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STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

Washington State Energy Code Development

Standard Energy Code Proposal Form

Code being amended: ☒ Commercial Provisions ☐ Residential Provisions

Code Section # C404.14

Brief Description:

This proposal adds demand responsive control requirements for certain water heaters.

Proposed code change text: (Copy the existing text from the Integrated Draft, linked above, and then use underline for new text and ~~strikeout~~ for text to be deleted.)

Add new definitions as follow and renumber Section C404.14s:

DEMAND RESPONSIVE CONTROL. A control capable of receiving and automatically responding to a demand signal.

Add new section as follows:

C404.14 Demand Responsive Water Heating. ~~All electric water heating systems with an integrated storage tank~~Electric storage water heaters with a tank larger than 20 gallons shall be provided with *demand response controls* that comply with ANSI/CTA-2045-~~B~~ A or another equivalent *approved demand responsive control*.

Exception: Health care facilities.

Add new reference standard:

Reference	Title	Section
American National Standards Institute (ANSI) 25 West 43rd Street New York, NY 20036, United States 1-212-642-4900; www.ansi.org		
ANSI/CTA-2045-B	Modular Communications Interface for Energy Management	7.3.4.4

Purpose of revision:

The revision provides editorial changes that align the language with the terminology to denote these water heaters in the water heating equipment efficiency table. The protocol has been changed to CTA-2045-A. Conversations with AHRI have indicated that there may not sufficient availability of equipment that meets

CTA-2045-B by the time this code goes into effect. It also clarifies that the alternate demand responsive control needs to be equivalent to CTA-2045-A.

This proposal does not conflict with the Commerce Department rule (WAC 194-24-180) which requires compliance with CTA-2045-A for some storage water heaters. The state statute is limited to water heaters larger than 40 gallons. However, 30-gallon water heaters are common particularly in small commercial buildings and multifamily buildings that do utilize individual water heaters. This proposal effectively expands the water heaters that would need to be DR-capable.

Purpose of code change:

Water heaters can provide significant load shifting and energy storage capacity in many building types. ANSI/CTA-2045 standardizes the socket, and communications protocol, for heat pump water heaters so they can communicate with the electricity grid other demand response signal providers. In addition, 2045 adds control and communications requirements for mixing valves in HPWH to enable them to provide greater storage capacity to support increased load shifting. The addendum also creates a definition of demand responsive control to ensure its consistent use throughout the code. ANSI/CTA-2045 is the industry standard for demand responsive controls for water heaters, but the requirement allows for other protocols to be approved by the building official.

This proposal requires that water heaters with integrated storage tanks have this demand control functionality. The requirement is limited to electric water heaters with integrated storage tanks. It only applies to water heaters over 20 gallons in order to exclude small, point-of-use water heaters; these water heaters also only have very small capacity for demand response. Water heaters in health care facilities are also exempted since the hot water provided can be considered a part of health care. The requirement would also not apply to large water heating systems, as they generally have separate storage tanks. These water heaters subject to this requirement generally serve lavatories and kitchenettes in commercial buildings and some water heating approaches in mid-rise residential.

Grid flexibility is one of the foundations of achieving meaningful decarbonization of building energy as it is an essential element of decarbonizing the electrical grid. Carbon free energy sources like solar and wind have varying production over the course of the day and the year. Demand responsive controls that can respond to demand response signals enable buildings to shape their loads to better align with available energy production. This could come in the form of curtailing energy use when demand is high or utilizing excess production for building tasks like pre-conditioning spaces or service hot water when demand is lower.

Your amendment must meet one of the following criteria. Select at least one:

- ☐ Addresses a critical life/safety need.
- ☐ The amendment clarifies the intent or application of the code.
- ☒ Addresses a specific state policy or statute. (Note that energy conservation is a state policy)
- ☐ Consistency with state or federal regulations.
- ☐ Addresses a unique character of the state.
- ☐ Corrects errors and omissions.

Check the building types that would be impacted by your code change:

- ☐ Single family/duplex/townhome
- ☐ Multi-family 1 – 3 stories
- ☒ Multi-family 4 + stories
- ☒ Commercial / Retail
- ☐ Institutional
- ☒ Industrial

Your name	Sean Denniston	Email address	sean@newbuildings.org
Your organization	New Buildings Institute	Phone number	503-481-7253

Other contact name Click here to enter text.

Economic Impact Data Sheet

Briefly summarize your proposal's primary economic impacts and benefits to building owners, tenants and businesses.

Demand control functionality will present a cost-saving opportunity for buildings in the future. More and more utilities are moving beyond voluntary programs and are expanding use of time-of-use rates for electricity as a tool for shaping demand. Installing demand-responsive lighting controls now will allow building tenants and owners to better control their utility costs. Since this requirement is part of the construction code, it will not require buildings to participate in any demand response programs. But it will ensure that buildings are capable of participating, so that WA buildings will be able to help integrate building loads with available production.

Provide your best estimate of the construction cost (or cost savings) of your code change proposal? (See OFM Life Cycle Cost **Analysis tool** and **Instructions;** use these **Inputs**. **Webinars on the tool can be found Here and Here**)

$Click here to enter text./square foot (For residential projects, also provide $Click here to enter text./ dwelling unit)

Show calculations here, and list sources for costs/savings, or attach backup data pages

There are two cost scenarios for CTA-2045-enabled water heaters:

- **Heat Pump Water Heaters:** CTA-2045 has become a largely standard (but not universal) feature of heat pump water heaters. Rheem and AO Smith, the brands carried by Home Depot and Lowes, both include CTA-2045 ports. Therefore, for buildings that are already utilizing unitized HPWHs to meet performance requirements, the incremental cost is $0 through product selection.
- **Electric Resistance Water Heaters:** CTA-2045 electric resistance water heaters have been produced, but don't seem to be widely available since HPWHs have taken over the energy efficient segment of the market. Therefore, the most straightforward way to implement CTA-2045 is to move to a HPWH with an incremental cost in the $1000 range. However, many utilities in WA offer incentives in the $500 range.
  - Rheem 40-gal "Performance" electric resistance: $379[1]
  - Rheem 50-gal "Performance Platinum" HPWH: $1399[2]

Provide your best estimate of the annual energy savings (or additional energy use) for your code change proposal?

kWH/ square foot (or) Click here to enter text.KBTU/ square foot

(For residential projects, also provide Click here to enter text.KWH/KBTU / dwelling unit)

Show calculations here, and list sources for energy savings estimates, or attach backup data pages

Although a HPWH would deliver additional savings (60% on average[3]), the purpose of the CTA-2045 protocol is not to save energy overall, but to serve peak energy.

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[1] https://www.homedepot.com/p/Rheem-Performance-40-Gal-Medium-6-Year-4500-4500-Watt-Elements-Electric-Tank-Water-Heater-XE40M06ST45U1/205810725. Accessed 6/30/2021

[2] https://www.homedepot.com/p/Rheem-Performance-Platinum-50-Gal-10-Year-Hybrid-High-Efficiency-Smart-Tank-Electric-Water-Heater-XE50T10H45U0/312742081. Accessed 6/30/2021

[3] https://hotwatersolutionsnw.org

List any code enforcement time for additional plan review or inspections that your proposal will require, in hours per permit application:

This proposal will add a minimal amount of extra plan review. Spec sheets will need to be checked to ensure that the water heater meets the requirement. There should be no additional inspection time if site inspectors are checking that water heating equipment is consistent with the construction documents.

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.