Proposal Summary

Circulator Pump Controls

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Measure Description

This measure would prescriptively require circulator pumps serving central water heating systems in nonresidential buildings to have advanced digital pump controls. Applicable controls would include internal or external controls that reduce energy use at the pump and/or water heater. The proposed control requirements would vary based on building size, application, water heating plant types, and distribution system designs. Proposed continuous pump control methods include but are not limited to pressure based variable speed control with thermal balancing valve(s), constant return temperature control, demand flow-based control, aquastat, and digital timeclock. The proposed measure would be applicable to new construction, alterations and additions.

This measure would include a reference appendix to add startup and field verification requirements for contractors based on the application and pump control strategy. Field verification would be via self-attestation on the design (NRCC) and installation (NRCI) forms.

Table 1 summarizes the scope of the proposed code change.

Table 1: Scope of Proposed Code Change

An “X” indicates the proposed code change is relevant.

Building Type(s)		single family	**Construction Type(s)**	X	new construction
		multifamily		X	additions
	X	nonresidential		X	alterations
Type of Change		mandatory	**Updates to Compliance Software**		no updates
	X	prescriptive		X	update existing feature
		performance		X	add new feature
Third Party Verification	X	no changes to third party verification			
		update existing verification requirements			

		add new verification requirements	

Justification for Proposed Change

Currently, there is a mandatory requirement that circulating pumps are capable of automatically turning off. There are no prescriptive requirements for advanced digital pump controls in Title 24, Part 6 for nonresidential buildings with central water heating systems. Although the experience of the Statewide CASE Team suggests that aquastat and analog timer controls are commonly installed in nonresidential buildings, these control types have longevity challenges.

Several studies have evaluated the benefits of ECM pumps and controls including the High-Performance Circulator Pump Demonstration Study by National Renewable Energy Laboratory (NREL) (Dean, Honnekeri, & Barker, 2018) and Extended Motor Products Savings Validation Research on Clean Water Pumps and Circulators by Northwest Energy Efficiency Alliance (NEEA) (Group, 2019). The NREL study suggests that the domestic hot water pumps electricity savings range from 90 percent to 96 percent with a simple payback period of 3 to 4 years. Based on the NEEA study results; ECM pumps provide approximately 50 percent savings while added controls can provide up to 84 percent electricity savings at the circulator pump. These studies do not evaluate the potential energy savings at the water heater. Based on these two studies, this measure is highly cost-effective.

In addition to the above studies, TRC and 2050 Partners are working on a field demonstration study for circulator pump controls. The Statewide CASE Team will leverage data from this study to inform the energy savings for the proposed measure.

Data Needs / Information Requests

The Statewide CASE Team is seeking the following information to inform the code change proposal. Data may be provided anonymously. To participate or provide information, please email [Richard Fatu, rfatu@trccompanies.com] directly and copy info@title24stakeholders.com.

- Design drawings for nonresidential buildings with recirculation systems and pump controls.

- Product literature/specifications for internal and external control products that are existing and in development.
- Documentation of successful implementations (case studies, adaptive flow control).
- Interviews/surveys with designers, consultants, contractors, installers, building officials, distributors, and manufacturers.
- Cost data from contractors, distributors, installers, consultants.
- Utility program data (e.g., nonresidential demand control midstream, aquastats, timeclocks).

Draft Code Language

1.1 Guide to Marked Up Language

The proposed changes to the Standards and Reference Appendices are provided below. Changes to the 2025 documents are marked with blue underlining (new language) and ~~strikethroughs~~ (deletions).

1.2 Title 24, Part 1

There are no proposed changes to Title 24, Part 1.

1.3 Title 24, Part 6

SECTION 110.3 – MANDATORY REQUIREMENTS FOR SERVICE WATER-HEATING SYSTEMS AND EQUIPMENT

. . .

2. Controls for hot water distribution systems. Service hot water systems with circulating pumps or with electrical heat trace systems shall be capable of automatically turning off/on the system using at least one of the following controls.

A. Digital timeclock

B. Digital aquastat

C. Self-learning control

D. Demand Control

E. Intermittent time control

Exception to Section 110.3(c)3: Systems serving residential buildings, dwelling units in multifamily buildings, and guest rooms in hotels/motels.

SECTION 140.5(a) Nonresidential Occupancies. Service water heating systems in nonresidential buildings shall meet the requirements of 1, ~~or~~ 2, and 3 below, or meet the performance compliance requirements of Section 140.1:

3. Nonresidential buildings with a service water heating system with a continuous recirculation system shall meet the applicable requirements below:

A. Each recirculation pump shall use an electronically commutated motor capable of variable speed operation.

B. The pump speed shall be controlled in response to pressure, hot water return temperature or demand flow as specified in Nonresidential Appendix NA X.X.X.

1.4 Reference Appendices

Nonresidential Appendix NA10

NAX.X.X Circulating Pump Controls

- Riser systems:
  - Pressure based controls: Head of the pump increases proportionally to the flow to compensate for pressure losses. Pump speed adjusted in response to the pressure.
  - Constant return temperature control: Pump controlled to maintain constant return water temperature. External temperature sensor must be installed in the return line.
- Non-riser systems:
  - Constant return temperature control: Pump controlled to maintain constant return water temperature. External temperature sensor must be installed in the return line.
  - Demand-flow control: Pump controlled to maintain the hot water flow demand.