

Advanced R744 Heat Pump: So Cool!

Rongxin Yin, Lawrence Berkeley National Laboratory

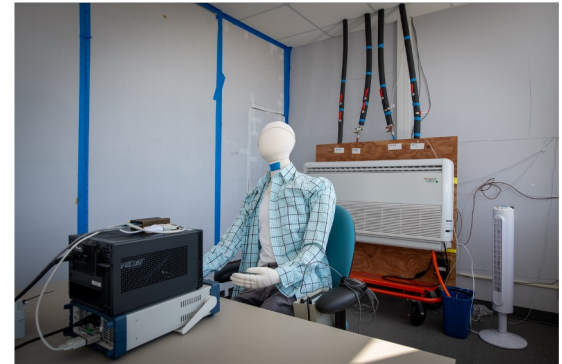
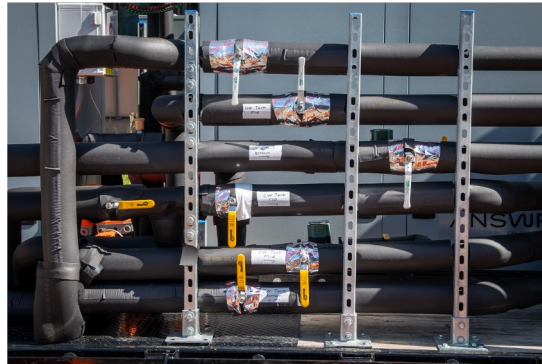
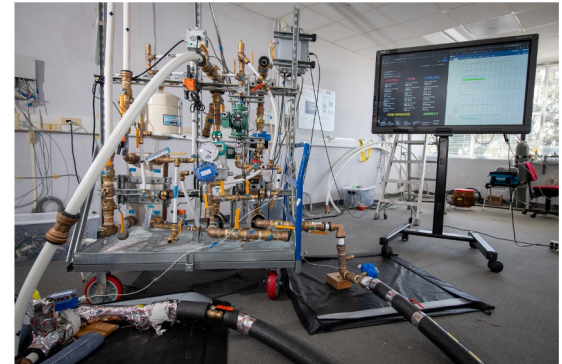
ProspectSV

WU Flow
Environmental
Systems LLC

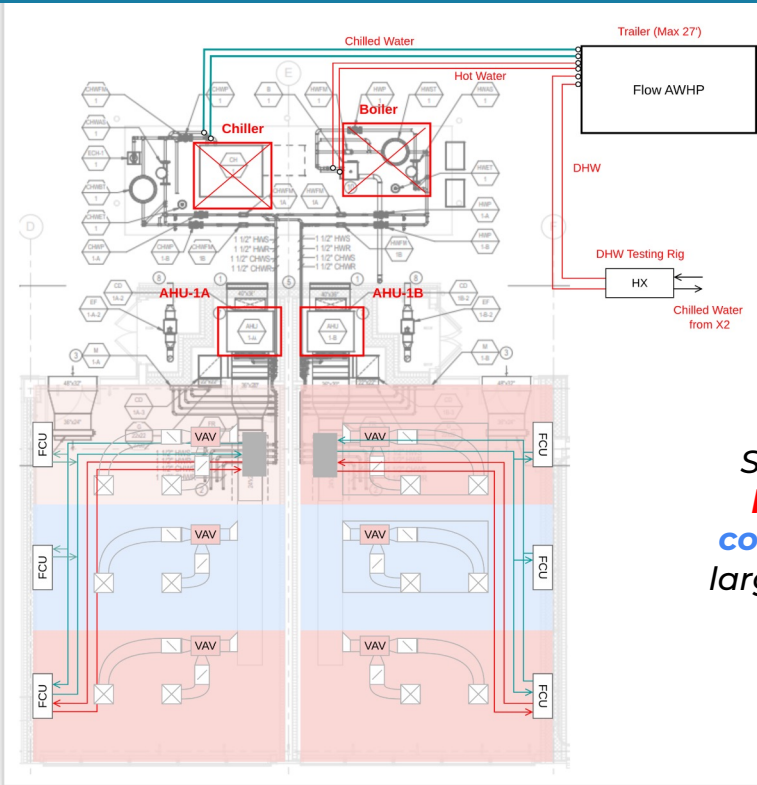
DMG

BERKELEY LAB

- Simultaneous Heating, Cooling, and domestic hot water **from a single power source**
- Advanced **energy balance control** and **defrost design**
- Thermal energy storage

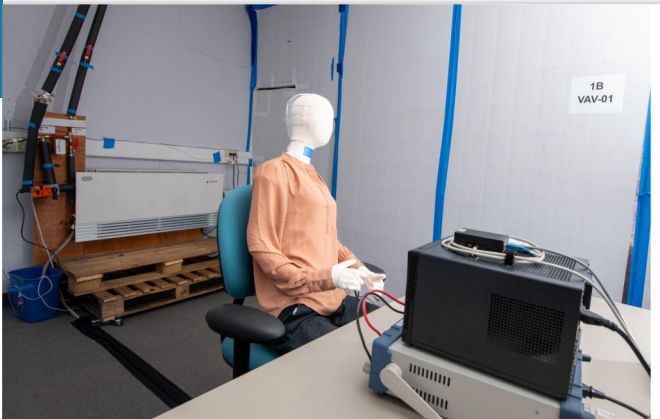


FLEXLAB Testbed Set-up

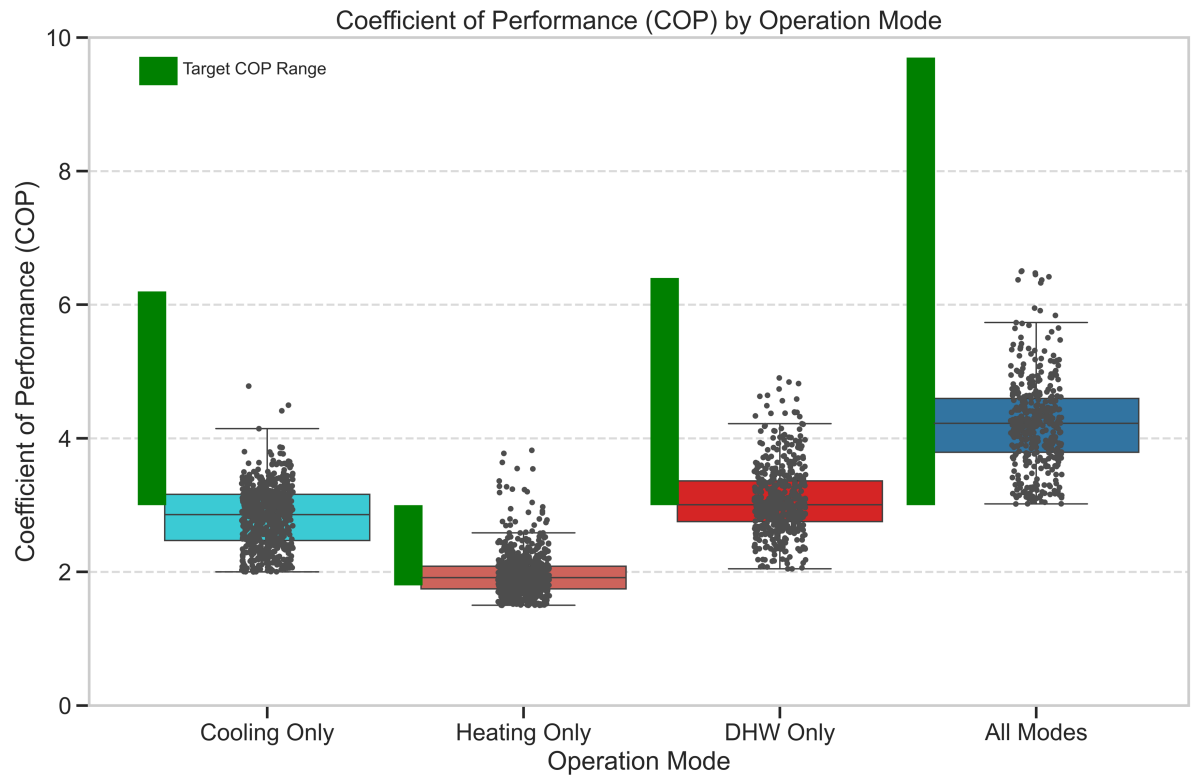


*“Plug & Play” of
Flow heat pump
to existing piping
system*

*Simultaneous
heating and
cooling needs in
large commercial
buildings*



Heat Pump COP Tests – Low Range Exceed Expectations



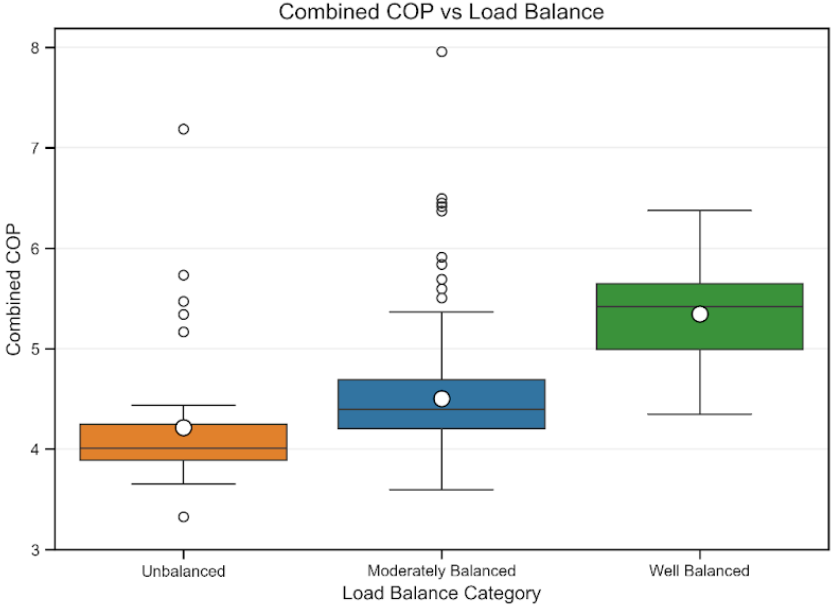
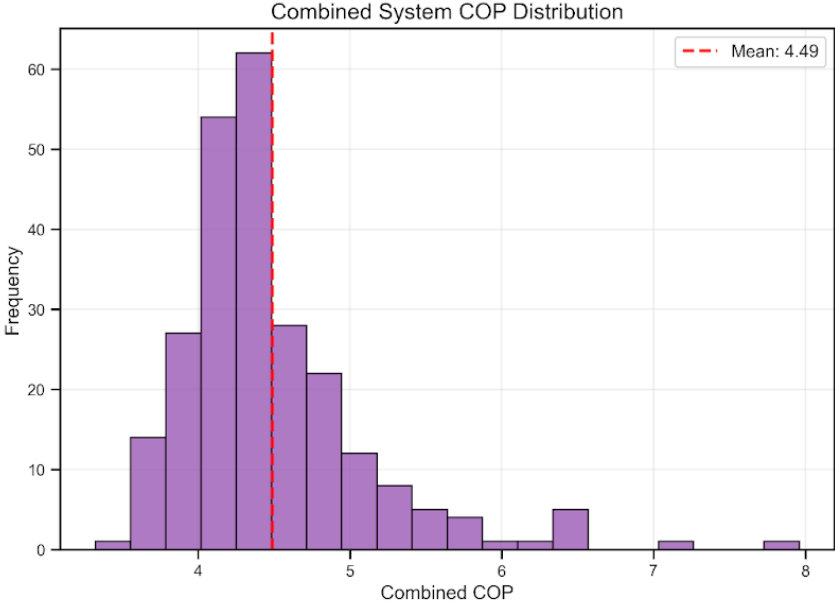
Additional Testing Performance Metrics

Performance Metric	Target Range	Results
Percent Modulation of Load	0% – 100%	0% - 60%
Defrost Derate Temperature	0°F - 40°F	No Defrost
Demand Flexibility	N/A	<u>Shed</u> 10~16%, 0.5-1.0 W/ft ² <u>Take</u> 30-40%, 1.3-2.3 W/ft ²



Higher Performance with Balanced Loads in Combined Mode

All Modes Operation - Multi-System COP Analysis



Advanced R744 Heat Pump: So Cool/Hot!

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Innovation:

- Simultaneous Heating and Cooling and domestic hot water from a single power source
- Advanced heating and cooling energy balance control and defrost design
- Plug-and-Play into existing HVAC system
- Thermal energy storage integration for higher operational efficiency

