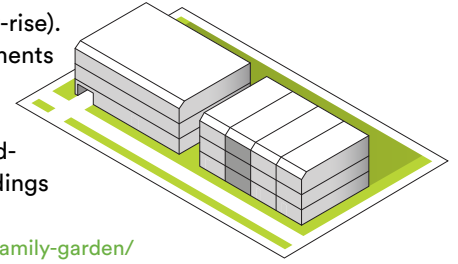







Playbook Summary: Garden Style 1-3 Stories

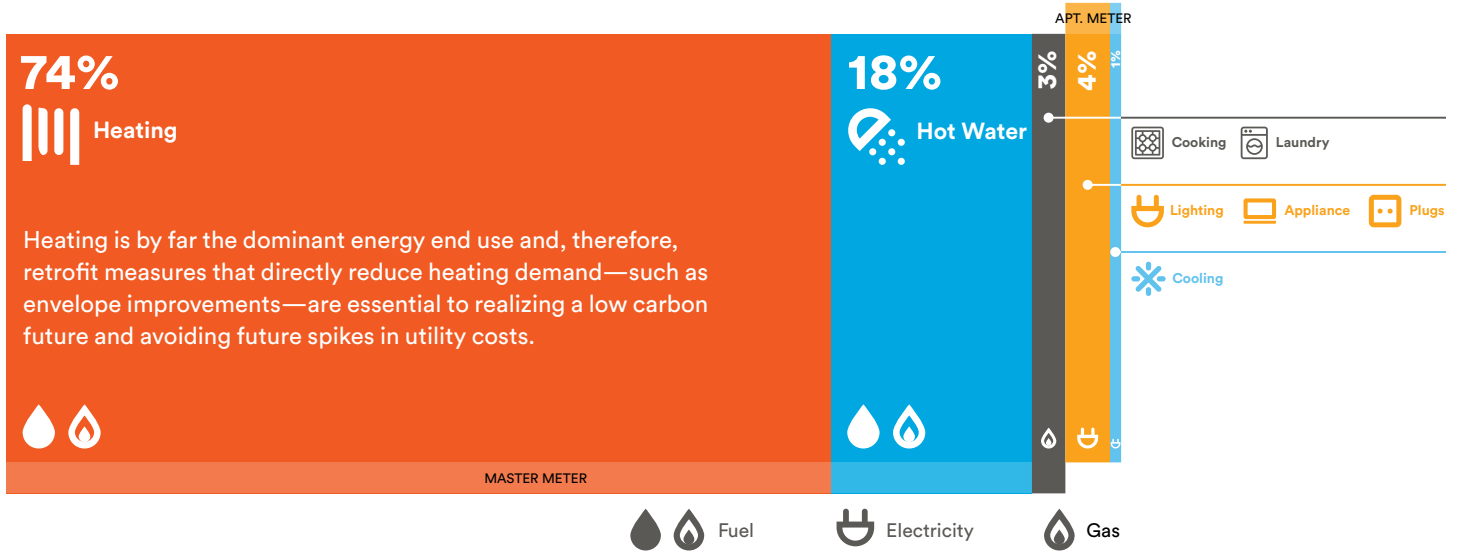
The garden-style refers to a type of apartment building with an outdoor-style (garden) complex typically two or three stories high (low-rise). These buildings allow for ground floor entrance access to all apartments and do not have common space nor amenities. The style is characterized by a wood frame with insulation inside walls and attic and are likely to be found in suburban and rural areas with multiple buildings held by the same owner. Additionally, these campus-style buildings will likely have central heating and, or domestic hot water plants.



Download Full Playbook → <https://be-exchange.org/report/lowcarbonmultifamily-garden/>

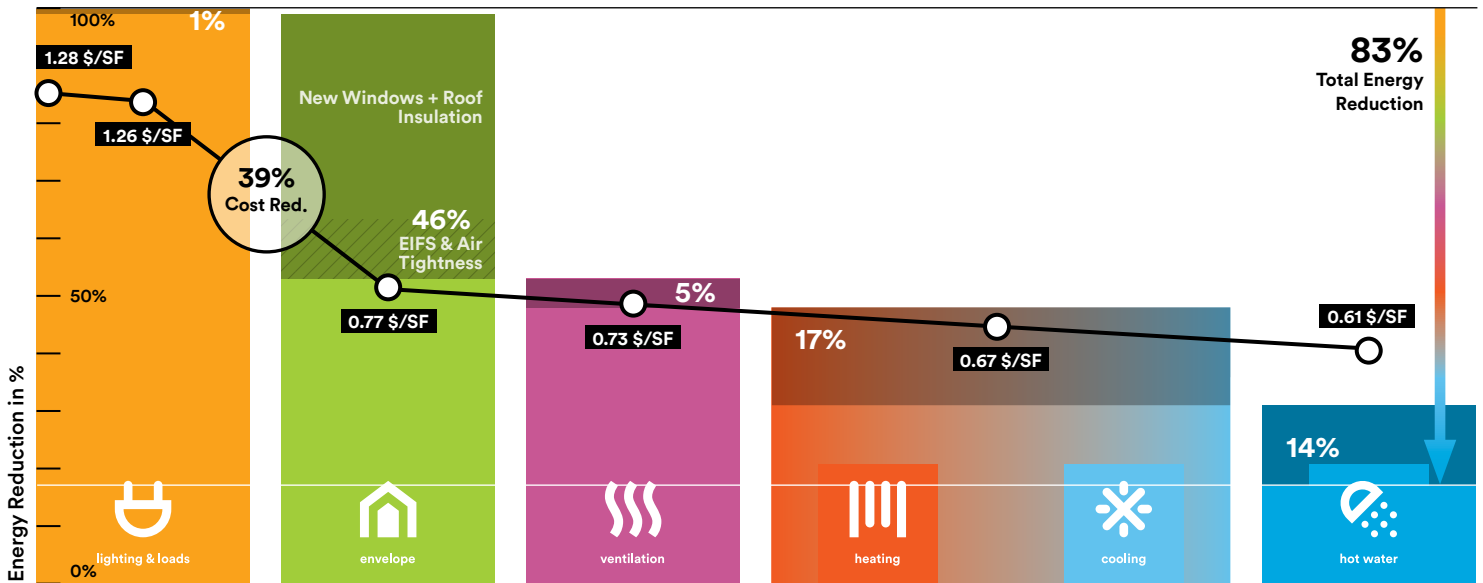
ELEMENTS	ISSUES	Retrofit Strategies		Recommended Targets
EXTERIOR WALLS Wood framed cavity walls with punched windows. Vinyl siding or brick typical.	<ul style="list-style-type: none"> - Minimal cavity insulation in wood frame walls - Often no air barrier - Major thermal bridges at ground connections, rim joists, corners, balconies 	 envelope	ROOF → Insulate Roof	→ Minimum of R-40
			EXTERIOR WALL → Add Interior insulation → Add Exterior Insulation	→ Minimum of R-20 → Minimum of R-10
WINDOWS Both wood and aluminum common, typically double-hung or sliders.	<ul style="list-style-type: none"> - Little thermal resistance - Air leakage high - Major comfort issues - Condensation risk - Windows allow significant solar heat gain 		WINDOWS → Replace Existing Windows with High Performance Windows	→ Recommended U Value 0.167 Btu/hr.ft ² .F
			AIR TIGHTNESS → Ensure Air Sealing as part of Exterior Wall and Window Upgrades	→ Recommended airtightness 1.0 ACH
COOLING Through-wall, or window, AC units common.	<ul style="list-style-type: none"> - Through-wall AC units create drafty conditions - Increases whole building U-value - Through-wall AC units create major thermal bridges Noisy, inefficient - Winter removal very rare 	 heating cooling	→ Mini-Split Heat Pumps	→ Heating: 3.3 COP Cooling: 4.4 COP
			 ventilation → Decentralized Energy Recovery Ventilation System	→ Sensible Heat Factor: 80% Max Fan Power: 0.76 W/cfm
			 hot water → Air to Water Heat Pump Centralized Systems	→ Min. COP: >2.2
DOMESTIC HOT WATER Central campus boiler, or boilers in each unit. If electric baseboard heating, electric DHW heater.	<ul style="list-style-type: none"> - Requires running the central campus gas fired water heater or in-unit atmospheric vented gas water heaters boiler in shoulder and cooling seasons 		→ Air to Water Heat Pump for In-Unit Systems	→ Min. COP: >2.2
			 Lighting & plug load → High Efficiency Common Area Lighting	→ 50% Reduction in W/SF
VENTILATION Mix of kitchen/bath exhaust and natural ventilation.	<ul style="list-style-type: none"> - Limited direct fresh air introduction - System is not balanced, drives infiltration from exterior and adjacent units - Exhaust is intermittent 		PLUG LOAD → High Efficiency Appliances and Smart Systems	→ 55% Reductions in Plug Loads

Energy Use Analysis



Energy & Cost Reductions by Phase

■ = Energy use
 ■ = Energy reduction per phase
 ↓ = total Energy Reduction
 ○ = Energy cost per SF



Takeaways:

To meet future stringent efficiency and carbon regulations, buildings' upgrades should be approached proactively and not as a response to a system's failure or tenant's turnover. Building owners must also consider the long-term advantages of planning, scheduling, and testing based on recommended performance targets that work in concert with the envelope, HVAC systems, water, lighting controls, and other systems. Taking the initiative

to actively ensure each component is working at its intended operating capacity while providing continuing maintenance to the building's equipment is critical, cost-effective, and most likely result in health and comfort benefits.

Resources

Other Playbooks → <https://be-exchange.org/lowcarbonmultifamily-main/>