

20 Green Design Features Payback Guide

Cost band, space, savings profile and payback for the twenty measures building owners ask about most — ranked so you can sequence a retrofit or a new build.

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How to use this guide

Green design is a financial decision before it is an environmental one. The measures below cut operating cost and emissions at the same time, but they do not all pay back the same way. This guide gives you a consistent one-page profile for each measure so you can compare them on the same footing, then a sequencing worksheet to build a plan.

Reading the payback column. Ranges assume a mid-size commercial or multifamily building on typical US utility rates without incentives. Federal, state and utility incentives usually shorten payback by 20–40%. Measures under 3 years are near-automatic; 3–8 years are strong; over 10 years need a strategic reason (carbon target, code, resilience, tenant demand).

Quick reference — all 20 at a glance

#	Measure	Category	Typical payback
1	Combined heat and power (CHP)	Energy	6–9 yrs
2	Fuel cells	Energy	7–10 yrs
3	Rooftop solar PV	Energy	5–8 yrs
4	Solar thermal collectors	Energy	6–9 yrs
5	Central chiller plant	HVAC	10–15 yrs
6	Geothermal heat pumps	HVAC	15–25 yrs
7	Rainwater harvesting	Water	8–12 yrs
8	Greywater reuse	Water	9–13 yrs
9	LED lighting retrofit	Lighting	2–3 yrs
10	Daylighting	Lighting	3–5 yrs
11	Occupancy-sensing lighting controls	Lighting	Under 1 yr
12	Passive House envelope	Envelope	10–15 yrs
13	Energy recovery ventilation (ERV/HRV)	HVAC	4–6 yrs
14	Low-flow plumbing fixtures	Water	5–10 yrs
15	Micro wind turbine	Energy	7–10 yrs
16	HEPA / MERV-13+ filtration	IAQ	n/a
17	Peak load shifting / battery storage	Energy	7–9 yrs
18	CO2-based demand-controlled ventilation	HVAC	4–6 yrs
19	Airside economizer	HVAC	2–4 yrs
20	Variable frequency drives on fans and pumps	HVAC	2–3 yrs

The 20 measures

1. Combined heat and power (CHP)

Category: Energy · **Complexity:** 5/5 · **Typical payback:** 6–9 yrs

Generates electricity on site and captures the engine or turbine heat for space and water heating.

Cost band	Very high (seven figures for a mid-size building)
Space needed	Dedicated mechanical room
Savings profile	Large — offsets both electricity and heating fuel
Best fit	Hotels, hospitals, campuses, any building with year-round heat demand
Watch-out	Only pencils out when the recovered heat is used most of the year

2. Fuel cells

Category: Energy · **Complexity:** 5/5 · **Typical payback:** 7–10 yrs

Electrochemical generation of power and heat with no combustion; some designs double as storage.

Cost band	Very high; federal credits reduce net cost
Space needed	Compact footprint
Savings profile	Large when heat and power are both consumed continuously
Best fit	Data-heavy or 24/7 facilities
Watch-out	Fuel price volatility and specialist maintenance

3. Rooftop solar PV

Category: Energy · **Complexity:** 3/5 · **Typical payback:** 5–8 yrs

Panels convert sunlight to electricity; long warranties make the return predictable.

Cost band	Moderate–high; tax credits and utility rebates apply
Space needed	Roughly 8–10 sq ft of clear roof per 100 W
Savings profile	Moderate, steady
Best fit	Any building with unshaded roof area
Watch-out	Fire-code setbacks and rooftop equipment eat usable area

4. Solar thermal collectors

Category: Energy · **Complexity:** 2/5 · **Typical payback:** 6–9 yrs

Sunlight heats domestic hot water directly, cutting boiler or water-heater run time.

Cost band	Moderate
Space needed	Competes with PV for roof space
Savings profile	Modest
Best fit	Residential, hospitality, laundries, pools
Watch-out	Needs backup heat at night and in winter

5. Central chiller plant

Category: HVAC · **Complexity:** 3/5 · **Typical payback:** 10–15 yrs

Concentrates cooling in high-efficiency water-cooled chillers with cooling towers.

Cost band	High
Space needed	Large plant room
Savings profile	Large on cooling-dominated buildings
Best fit	Large office, healthcare, mixed-use
Watch-out	Single point of failure without N+1 design

6. Geothermal heat pumps

Category: HVAC · **Complexity:** 4/5 · **Typical payback:** 15–25 yrs

Ground loops act as a heat sink in summer and heat source in winter.

Cost band	Very high; well field is the cost driver
Space needed	Same plant space as conventional; large well field
Savings profile	Large and eliminates on-site combustion
Best fit	New construction with land, campuses
Watch-out	Site geology and land area decide feasibility

7. Rainwater harvesting

Category: Water · **Complexity:** 3/5 · **Typical payback:** 8–12 yrs

Collects roof runoff into tanks for irrigation, cooling make-up or flushing.

Cost band	Low–moderate
Space needed	Tank footprint (indoor or buried)
Savings profile	Small on the water bill; large on stormwater fees where charged
Best fit	Warehouses, schools, any large roof
Watch-out	Supply is seasonal; needs a municipal backup

8. Greywater reuse

Category: Water · **Complexity:** 4/5 · **Typical payback:** 9–13 yrs

Treats water from sinks, showers and laundry for toilet flushing and irrigation.

Cost band	Moderate (per-unit tanks and dual piping)
Space needed	Tank per dwelling or central system
Savings profile	Moderate
Best fit	New multifamily and hotels
Watch-out	Retrofit is hard without separated drain lines

9. LED lighting retrofit

Category: Lighting · **Complexity:** 1/5 · **Typical payback:** 2–3 yrs

Replaces fluorescent, HID and incandescent lamps with LED fixtures.

Cost band	Moderate
Space needed	None
Savings profile	Large — lighting plus a cooling-load reduction
Best fit	Every building
Watch-out	Choose warm CCT where occupants object to cool light

10. Daylighting

Category: Lighting · **Complexity:** 3/5 · **Typical payback:** 3–5 yrs

Skylights, light shelves and glazing placement replace electric light during the day.

Cost band	Low for skylights on a top floor
Space needed	None
Savings profile	Modest
Best fit	Single-story and top floors
Watch-out	Control glare and solar heat gain

11. Occupancy-sensing lighting controls

Category: Lighting · **Complexity:** 2/5 · **Typical payback:** Under 1 yr

Sensors switch or dim lights based on presence and daylight.

Cost band	Low
Space needed	Wall or ceiling devices only
Savings profile	Modest but immediate
Best fit	Offices, corridors, restrooms, parking
Watch-out	Compatibility across mixed fixture types

12. Passive House envelope

Category: Envelope · **Complexity:** 5/5 · **Typical payback:** 10–15 yrs

Super-insulated, airtight envelope with heat-recovery ventilation; HVAC shrinks dramatically.

Cost band	Adds roughly 5–10% to construction cost
Space needed	None — it is the building
Savings profile	Very large (often 60–80% HVAC reduction)
Best fit	New construction
Watch-out	Limited application to existing envelopes

13. Energy recovery ventilation (ERV/HRV)

Category: HVAC · **Complexity:** 3/5 · **Typical payback:** 4–6 yrs

Exchanges heat and moisture between exhaust and intake air streams.

Cost band	Moderate
Space needed	Mounted on duct runs
Savings profile	Moderate
Best fit	Any mechanically ventilated building
Watch-out	Effectiveness depends on climate

14. Low-flow plumbing fixtures

Category: Water · **Complexity:** 1/5 · **Typical payback:** 5–10 yrs

WaterSense-labeled toilets, faucets, showerheads and urinals.

Cost band	Moderate
Space needed	None — replaces existing fixtures
Savings profile	Moderate on water and water-heating
Best fit	Every building
Watch-out	Old piping can be damaged during swap-out

15. Micro wind turbine

Category: Energy · **Complexity:** 5/5 · **Typical payback:** 7–10 yrs

A single larger turbine on a suitable site; complements solar's daytime profile.

Cost band	High; credits apply
Space needed	Large clearance around the tower
Savings profile	Moderate
Best fit	Open, windy sites only
Watch-out	Noise, visual impact and site turbulence

16. HEPA / MERV-13+ filtration

Category: IAQ · **Complexity:** 3/5 · **Typical payback:** n/a

High-efficiency filters and UV stages remove fine particulates and pathogens.

Cost band	Low–moderate
Space needed	Larger filter banks at air intakes
Savings profile	Not an energy measure — a health and LEED IEQ measure
Best fit	Healthcare, schools, dense offices
Watch-out	Slight fan-energy penalty from pressure drop

17. Peak load shifting / battery storage

Category: Energy · **Complexity:** 4/5 · **Typical payback:** 7–9 yrs

Batteries or thermal (ice) storage supply peak-hour loads to cut demand charges.

Cost band	Moderate–high
Space needed	Small electrical room area
Savings profile	Moderate — bill savings without kWh reduction
Best fit	Buildings on demand-charge or time-of-use tariffs
Watch-out	Only pays where the tariff rewards it

18. CO2-based demand-controlled ventilation

Category: HVAC · **Complexity:** 3/5 · **Typical payback:** 4–6 yrs

CO2 sensors throttle ventilation to actual occupancy instead of design maximum.

Cost band	Moderate
Space needed	Sensors and controls only
Savings profile	Moderate
Best fit	Assembly spaces, offices, schools
Watch-out	Adds harmonics; needs clean controls integration

19. Airside economizer

Category: HVAC · **Complexity:** 3/5 · **Typical payback:** 2–4 yrs

Uses cool outdoor air for 'free cooling' when conditions allow; often code-required.

Cost band	Low–moderate
Space needed	Larger air handlers and dampers
Savings profile	Moderate
Best fit	Temperate and dry climates
Watch-out	Little value in hot-humid zones

20. Variable frequency drives on fans and pumps

Category: HVAC · **Complexity:** 3/5 · **Typical payback:** 2–3 yrs

Electronically slows motors under part load instead of throttling with valves or dampers.

Cost band	Low
Space needed	Small control-panel space
Savings profile	Moderate
Best fit	Any building with large fans or pumps
Watch-out	No benefit on motors that must run at full speed

Sequencing worksheet — build your plan

Most buildings get the best result by working in three tiers. Tick the measures that apply and total each tier.

Tier 1 — fast payback, low disruption (do first)

- ☐ LED lighting retrofit
- ☐ Occupancy-sensing lighting controls
- ☐ Variable frequency drives on fans and pumps
- ☐ Airside economizer (where climate allows)
- ☐ Daylighting on top floors

Tier 2 — moderate payback, needs engineering

- ☐ Energy recovery ventilation
- ☐ CO2 demand-controlled ventilation
- ☐ Low-flow plumbing fixtures
- ☐ Rooftop solar PV or solar thermal
- ☐ Peak load shifting / storage
- ☐ Rainwater harvesting
- ☐ HEPA / MERV-13+ filtration (health, not payback)

Tier 3 — strategic, capital-program items

- ☐ Central chiller plant
- ☐ Combined heat and power
- ☐ Fuel cells
- ☐ Geothermal heat pumps
- ☐ Greywater reuse
- ☐ Passive House envelope (new build)
- ☐ Micro wind turbine

Rule of thumb: Tier 1 savings usually fund the engineering study for Tier 2. Tier 2 savings plus incentives fund the business case for Tier 3. Do not skip to Tier 3 without a metered baseline — you cannot prove savings you never measured.

Before you spend: the three questions

1. What is the baseline? Twelve months of gas, electric and water bills, normalized for weather. **2. What does the tariff reward?** Demand charges and time-of-use rates change which measures win. **3. What is the building's remaining life?** A 25-year payback on a building with a 15-year plan is a loss.

Ready to turn this into a scoped project?

Our Green Build Project Management service takes a building from baseline audit through measure selection, incentive capture, design coordination and commissioning — one accountable team from start to finish.

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