Better Buildings®
U.S. DEPARTMENT OF ENERGY

Low Carbon Technology Strategies

MIDRISE APARTMENT

Driving our nation's buildings to low and zero carbon saves money, creates jobs, and leads to a healthier environment and more resilient economy. The table below includes steps that building owners and operators can implement to achieve smart, healthy, and low-carbon midrise apartment buildings within their existing building portfolios. Midrise apartments may use packaged rooftop units for heating, cooling, and ventilation or central plant systems for larger buildings. Assess current conditions in your building against the simple, intermediate, and advanced options to begin planning your next steps to reduce carbon emissions.

Technology		Simple	Intermediate	Advanced
Lighting	Interior Lighting	Common Areas: • Install Type B tubular LEDs that meet DesignLights Consortium (DLC) technical requirements • Reduce overlit spaces • Install occupancy sensors or vacancy sensors Dwelling units: • Install ENERGY STAR® certified light bulbs or replace with an LED fixture	Common Areas: • Install dimmable LED retrofit kit or replace with LED fixture that meets DCL requirements • Install daylighting controls and occupancy / vacancy sensors • Integrate with building automation system (BAS) if possible	Common Areas: • Install retrofit kit or new luminaire with luminaire level lighting controls • Include integrated daylight and occupancy sensor networked lighting controls that meet DLC requirements, load shed via Auto-DR interface, and integrate with BAS
	Specialty Lighting	• Retrofit track heads and decorative fixtures with ENERGY STAR-certified light bulb	• Replace existing fixtures or track head with LED fixtures or track head	
	Exterior and Parking Lot Lighting	• Install LED screw base replacement for HID lamps that meets DLC requirements • Install photocell to control lighting	• Replace with area luminaires that meet DLC requirements • Install time clock and reduce lighting at night	• Redesign using the Better Buildings Parking Lot specification and include video-based occupancy sensors
Space Conditioning and Water Heating	HVAC Equipment	• Verify and repair dampers • Test and seal ducts • Install advanced RTU controls retrofit (variable speed supply fan, integrated air-side economizer, and RTU-level demand-controlled ventilation (DCV))	• Replace equipment with right-sized, high-efficiency equipment (CEE Advanced Tier) • Install air source heat pump RTUs, dual fuel RTUs, or variable refrigerant flow (VRF) systems • Add energy recovery ventilators • Implement air cleaning technology to reduce ventilation requirements • Install active thermal energy storage for load shifting and system optimization • Add evaporative cooling in dry climate zones • Retrofit central boiler plant, distribution system, and terminal units (e.g., pipe insulation, controls, efficient pump)	• Install water source or ground source heat pumps • Implement natural ventilation, controlled in coordination with mechanical ventilation
	Water Heating	• Reduce water heating demand through various technologies like low-flow faucets and showerheads • Lower hot water supply temperature setpoint (130F) • Add tank wrap to individual water heaters	• Install point of use electric water heaters for small, distributed loads • Install high-efficiency, connected heat pump water heaters • Retrofit central water heating plant and distribution system (e.g., pipe insulation, controls, efficient pump)	• Install CO_2 air-to-water heat pumps

Technology		Simple	Intermediate	Advanced
Controls and Analytics	Install or Upgrade Controls	• Widen zone temperature dead band on existing thermostats • Install wireless networked thermostats to centrally manage heating/cooling set points, setbacks, and schedules • Implement building Re-tuning™ process • Automatically shut off equipment (exhaust fans, room air cleaners, other loads) during unoccupied times	• Add controls to support holiday scheduling, optimal start, and additional monitoring points • Reduce airflow to zones during unoccupied times with zone-level DCV • Implement demand limiting RTU controls and continuous demand management	• Reduce airflow to zones during unoccupied times by integrating the occupancy sensors from the lighting control system into the HVAC control system • Implement controls that integrate building loads, thermal/battery storage, on-site co-generation plants, PV, and EV charging to provide demand flexibility (Market Brief)
	Install Energy Management and Information System (EMIS) (EMIS Primer, Specification)	• Install energy information system (EIS) with whole building interval meters • Submeter critical loads to verify operation • Compare whole building EUI among portfolio or against similar buildings	• Subscribe to remote monitoring and diagnostic service for HVAC	• Install an EMIS as an integrated platform for monitoring and control of lighting and HVAC systems • Utilize EMIS to control and monitor for demand flexibility (Market Brief)
Building Envelope	Opaque Building Envelope	• Use reflective roof materials • Use cool roof coating, climate dependent • Identify thermal bridges with IR camera; mitigate (complexity varies) • Add loose fill insulation in attic space • Deploy radiant barrier or spray applied low-E paints/coatings in attic spaces (where applicable)	• Add or increase level of continuous insulation when replacing roof membrane • Add attic ventilation, hot climate • Install phase change material (PCM) panels in dropped ceiling (multiple technologies available)	• Add continuous insulation to exterior walls • Use advanced techniques to fill gaps with spray foam
	Building Airtightness	Compartmentalize dwelling units: • Seal obvious cracks • Install weather stripping • Seal around receptacles • Apply window flashing to prevent moisture penetration	• Conduct blower door test along with smoke test to locate and seal where needed • Caulk and seal above dropped ceiling	• Install air barrier (preferably combined with other retrofit measures, such as adding exterior or interior insulation)
	Windows and Attachments	• Install applied films • Automate interior attachments • Caulk/seal windows • Install window shading or attachments	• Add storm window/secondary glazing or replace existing windows with double-pane or Low-E • Automate existing exterior attachments • Add automated exterior attachments/awnings	• Install dynamic windows • Install thin triple windows • Install vacuum glazing
Plug and Process Loads (PPLs)		• Procure ENERGY STAR rated or better products • Enable low-power or sleep settings • Consolidate and reduce loads • Procure and install PPL control technologies: – Advanced Power Strips – Wireless Meter and Control Systems (aka Smart Outlets) – Automatic Receptacle Controls	• Load shift by implementing advanced scheduling technologies for charging EVs	• Integrate PPL controls to shed, shift, and modulate during times of peak fossil generation • Implement power over ethernet (PoE) systems • Integrate PPLs into demand response
Renewables and Battery Storage		• Participate in a community solar program or access renewables via a power purchase agreement (PPA)	• Purchase on-site PV to cover roof area (verify roof structure and age) and parking as needed • Integrate electric batteries and additional thermal energy storage to balance PV production	• Integrate renewables, battery storage, and building loads into demand flexibility controls (EMIS platforms often provide this integrated-control capability)

Need additional support? See the Path to Zero: Getting Started Guide. Reach out to Better Buildings for support on your path to low carbon.

Learn more at betterbuildingssolutioncenter.energy.gov/

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