



Public Safety, Sanitation, and Climate

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SAN FRANCISCO
ENVIRONMENT
DEPARTMENT

**Are there barriers to
heat pump water heater
use in food facilities?**

Public policy problems



Pollution



Hazards



Health

BAAQMD Rules

Low-NOx

2024: Residential furnaces \leq 175 kBTU/hr

Zero-NOx:

2027: Water heaters $<$ 75kBTU/hr

2029: Furnaces

2031: Water heaters up to 2MM BTU/hr

Pollution

Safety & Climate

CPUC

- 2021 – Eliminated gas line subsidy
- 2023 – Eliminated mixed-fuel line subsidy

Energy Commission

- 2025 – Heat pump baseline
- 2030 – Install 6M heat pumps
- Equitable decarbonization

CARB

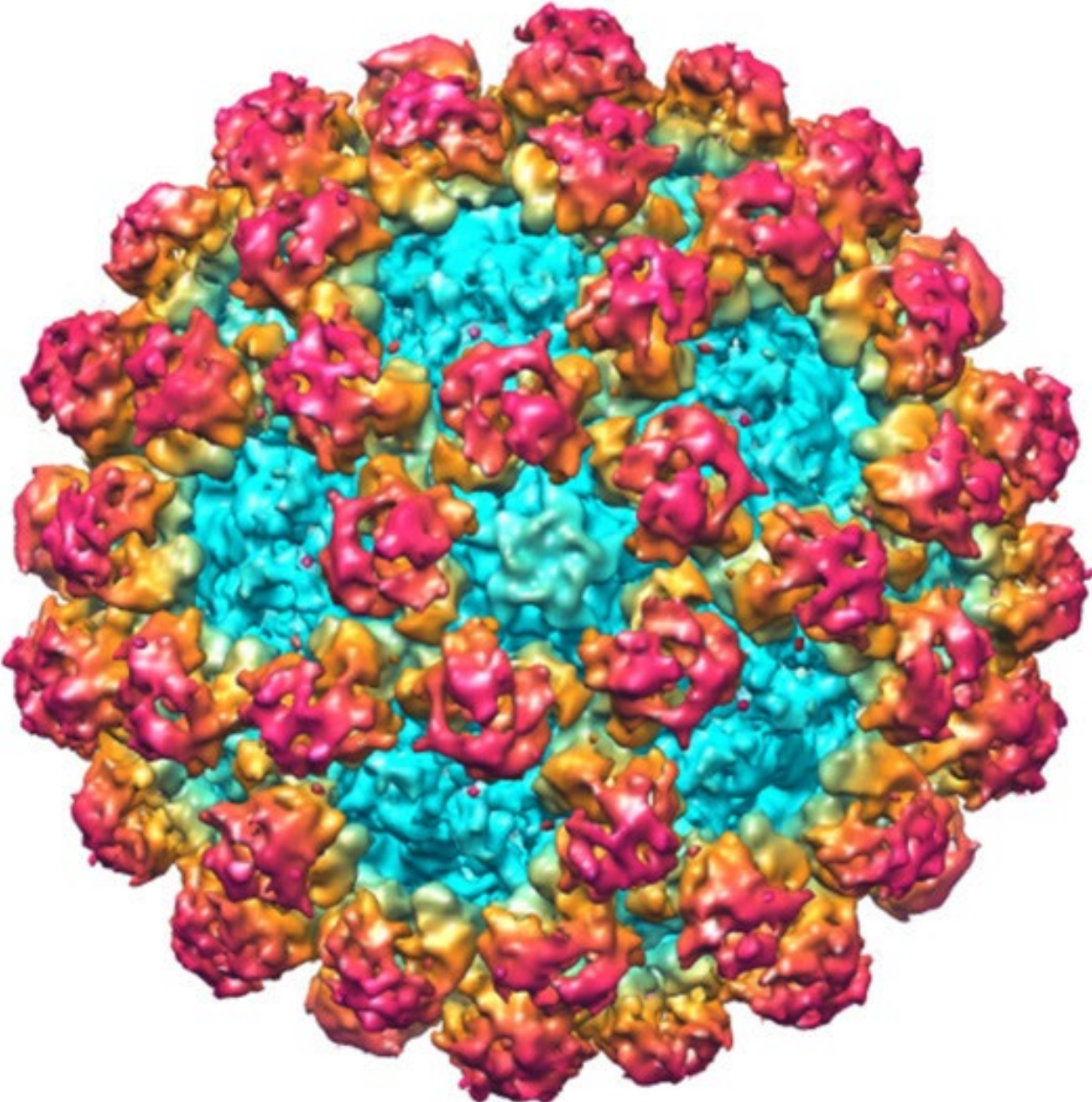
- Zero-emission appliance rules
- Zero CO2 new construction

SFE



Health

SFE



California Retail Food Code

114192(a)

An **adequate** pressurized, potable supply of hot water and cold water shall be provided.

Hot water shall be supplied at a minimum of **120°F measured from the faucet**.

The water supply system shall be **approved by the local enforcement agency**.



Implementing Regulations

Regulations are local, not from a statewide code.

Priorities:

- Sufficient hot water at all times
- Uniformity
- Plan review by health staff
(Experts in environmental health, not plumbing or energy)

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**CALIFORNIA CONFERENCE
of Directors of Environmental Health**

CCDEH Guidelines

For storage water heaters:

1. Calculate max hourly demand

(with all equipment and taps in use continuously)

2. Minimum water heater recovery

- Single use utensils: 80% of max demand
- Washing eating utensils: 100% of max demand

3. Water heater input capacity must be sufficient for maximum demand



Either do the math

Formula 1 (for gas water heaters):

$$BTU\ Input = GPH \times \text{°F Rise}^1 \times \frac{8.33lb}{gallon} \div Thermal\ Efficiency$$

Formula 2 (for electric water heaters):

$$KW\ input = GPH \times \text{°F Rise} \times \frac{8.33lb}{gallon\ of\ water} \div Thermal\ Efficiency^1 \times 3412 \frac{BTU}{KW}$$

OR

Look it up:

Sizing Table for Electric Water Heaters

Gallons per Hour Delivery at Indicated Temperature Rise

KW	40°F	50°F	60°F	70°F
1	10	8	7	6
2	20	16	13	11
3	30	24	20	17
4	40	32	27	23
5	50	40	33	29
6	60	48	40	34
7	70	56	47	40
8	80	64	54	46
9	90	72	60	52
10	100	80	67	57
11	110	88	74	63
12	120	96	80	69
13	130	104	87	75
14	141	112	94	80
15	151	120	100	86

The Challenge

Gas and Electric Resistance





- **Less efficient**
 - Deliver 0.65 – 0.98 units heat per unit used
- **Output scales up easily**

Heat pumps

- **Efficient**
 - ~3 kWh heat per kwh used
- **Work best 'slow and steady'**



Water Heating Technology

	Gas – Tank	Gas – Tankless	Electric – Resistance	Electric – Heat Pump
				
Pollution	High	High	~Zero	~Zero
Operating cost	Baseline	Baseline	Prohibitive	More than gas but comparable
Regulation	Banned – 2031	Banned – 2031	Allowed	Health regulations

Hybrid Heat Pump Water Heater

- Efficiency of a heat pump
- Recovery of electric resistance
- Unfamiliar to health officials

How to pass Health plan check:

- Use electric element input kW (only) to satisfy CCDEH minimum

But produce most hot water with the heat pump ('hybrid mode')



Hybrid Heat Pump Water Heater

Limitations

- Electric service capacity
- Utility cost
- Limited sizes available

Best applications

- Coffee or sandwich shop
- Ice cream shop
- Small quick service restaurant



Actions Supporting Adoption

CURRENTLY

- Seeking pilot sites
- Upcoming FSTC training for health officials and building departments
- Technical Bulletin for health officials

IN THE WORKS

Engineering studies of heat pump performance in food service settings

Data will inform technical recommendations to update health regulations and building code

TECHNICAL BULLETIN

Heat Pump Plan Review for Food Facilities

Some electric heat pump water heaters can comply with 2020 CCDEH Guidelines for Sizing Water Heaters

