



Via email only to: ConnectedProducts@energystar.gov

March 18, 2019

Abigail Daken
Manager ENERGY STAR Connected Products
US EPA
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Re: Request for Comments - Connected Criteria for Large Load Products Discussion Guide

Dear Ms. Daken:

By way of this letter, Steffes, LLC (“Steffes”) responds to the above referenced Request for Comments. Our corporate address is 3050 Hwy 22 N, Dickinson, North Dakota 58601. The Steffes’ contact person for questions or comments is Paul Steffes who can be reached at 704-483-5400 or by E mail at psteffes@steffes.com.

Steffes is a fifty-year old, privately-held concern with manufacturing facilities located in Dickinson and Grand Forks, North Dakota. Although we make a variety of OEM and consumer products, for more than 30 years Steffes has supplied commercial and residential markets with Energy Storage Systems used in load shifting programs administered by electric utilities..

Over the last decade, Steffes has emerged as an industry leader in the nascent *grid-interactive* space (for domestic water and space heating). Our work in this area includes primary research and development that we have performed internally at Steffes, as well as collaborations with other parties, including the Electric Power Research Institute and the Natural Resources Defense Council.

With that introduction, we are pleased to offer responses to EPA’s questions below.

Respectfully submitted,

/S/

Paul Steffes

Founder and CEO

STEFFES RESPONSE TO EPA QUESTIONS

QUESTIONS FROM PAGES 6 AND 7

1) What are the implications to upgrading local processors to be able to respond locally? (added hardware, software changes, energy use, other considerations)

RESPONSE: For water heaters that are shipped with processors (like the Steffes [Hydro Plus](#)), only a software modification would be required. For all other water heaters, additional hardware would be required.

2) What are the pros and cons of DR application layer message translation locally in the product?

RESPONSE: Steffes is unaware of any other means of performing application layer message translation except locally.

3) What are the pros and cons of products using a cloud connection for DR response?

RESPONSE: Pros - Real-time access to log data and issue commands, ability to update software as-needed. Leverage data analytics. Cons – more complex, additional hardware (compared to local controlled only), reliant on multiple parties and connections.

4) Is there a way to quantify the additional utility support that would be available for products that do have local application layer protocol translation and therefore are a less risky investment?

RESPONSE: Steffes believes it might be theoretically possible to quantify such support but is unaware of any such efforts to date. Moreover, Steffes is not convinced that such an approach would necessarily be less risky.

5) The flexible load resources these products could provide would be most useful to the grid if distribution system operators know where they sit in the grid topology. For instance, this would allow optimum use of these resources to alleviate distribution bottlenecks. What mechanisms are used currently to provide this insight (e.g. in program deployment)? Are there specification criteria that could facilitate this?

RESPONSE: Steffes employs an asset grouping approach (that requires a predetermined minimum number of assets in each group to function properly). We typically find that our customers are ill-prepared to handle assets to achieve this value. Further, Steffes does not believe that further specifications would necessarily be helpful as the challenge seems more to be one of communications (sales) versus want for additional clarity through additional specification.

QUESTIONS SPECIFIC TO WATER HEATERS

1) If an ENERGY STAR DR test method is developed, what issues specific to heat pump water heaters would need to be addressed?

RESPONSE: High tank temperature limit (implicates tank volume required as well as need for tempering valve), minimum ambient air temperature limit, compressor protective time delay controls.

If we're talking about add-on kits for standard HPWHs, power cycling multiple times per day could be an issue. If we're talking about "smart" HPWHs, managing the elements and compressor in tandem could be an issue. Steffes has been working on this problem for a number of years and has proprietary approaches it would be willing to discuss with EPA.

2) If an ENERGY STAR DR test method is developed, what considerations should be addressed so that it is also useful for electric resistance water heaters outside of the ENERGY STAR program?

RESPONSE: For ERWHs, allowing sub-100% UEF values for large tanks would be important. As with HPWHs, addressing high-temperature operation would be important.

3) EPA would include a requirement that allows consumers to temporarily override a DR event. What is the appropriate length of time before the water heater returns to normal DR-ready operation?

RESPONSE: Rather than a *requirement* to allow consumers to temporarily override a DR event, Steffes would prefer permissive (consumer choice) language.

With respect to the appropriate length of time for the water heater returns to normal operation, assuming a desire to get to full temperature from cold, the following formula is helpful: $t = 2.3 * V * 70 / P$, where t = time in hours, V = water heater rated volume, and P = water heater rated input during override. Note that it may be desirable for this to be vendor-defined as a sales feature / differentiator.

4) Can EPA easily build off response requirements, such as those in CEE's Residential Water Heating Initiative, or is more specificity required for ENERGY STAR?

RESPONSE: building off the response requirement found in other documents (such as CEE'S Residential Water Heating Initiative) would be reasonable.

5) What data would water heaters need to be able to send to a DR management entity (DRMS, etc.) about their state to optimize usefulness to the grid (e.g. current energy storage capacity, tank temperature, etc.)? What data are water heater manufacturers and service providers willing to send?

RESPONSE: Required data would be application-dependent but, at a minimum, would include energy capacity, stored energy (in W-h), power capacity, and instantaneous power (in W) to start. In addition, target/baseline stored energy, baseline power would likely be required. On a less certain bases, frequency reading, VARs, electric potential, status parameters, errors, availability (instantaneous and scheduled), etc. could also be required.

6) Can manufacturers remain in control of user experience when service may be impacted by use of water heaters as grid resources? If so, are there any criteria necessary to ensure it's possible? If not, how will user impact be minimized?

RESPONSE: priority must be given to performing an asset's primary function (e.g., Heating water for domestic use) over ancillary services. As connected criteria tend to clamp down on operational flexibility with ridge rules, the devices will conform strictly with the requirements of the rules at the potential expense of innovation.