

HVAC

Technology Families

- Decoupled HVAC systems
- Variable capacity systems (commercial)
- Variable capacity systems (residential)
- Automated fault detection and diagnostics
- Air-to-water heat pumps for space heating and cooling
- Non-compressor-based HVAC
- Low-GWP refrigerants in HVAC
- HVAC controls

Technology Area

Decoupled ventilation and heating/cooling systems incorporating low energy technologies with advanced design and controls features—including heat recovery ventilators, variable refrigerant flow systems, chilled beams, and radiant systems—are leading the movement for greater efficiency gains. Advanced controls, system integration, and fault detection are gaining importance in advancing building energy efficiency and occupant comfort. Non-compressor and variable capacity compressor technologies, and sustainable refrigerants are also emerging areas of interest.

Unique Opportunities and Barriers

The emphasis on low-energy systems and decarbonization has the potential to lower energy use, while utilizing refrigerants that have low global warming potential or avoiding refrigerants altogether. Adopting cost-effective, climate-appropriate technologies for the hot, dry service territory of Southern California is important.

Highlighted Priority Areas

<i>Tech Family</i>	<i>Tech Subgroups</i>	<i>Definition</i>	<i>Priority</i>
Variable Speed Compressor Systems (commercial)	Variable refrigerant flow (VRF); Variable speed RTU's, chillers, water-source heat pumps, and PTACS.	A reversible heat pump or cooling-only system that uses a variable-speed compressor to modulate refrigerant flow to optimize energy consumption. VRF, PTAC, and WSHP are almost always reversible heat pumps, RTUs and chillers are nearly always cooling-only, but are available in reversible models.	High
Variable Speed Compressor Systems (residential)	Mini- and multi-split systems (non-ducted & ducted) and traditional central split systems; usually air source but can be water-source or geothermal	A reversible heat pump or cooling-only system that uses a variable-speed compressor to modulate refrigerant flow to optimize energy consumption. Mini- and multi-splits sold in the USA are nearly all reversible heat pumps. Traditional splits are available in both configurations.	High
HVAC Controls	Building Automation System/Energy Management Information System (commercial); communicating thermostat (residential)	Controls, monitors, and manages the building's HVAC energy use and component functionality. Allows interaction of devices, systems, controls, automated response to predetermined settings. Understands the operation of building systems to improve performance.	High

HVAC at a Glance

Energy Savings Technical Potential											
Decarbonization Potential											
Codes & Standards Alignment											
Demand Flexibility Potential											
Technology Family	Technology Subgroups	Definition	ETP Role	ETP Priority					Technical Performance KI	Market Knowledge Index (KI)	Program Intervention KI
Decoupled HVAC systems	Decoupled HVAC systems (e.g. HRV/DOAS + chilled beams, radiant, fan coils, or VRF); Advanced HRV controls: modulating heat recovery bypass control and IAQ sensors for DCV; Advanced HRV design: counterflow heat	Decoupled HVAC systems separate ventilation airflow/loads from space conditioning to provide lower HVAC system energy overall through the reduction in reheat and allowing for the	1-Lead	2-Medium					2-Medium	3-Low	3-Low
Variable speed compressor systems (commercial)	Variable refrigerant flow (VRF); Variable speed RTU's, chillers, water-source heat pumps, and Package Terminal Air Conditioner Systems (PTACS).	A reversible heat pump or cooling-only system that uses a variable-speed compressor to modulate refrigerant flow to optimize energy consumption. VRF, PTAC, and WSHP are almost always	1-Lead	1-High					2-Medium	2-Medium	3-Low
Variable speed compressor systems (residential)	Mini- and multi-split systems (non-ducted & ducted) and traditional central split systems; usually air source but can be water-source or geothermal	A reversible heat pump or cooling-only system that uses a variable-speed compressor to modulate refrigerant flow to optimize energy consumption. Mini- and multi-splits sold in the USA are	1-Lead	1-High					2-Medium	2-Medium	2-Medium
Automated fault detection and diagnostics	Small/Medium Commercial Buildings - FDD reporting format; Large Commercial Buildings - FDD reporting format; Residential Buildings - FDD reporting format; Small/Medium Commercial Buildings - HVAC equipment	Functionality that detects and diagnoses problems that lead to degraded performance of HVAC systems (energy efficiency, capacity, increased maintenance, or shortened equipment	2-Collaborate	2-Medium					2-Medium	3-Low	3-Low
Air-to-water heat pumps for space heating and cooling	Air-to-water heat pumps for space heating; air-to-water reversible heat pumps for space heating and cooling.	Heat pumps that use ambient air as a heat source to add heat to a space heating hydronic system. Reversible units can also chill the water for cooling.	1-Lead	2-Medium					2-Medium	2-Medium	3-Low
Non-compressor based HVAC	Sub wet-bulb systems, High-performance evaporative systems, Natural ventilation systems, Radiant systems, Solid state (thermoelectric, magnetocaloric), Systems designed for compressorless heating/cooling	HVAC systems that do not rely on refrigerant-based vapor compression cycle	2-Collaborate	2-Medium					1-High	3-Low	3-Low
Low-GWP refrigerants in HVAC	Low global warming potential (GWP) refrigerants, applies to room AC and dehumidifiers, packaged systms, VRF, etc.	Refrigerants used in vapor compression systems that have lower global warming impacts than legacy refrigerants.	1-Lead	2-Medium					3-Low	3-Low	2-Medium
HVAC controls	Building Automation System/Energy Management Information System (commercial); communicating thermostat (residential)	Controls, monitors, and manages the building's HVAC energy use and component functionality. Allows interaction of devices, systems, controls, automated response to predetermined	1-Lead	1-High					2-Medium	3-Low	3-Low