

FOCUS ON EMERGING TECHNOLOGY



CLOUD-CONNECTED RESIDENTIAL HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) MONITORING PLATFORMS

Technology Description

Cloud-connected residential HVAC monitoring platforms use an internet connection to provide real-time performance tracking, remote control, and data analysis of a home's HVAC systems. Devices, such as individual sensor units or smart thermostats, gather data from the HVAC equipment which is sent to a cloud-based platform. The platform translates the raw data to actionable insights which are visible to the building occupant via the platform's mobile app or web browser.

Platforms can be integrated directly into equipment during the manufacturing process or through a third-party retrofit. The ability for a platform to integrate with a property's equipment is largely dependent upon the HVAC equipment components and control systems.

Benefits

- Remote control to adjust system settings from anywhere at any time.
- Real-time system performance metrics identify energy patterns and inefficiencies to help users save energy and money.
- Detects issues before they become major problems, reducing downtime and repair costs.
- Integrates with smart home ecosystems.
- Potential to be used in conjunction with utility load shedding programs to reduce demand.

Customer Type

- Homeowners, multifamily property owners, managers, and/or operators.
- Small commercial owners, managers, and/or operators with residential-sized HVAC equipment.

Market Sectors

Residential and small commercial.

Potential Energy Savings

Tier 3 (Connected Commissioning) platforms are estimated to save up to 6% in energy use and Tier 4 (Continuous Fault Detection and Diagnostics) could save up to 7%. Estimates are based on modeled savings for a home in Wisconsin. Actual results may vary by housing type.

Research Findings

- HVAC monitoring platforms can be categorized into five tiers based on their technical capabilities:
 - Tier 1: On-Demand Monitoring: Provides basic remote access to HVAC data on a manual or intermittent basis without automated analysis.
 - Tier 2: Automated Diagnostics: Captures key operating data and applies simple threshold checks to identify basic faults and trigger alerts.
 - Tier 3: Connected Commissioning: Guides technicians through structured commissioning workflows using connected tools and real-time calculations.
 - Tier 4: Continuous Fault Detection and Diagnostics: Delivers persistent monitoring and automated fault detection using rule-based logic and cloud analytics.
 - Tier 5: Predictive Optimization (Emerging): Uses advanced analytics and machine learning to forecast future equipment failures and recommend proactive actions.
- Tier 3 and Tier 4 cloud-connected HVAC monitoring platforms were found to deliver the most meaningful lifecycle energy reductions.
- Low awareness of benefits, confusion around platform functionality, and uncertainty around ongoing costs are the top contributors to the slow adoption rate and installer hesitancy.
- Connected commissioning (Tier 3) offers strong real-world savings by using platform sensors to verify proper setup and reduce installer burden.
- Partnerships with equipment manufacturers, regional alliances, and national labs could accelerate standards, training, and broader industry acceptance.
- Workforce education, premium service models, and multi-brand integration platforms could create pathways to improve installation quality and expand value for both single-family and multifamily markets.

REDUCING ENERGY WASTE ACROSS WISCONSIN

Focus on Energy, Wisconsin utilities' statewide program for energy efficiency and renewable energy, helps eligible residents and businesses save energy and money while protecting the environment. Focus on Energy information, resources, and financial incentives help to implement energy efficiency and renewable energy projects that otherwise would not be completed.