providing the world's first Grid-Interactive Efficient Building decision making tool to lower the Total Cost of Ownership (TCO) of commercial buildings and campuses. Homeowners and commercial building owners

get web and mobile apps to monitor and schedule their homes and loads, and utilities and aggregators are enabled to orchestrate millions of loads to support the grid.

SkyCentrics is also a major contractor of the CEC's \$16M Cal Flex Hub grant to the Lawrence Berkeley National Lab where we are helping LBNL and the CEC study grid-interactive flexible loads and prices to devices. SkyCentrics is a leader in the Advanced Water Heater Initiative (AWHI) co-chairing the committees on Connectivity and Commercial Heat Pump Water Heaters.

It is with this experience in mind that we suggest the following changes to the Pool Pump Controller program and Flexible Appliance Standards.

1. Mandate a CTA-2045 EcoPort in every Pool Pump Controller to enable:
  - a. Competition not monopoly
  - b. Flexibility of communication pathways (cellular, Wi-Fi, etc)
  - c. Elimination of stranded assets
2. Allow an alternative path for OEM connectivity as well

The most obvious reason for our proposal is that Pool Pump Control should take advantage of the 10 years of debate by the water heater industry over the same conversation (utility signal integration) and come to the same conclusion, but more quickly!

The water heater industry through AHRI and Energy Star's first positions on connected devices initially said "OpenADR or CTA-2045, in the cloud or on the appliance." But then, after 10 years or pilots and thoughtful deliberation, they moved to the final recommendation that we have at the end of our comments and that we recommend above. In our comments below, we provide more detailed reasoning for all the benefits of this decision.

### **Schedulable and Connectible**

The CEC would like to have pool pump controllers be able to schedule, shift, and curtail. We believe that this translates into two features needed, schedulable and connectible (to the internet or the MIDAS server directly). We review the issues that the Commission and staff should consider in the docket as they receive stakeholder feedback and prepare a final regulation for release.

The CEC draft proposal for OEM pool pump controllers has 2 features that we would like to comment on:

1. A schedule feature with a default schedule
2. A TCP/IP connection (as the open standard connection)

We propose that both of these concepts are much better served by looking at the work done for water heaters by AHRI 1430, the states of WA and OR, and CA Title 24 JA13, namely mandating a CTA-2045 EcoPort in every appliance, for the reasons stated below.

But first, some comments from the July 19 CEC Workshop on Pool Pumps (docket 20-FDAS-01) that we think reinforce our reasoning below, and to which we will refer in our comments.

Jennifer Hatfield director, Government Affairs for The Association of Pool & Spa Professionals said that “because this is a national product, and that California is likely to have different needs than other states, that the CA requirements need to be met by a modular optional method, where it can be added for CA, but not added for other states.”

Pierre Delforge of NRDC said that “We need to create a standard of open connection at the device. Might be cellular, FM...whatever it is, we need the device to be upgradeable. We need a USB type device or port like we have on laptops. And that meets Jennifer’s idea of the optional module. It will allow upgradeability and remain connected over the life. CEC should consider this now. Think of how the USB for laptops gave us so much flexibility and optionality. We need the same thing for appliances. The emerging standard is CTA-2045. There is still a lot of work happening, but requiring it is best way to get this work to be finalized. If we don’t require it, we will have a fleet of devices that has Wi-Fi built in, and they will not be long term connectible.”

Then Jennifer Hatfield said “What Pierre said was great.”

Then Pierre said, “TCP/IP is not prescriptive enough. Standards need some pull from regulation. Once it [CTA-2045] is required, you will see a lot more pull from the industry. [It provides a...] Standard set of commands and physical access at the device. They won’t be adopted if we don’t require it. But they are a minimum standard that requires long term access, connectivity to the device.”

Then Angela Chuang of EPRI said, “EPRI investigated the potential impact of default schedules for pool pumps on system operation. We are coming to a close on a multiyear project on flexible pool pumps (with Energy Star). The evolution of connected spec for pool pumps is that initially, they did have a default schedule, but after commentary, they got rid of it. Because of OEMs and utilities across the nation needing different default schedules and therefore you could not have one default schedule across the nation, so better to not have any.”

Then finally Daniel Bush of the CEC said, “Water heaters and EV chargers are the big electric loads for the grid that we want to be able to send signals to. As Commissioner McCallister said at the outset, the better foundation we can set at the beginning, here, for pool pumps, that we can then apply to water heaters and EV chargers, then the better for grid. Default schedule is good, connectivity is good, but an agreed upon set of common controls is critical. [We] Need the ability to control the schedule. A default schedule is a blunt axe. Not every day will have the same amount of solar. CEC and MIDAS are working on daily 24 hour ahead hourly price shapes. We need an active set of connected controls and two way communication. That is the end

game and we should make sure our decisions now prepare us for the end game. The ability to send a common agreed upon set of commands, to update the schedule, to get status and/or confirm response.”

The above comments during the workshop provide a lot of support for a modular approach as provided by the CTA-2045 EcoPort. The EcoPort is a standard that is ready to meet the needs of connected pool pumps. Water Heater OEMs and NGOs spent 10 years debating the merits of a CTA-2045 mandate vs relying on OEM clouds and OEM cloud API's. They concluded that an OEM path was optional and to be expected, at least in the case of the larger manufacturers, but a mandated CTA-2045 EcoPort was critical for the reasons stated above, and those stated below in our comments.

SkyCentrics believes that the CEC should take advantage of the years of debate that occurred with water heaters and settle on the same conclusion. You can see the final language decided by the Advanced Water Heater Initiative (AWHI) on the AWHI table at the end of our comments below. UL and Intertek have hardware and software provided by NEEA and the OpenADR Alliance that can certify water heaters to be CTA-2045-B Level 2 compliant. The hardware for testing CTA-2045-B compliance is 'ready to go' and the software can be modified in weeks to certify pool pump controllers to be CTA-2045-B Level 102 compliant. We attach both the CTA-2045-B Level 2 'cheat sheet' provided to water heater OEMs and a draft of what the CTA-2045-B Level 102 compliance 'cheat sheet' could look like for pool pumps.

### **Part I - Schedulable**

Schedulable is needed for both the schedule and shift features that the CEC wants.

All 3 major pool pump controller OEMs currently have a schedulable function. Most of the small independent third party controllers have this as well. That is the whole point of those particular products.

Given that, as stated below, all the 3 major OEM pool pump controllers also have a connectible function to their own clouds, then it would appear that at least for the 3 major OEMs, the CEC is ONLY asking for one new feature to be implemented, namely the default schedule. Speaking to some of the pool pump OEMs we discovered these important issues that CEC should take into consideration as they debate the implementation of a default schedule:

1. Variable speed pool pumps are generally set to run at about 800-1000 RPMs. However, when they power on, they prime. This means that for between 30 seconds to up to 5 minutes, they turn on at their highest speed (about 3400 RPMs). This uses about 3000 watts of power. Is California ready for 200,000 pool pumps to come on at 3,000 watts at exactly 9 AM?  
If the CEC chooses to require a default schedule, they may choose to have a randomized delay of this feature of up to 5 minutes placed in each controller.

2. The OEMs ship their products through national distribution. They asked if other states would want the same default schedule or different. We believe that at least some other states would want a different schedule. This is a 'non-starter' for the OEMs. They will not ship to different states with different default schedules.
3. Please note Angela Chuang of EPRI's comments above, where Energy Star considered a default schedule for pool pump controllers and then decided against it.

However, CTA-2045 EcoPort module makers can easily ship different modules with different schedules to different states. The CTA-2045 EcoPorts can have the default schedules that the CEC wants and can have the randomized time delay on start and stop that the CEC should consider. More importantly, the CTA-2045 EcoPort also provides the critical features shown below in the connectivity section that we believe the CEC would agree best meets the needs of the people of California.

## **Part II - Connectible**

Connectible is needed for the curtail features that the CEC wants, let alone the end game of daily, or even more frequently changed, price shapes. SkyCentrics is part of the CEC California Flex Hub grant that is studying how to deliver prices to devices, starting with 24 hour ahead daily price shapes with hourly price blocks (initially hourly, but more granular down the road, and then possibly updated more than once every 24 hours). As Daniel Bush said on the July 19 Workshop,

“Default schedule is a blunt axe. Not every day will have the same amount of solar. CEC and MIDAS are working on daily 24 hour ahead hourly price shapes. We need an active set of connected controls and two way communication. That is the end game and we should make sure our decisions now prepare us for the end game. The ability to send a common agreed upon set of commands, to update the schedule, to get status and/or confirm response [on a regular basis].”

All 3 major pool pump controller OEMS currently have a connectible function to their own clouds. Therefore by definition, they have a TCP/IP connection to their pool pump controllers. Therefore, in the current draft proposal, the CEC is asking for nothing new.

Also, asking for a TCP/IP connection is not prescriptive enough, as Pierre Delforge of NRDC said at the workshop. If a pool pump has a TCP/IP connection, each OEM can have different commands, or more importantly NOT have them. Each OEM can have different data provided by its controller or NOT have the data provided. Let alone that a different language is needed to talk to each OEM product. In contrast, the CTA-2045 EcoPort enables a common language to be spoken by all pool pump controllers. Agreeing on CTA-2045-B Level 102 for pool pumps like Level 2 for water heaters means that all OEMs have agreed that they can deliver controllers that will speak a common language, deliver the same data, and respond to the same control signals.

To summarize, mandating a TCP/IP connection:

1. Does not change what the 3 major pool pump controllers already do, they have TCP/IP connections to their own clouds.
2. Does not enable third party connections except through an API through the OEM cloud (which would be encouraging monopoly access [see below for more details on this])
3. Does not enable a local connection. Even if you mandate that the TCP/IP port must be swappable to another local connection, there is no guarantee that you can speak the language to control the pump or get data from the pump.

A CTA-2045 EcoPort solves all of the problems identified, including items 2 and 3 above. It does enable third party connections, and it does enable the possibility of local connections.

There are three ways to mandate connectible:

1. connectible but only with added options purchased later sometimes called 'dongles',
2. connectible 'out of the box',
3. connected 'out of the box'.

Typically cellular is the only way to have #3, connected out of the box. When powered up the device phones home and you are connected. Connectible out of the box is generally Wi-Fi, but can be many other options such as RS-485, Ethernet, Z-Wave, LoRa, and Powerline Carrier to name a few. When specifications or mandates require connectible, unfortunately, they think they are getting 'out of the box', but sometimes they get 'only with added options purchased later'. It is important to be cautious if you do not want that outcome.

### **Communication path options**

When connectible mandates occur, the regulator should decide if they are comfortable with only one communication path option, or they want more flexibility. Utilities generally want more flexibility. In home appliances, the option provided by the OEM is often ONLY Wi-Fi, and utilities have a lot of issues with Wi-Fi in pilots and programs over the last 10-20 years. People change routers, change their passwords and equipment getting grid signals becomes disconnected. It is often costly to utility operations budgets to call customers and ask them to re-connect the equipment. A CTA-2045 EcoPort gives you optionality for ANY communication path both present and future.

### **Longevity and future proofing**

Longevity is important for utility assets and infrastructure. Utilities think in 50 year time frames. Water heaters may only last 10-20 years, but for example, Scientific Atlanta FM radio load control switches (LCS) that were wired to the water heater can remain in place and simply be wired to the next water heater. Interestingly, when the LCS started failing and being irreplaceable, utilities wanted a 'swap out solution' so that an installer could leave the wiring in place and the box in place and just swap out the electric board that was in the box. This is a good example of the longevity desired by utilities.

Related to longevity, is future proofing. One would think that although costly, cellular is the most future proof communication path. However one utility put out an RFP for an LCS that

would have a cellular connection built in, and a CTA-2045 EcoPort port. When asked why they needed the port given that they already had built in cellular, they replied, “In 10-20 years, that cellular 5G connection may be deprecated and cease to function because the cellular networks are moving to 9G. At that time, we want to just be able to ship the customer a 9G EcoPort module.”

Future proof also speaks to what happens when the appliance itself fails. Will the new appliance have a different method of communication? Will it require contracts with new manufacturers? New API integrations to their platform? The only way developed to date to swap a communications method to the old appliance with a new appliance without the risk of the above integration issues is with an open-standard communications port such as the CTA-2045 EcoPort. If mandated for all new appliances of that type, as WA and OR have done for water heaters, then any new water heater or pool pump controller will have the EcoPort and the EcoPort module from one manufacturer can simply be swapped to the new appliance and communications with reliable data interchange and reliable response to known and useful commands from the utilities or price signals can instantly start again.

### **Avoiding Stranded Assets**

Based on the examples in Longevity and Future Proofing above, one can see that the risk of stranded assets is greatly reduced by a CTA-2045 EcoPort. In the one risk case not mentioned, where the EcoPort module maker goes out of business, the least expensive recovery of those stranded assets that has ever existed can be put into place, namely mailing each customer a new EcoPort module from a new manufacturer.

### **Promoting competition vs promoting monopoly**

In the same way that the EcoPort allows for communication path flexibility, promotes longevity and future proofing, and avoids stranded assets, it also promotes competition vs promoting monopoly. Don't state regulators generally want to promote competition and avoid promoting monopoly. The EcoPort solution, as shown in the stranded asset example above, enables a very inexpensive way of 'swapping out' vendors. If one EcoPort module vendor raises its prices or changes its functionality, the large electric loads which were connected through those modules can be connected to a different EcoPort module vendor by simply mailing customers the new EcoPort module. **If there is NO EcoPort mandate, then state regulators are essentially promoting a monopoly** because the only way to connect to the appliance will be through the OEM cloud paying the OEM fees for access, with no opportunity for other options to access the appliance.

### **Leaving room for smaller OEMs**

The big 3 pool pump OEMs have internet connectivity and are schedulable both locally and remotely. Smaller OEMs often do not have internet connectivity but are generally schedulable. One of the impacts of regulations is that they make smaller OEMs with smaller budgets incur costs that are a larger percentage of their budget. In the pool pump controller case, if these smaller OEMs have not created a cloud solution for internet connectivity, it is because they have not had it in their budget. In the water heater world, SkyCentrics has worked with smaller

OEMs to enable them to have a CTA-2045 ECOPORT and then they never have to create a cloud solution. Their customers can get BOTH a cloud solution for remote access AND be CA Title 24 JA13 compliant (in the case of water heaters, that is the regulation) and the OEM does not have to incur the expense of creating a cloud solution. Instead, they incur the much smaller expense of creating just the ECOPORT. This is \$2-3 in parts cost if they already have a digital computing chip (CPU) and some firmware change. It is obviously a bit more if they do not have a CPU at all.

### Challenges with using OEM clouds

The Energy Star Connected Device (ESCD) standards mandate that vendors provide an open standard solution at the edge of the ‘system’ where the ‘system’ is defined as “at the appliance” or “a module on the appliance” or “the cloud to which an appliance is connected”. The only open standards mentioned as used at this time are OpenADR and CTA-2045. Since CTA-2045 is a standard specifying a hardware port, it obviously cannot be used in the cloud.

OEMs see this choice as: I can put a CTA-2045 port at my appliance which requires a hardware change, or I can put OpenADR in my cloud. Since OEMs do not like hardware changes on their commodity white goods, they would prefer to avoid that if possible. The ESCD standard gives them that option. If they choose OpenADR in their cloud, then **they will have monopoly access to the fleet of their devices essentially forever**. Not only that, but they will have NO communication path flexibility as they will only choose to put one connectivity type on their appliance (typically Wi-Fi). At most, they may have dongles of their own to provide other connectivity paths. Each manufacturer would have their own set of dongles causing what CEC Commissioner McCallister was the undesirable state of ‘dongle-itis.’

Finally, utilities are anxious about having to contract with many different appliance vendors. These are expensive contracts to negotiate and the vendors may End of Life their support for their devices. Even Google, not a small company, has End of Life’d some of their Internet of Things devices.

An EcoPort solution allows utilities to contract with one vendor and cover many appliance types and a variety of OEMs. To date, that is water heaters, pool pumps, EV Chargers, HVAC PTAC, HVAC mini-split, commercial heat pump water heaters.

Note that AWHI and NEEA have developed what seems to be the ‘best of both worlds’ specification. They mandate a CTA-2045 port, but ‘expect’ that OEMs will also have their own connectivity path to the appliance. See table below to see the AWHI language that includes what CA Title 24 JA 13 required for water heaters.

Attribute for feature	Reference documents or explanation
1. Required connectivity Pathways:	<ul style="list-style-type: none"> <li>(A) NEEA AWHs 7.0<sup>1</sup> Section 6.4 and Appendix G: CTA-2045 compliant communication port</li> </ul>

<sup>1</sup> See the Northwest Energy-Efficiency Alliance Advanced Water Heating Specification, Version 7.0 (effective 6/30/2020), <https://neea.org/img/documents/Advanced-Water-Heating-Specification.pdf>.

<p>(A) CTA-2045 EcoPort Physical Port.  (B) The ability to input a TOU schedule as specified by JA13.  <b>Voted on and approved 2020 08 07 Majority</b></p>	<p>(AC or DC form factor). The CTA-2045 port must be: (1) fully integrated into water heater at time of production; or (2) if a dongle is used to provide the CTA-2045 port, a dongle must be factory installed on the heater with fastening system such that it will not become detached during shipment and installation.</p> <ul style="list-style-type: none"> <li>(B) This can be done by a manufacturer’s communication pathway or the CTA-2045 module pathway. HPWH manufacturers and/or CTA-2045 module vendors have a choice of the communication technology to be used including, but not limited to: WiFi, Bluetooth, control panel screen on unit, etc.</li> </ul>
<p>2. Time of Use (TOU) Schedules / time variable rates including the initial setup commissioning and functioning.  <b>Voted on and approved 2020 08 07 unanimously</b></p>	<p>As specified <a href="#">in JA13<sup>2</sup> sections 13.3.3 a, d, e, f, and g of CEC’s</a> or a future version of an industry standard which includes TOU schedule requirements and a standard format for such schedules for utilities (e.g., CTA2045-B)</p>
<p>3. Required Minimum Demand Management Command set  <b>Voted on and approved 2020 09 04 unanimously</b></p>	<p>See for full detail of CTA 2045-B level one and level two in appendix A</p>
<p>4. Time Varying Rate updates and communication protocols with long term solutions under development at the CEC.  <b>Voted on and approved 2020 09 04 unanimously</b></p>	<p>Be compliant with CTA-2045-B Appendix F: Certification Level 2 (Water Heater). Specifically: Support the Price Stream message to allow fully flexible price schedules, meeting the needs of both TOU now and higher resolution time-varying rates in future. Per CTA-2045-B Certification Level 2: A minimum of 64 time/price pairs should be supported and stored internally to allow optimization of the water heater control over the next 24 hours.</p>

<sup>2</sup> See the California Energy Commission’s Joint Appendix 13, [https://www.energy.ca.gov/sites/default/files/2020-07/JA13\\_Qualification\\_Requirement\\_HPWH\\_DM\\_ADA.pdf](https://www.energy.ca.gov/sites/default/files/2020-07/JA13_Qualification_Requirement_HPWH_DM_ADA.pdf).

CTA-2045-B Level 202 Command Overview

Row	Data Link Messages (Message Type 0x08, 0x03):				Pool Pump 202		
		CTA-2045-A Mandatory					
		SGDs	UCMs			Level 202	
1	Link ACK	Y	Y			y	
2	Link NAK	Y	Y			y	
3	Query Maximum Payload Length	Y	Y			y	
4	Maximum Payload Length	Y	Y			y (256 bytes)	
5	Message Type Supported	Y	Y			y	
	<b>Basic DR Application (Message Type = 0x08, 0x01)</b>						
		CTA-2045 Mandatory					
		SGDs	UCMs				
6	Basic Application ACK	Y	Y			y	
7	Basic Application NAK	Y	Y			y	
8	Shed - JA 13 (light shed)	Y	Y			y	Use less energy (Match what Energy Star Connected Device asks for)
9	End Shed	Y	Y			y	
10	Outside Comm Connection Status	Y	Y			y	
8	Critical Peak Event - JA 13 (Deep Shed)					y (can be the same behavior as with Grid Emergency)	Use even less energy than Shed OR just match what you do with Grid Emergency
9	Grid Emergency - JA 13 (Full Shed)					y	Use the least energy possible (Match what Energy Star Connected Device asks for)
10	Customer Override					y	
11	Operational State Query					y	
12	State Query Response					y	
13	Load Up - JA 13 (Basic Load Up)					y	If Off, turn on. If On, Use more energy (Match what Energy Star Connected Device asks for)
14	Power Level (0-100%)					n	
	<b>Intermediate DR Application (Message Type 0x08, 0x02):</b>						
11	NEW Advanced Load Up - JA 13 (Advanced Load Up)					y (can be the same behavior as Load Up)	Turn on immediately, and use more energy than in a Load Up command (may not be applicable to pool pumps)
12	Device Information Request					y	Report Power Usage
13	Get/Set UTC Time					n	
14	Get Commodity Read (UCM->SGD only)					y	
15	Get/Set SGD Efficiency Level					n	
16	Get/Set User Preference Level					n	

**Color Description**

New in CTA-2045-B
Underlying communications
Shed Events
Load Up Events
Related To Events
Higher level commands
NO - Not Needed

Consider CTA-2045.1 - optional spec for ap

For OEMs wanting to 'do the minimum' to implement the CTA-2045 standard

- 1) 2 levels of shed (Shed = Use Less Energy, Grid Emergency = Essentially OFF)
- 2) 1 level of Load Up - but aspire to Advanced Load Up
- 3) Device Information Request - Deliver the instantaneous power consumption of your product to an accuracy within 10-15% - more accuracy is great
- 4) Operational State (Running normal, Idle Normal, Running Curtailed, Idle Curtailed, Running Heightened, Idle Heightened)
- 5) Customer override