



Connected controls and commissioning for rooftop units (RTUs): Improving lifetime efficiency

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CalMTA is a program of the California Public Utilities Commission and is administered by Resource Innovations

What is an RTU?



RTUs serve 54% of
floorspace in CA

- **Rooftop units (RTUs)** package a variety of components into a single unit to serve a building's **heating, cooling, and ventilation** needs.
- Traditionally sit on the roof of **small- to medium-sized** non-residential buildings
- Can provide heating via **gas furnace, electric resistance, or heat pump**, or some combination (for back-up heat).

Common RTU challenges

Installation errors

- Economizers
- Airflow
- Setpoints
- Scheduling errors
- Controls improperly configured

Operational inefficiencies

- Economizers
- Over-/under-charge
- Coil fouling/filter
- Default controls overridden (e.g., switchover temperature)



Connected controls and commissioning (CCC)



**Application-based
startup and
commissioning**



Reduce installation errors

**Automated fault
detection and
diagnostics**
(beyond Title 24)



Optimize performance over
lifetime

Remote connection



Allow off-site troubleshooting
and scheduling

Demand response



Allow for load flexibility

The benefits of CCC



Improved startup and commissioning

- Streamlines, simplifies, and standardizes the startup process, reducing the need for specialized tools and knowledge
- App can validate correct setup



Ongoing monitoring, fault detection and diagnostics + remote connection

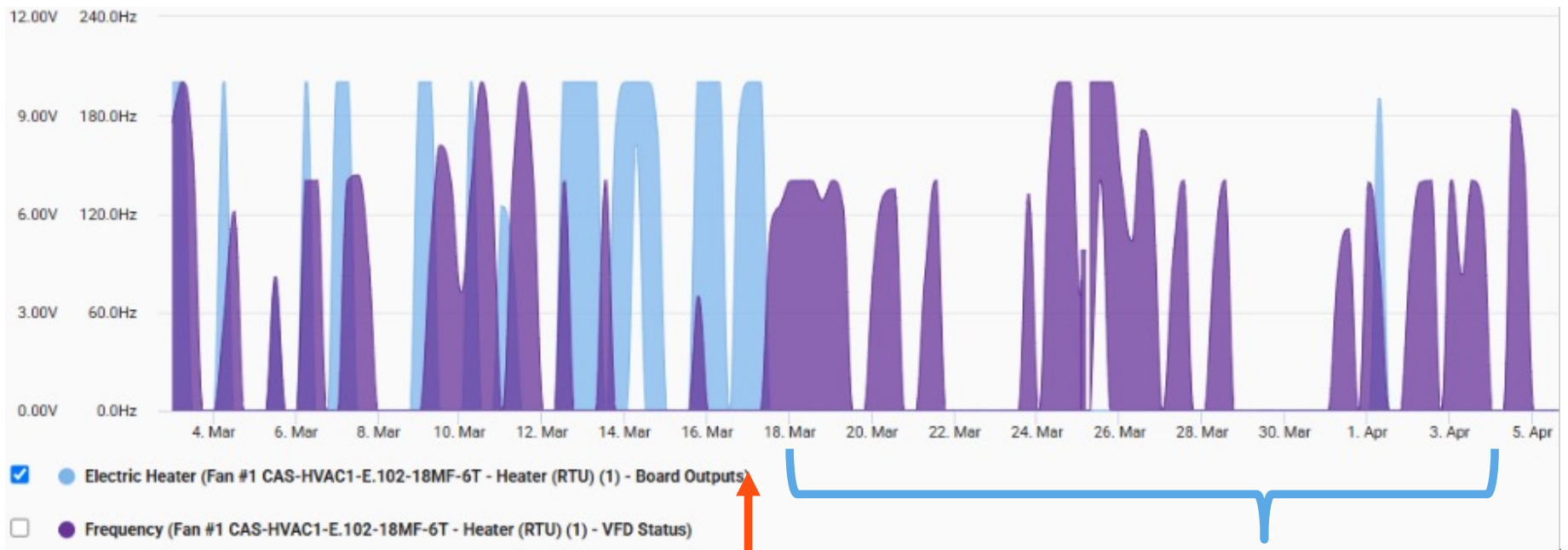
- Identify faults and operational inefficiencies
- Alert building owner/manager and HVAC service providers to issues
- Enable remote diagnosis and possible resolution, avoiding the need for site visits
- Issues causing increased energy consumption can be resolved more quickly
- Technician comes prepared to address issues that cannot be resolved remotely

RTU demonstration project



- Variable-speed HP RTU with CCC installed at UC Davis facility
- Designed to deepen understanding of product performance, barriers/costs/ limitations, and benefits
- CalMTA partners: UC Davis, Western Cooling Efficiency Center (WCEC), CalNEXT
 - Work piggybacks off WCEC's work with CalNEXT (project ET23SWE0054)

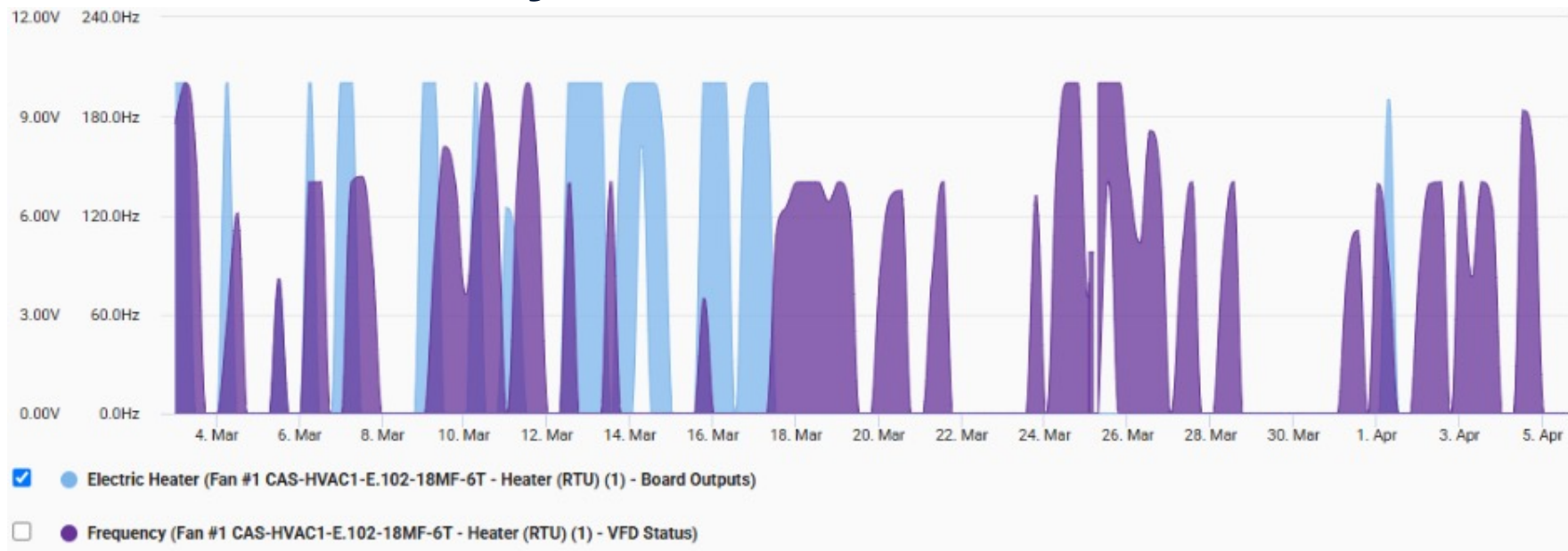
Remote monitoring helped diagnose excessive auxiliary heat



Electric heat only comes on when needed

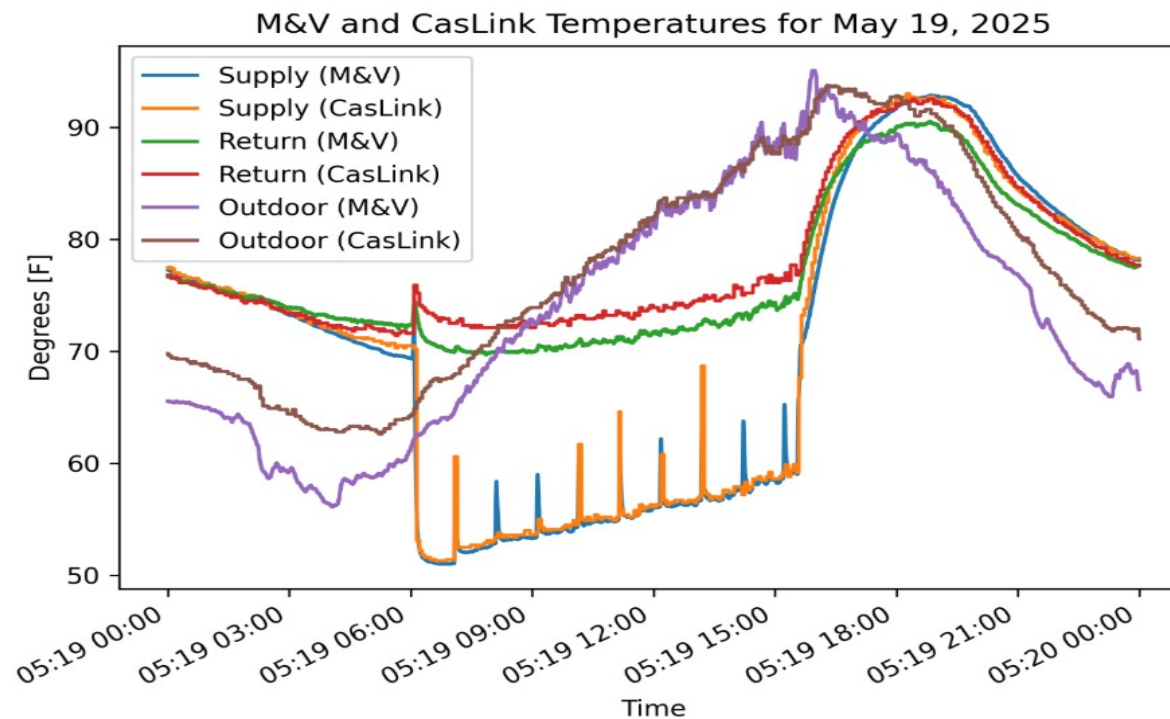
Mixed air setpoint adjustment made here

Remote monitoring helped diagnose excessive auxiliary heat

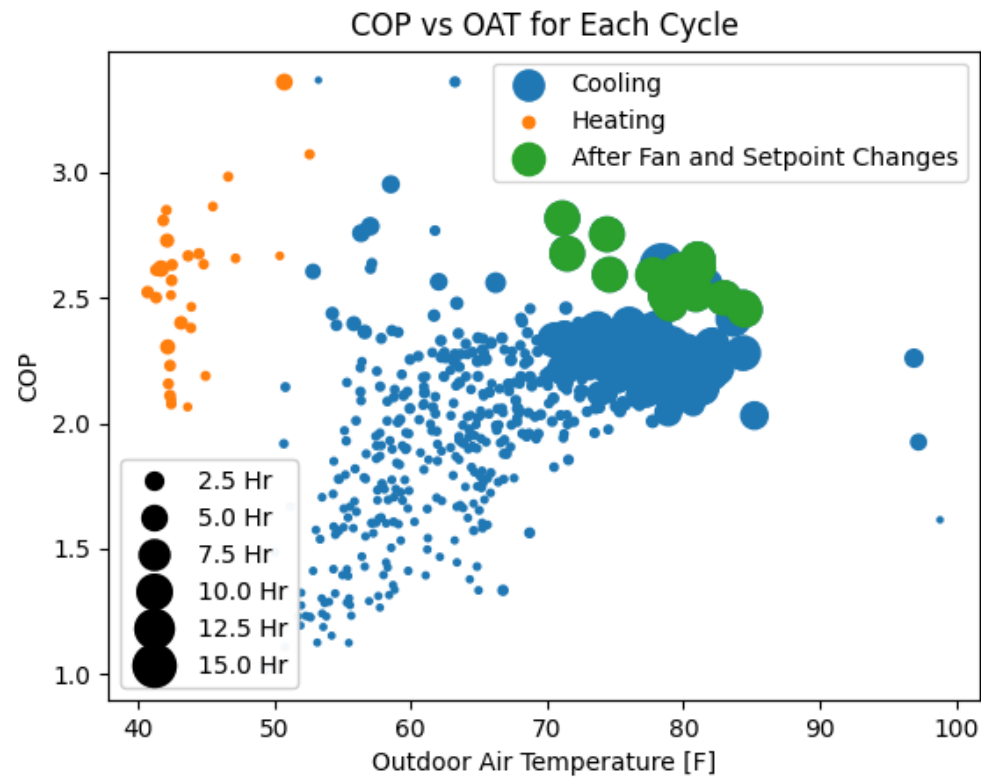


However, the fault ideally would be detected at startup, showing that the manufacturer's platform and process still needs to be refined.

Factory-installed sensors generally consistent with field-installed monitoring



Tracked data allowed setpoint adjustments to increase COP



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