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## Multifamily Domestic Hot Water - Demand Control Clean Up

*Additional submitted attachment is included below.*

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June 12, 2023

RE: Multifamily DHW – Demand Control Clean Up

To Whom it May Concern:

Enovative would like to provide its perspective on the rule making for changing the recirculation control requirements for multifamily central domestic hot water systems. We have been involved with research, development, and installation with various recirculation control systems for multifamily buildings since 2006 and can offer some valuable insights.

First, the current CA T24 energy code calls for demand recirculation controls as a prescriptive requirement. This is using flow sensing technology to detect demand, as well as return line temperature to regulate the run time of the recirculation pump. Optionally, you can incorporate a timed trigger to simulate flow in order to ensure that the pump does not stay off for too long a period of time during off-peak periods of hot water demand. Operating the pump in this fashion has shown consistent and dramatic reduction in both pump run time and of water heater/boiler fire time

Demand controls have significant potential for energy savings, as has been documented by numerous independent research efforts. Here are just a few, as a reference:

- Benningfield Group. (2009) *Monitoring Report: Demand Control for Multifamily Central Domestic Hot Water*
- CASE 2013 California Building Energy Efficiency Standards (2011) *Multifamily Central DHW and Solar Water Heating*
- Heschong Mahone Group, Public Interest Energy Reseach (PIER) program (2013) *Multifamily Central Domestic Hot Water Distribution Systems*
- Gas Technology Institute (2014) *On-Demand Controls for Central Hot Water Systems White Paper*
- MN Center for Energy and Environment (2018), *Evaluation of New DHW System Controls in Hospitality and Commercial Buildings*
- Levy Partnership (2019) *Multifamily Domestic Hot Water Demand Controls Demonstration*

Our understanding is that the code is being re-written disallow demand controls over concerns that the controls may too often be disabled or bypassed because of hot water service-related issues when compared to pumps that circulate continuously.

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In actuality, commercial demand controls (to differentiate from demand controls used in single family residential buildings) still have no meaningful market penetration in California and are, to a large extent, underutilized and most contractors and plumbing engineers are unfamiliar with the technology. Instead, the current practice in the industry is to continue using either conventional recirculation pumps that operate on a continuous basis, on an aquastat deadband control, or on a VSD, which will modulate the speed of flow based on demand conditions, but still run the pump continuously.

As a manufacturer and installer of demand controls, Enovative has seen these systems work in multifamily buildings, sometimes for many years, without any issues. We have seen these work with boilers and have seen them work with heat pump water heaters with extremely beneficial results. When a demand recirculation control is properly installed and adjusted to match the characteristics of the building, there are few other measures that are as cost effective and deliver as much absolute energy savings, without sacrificing on hot water service.

Rather than eliminating demand controls as a pathway to meeting the prescriptive requirement, the energy code should instead provide multiple options for design engineers to choose from, if demand controls do not work for them. For example, in the original CASE study of 2011, the researchers demonstrated that temperature modulation controls, remote monitoring, and a combination of temperature modulation/remote monitoring also provided an alternative way to mitigate recirculation loop losses versus demand controls. See table below:

| Control Technology | Low-rise | | | High-rise | | |
|---|---|---|---|---|---|---|
| | Electricity Savings (kWh) | Demand Savings (kW) | Natural Gas Savings (Therms) | Electricity Savings (kWh) | Demand Savings (kW) | Natural Gas Savings (Therms) |
| Temperature Modulation | 0 | 0 | 405 | 0 | 0 | 535 |
| Continuous Monitoring | 0 | 0 | 461 | 0 | 0 | 771 |
| Temperature Modulation + Continuous Monitoring | 0 | 0 | 785 | 0 | 0 | 1199 |
| Demand Control | 1228 | 0.140 | 1014 | 2035 | 0.233 | 1255 |

These are just some optional controls strategies with modeled and validated savings that allows flexibility to the designer engineer and building operator, but are also basic enough that they are offered by any number of controls manufacturers. Many boilers and commercial water heaters also have these modulation and monitoring capabilities built-in to some of their models.

VFD's could also be another option, however, little data exists as to the impact that they have on reducing distribution heat losses versus just the energy used to run the pump. The bigger point being, that given the differences in building, plumbing, and DHW system configurations, the energy code should provide a short menu of proven, cost-effective control strategies for hot water recirculation in multifamily buildings to meet the prescriptive code requirement.

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Sincerely,

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