

PVT + HEAT PUMP + STORAGE • PER 10 PANELS

Sun by day. Heat all night.

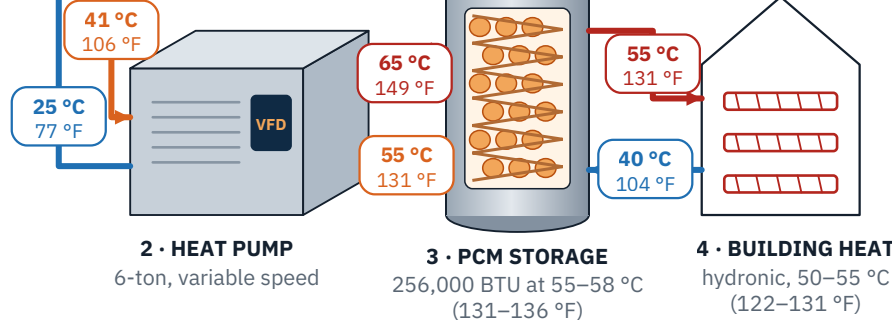
Each 10-panel zone cools its own panels, lifts the recovered heat to 60 °C (140 °F) with a variable-speed heat pump, and banks it in compact phase-change storage, so the building runs on solar heat long after sundown.

1 • PVT ARRAY

10 × 600 W, finned copper HX



Daytime sun charges storage;
stored heat carries the building overnight.



54,200

BTU/hr heat collected,
5,420 per panel¹

74,000

BTU/hr delivered at 60 °C
(140 °F), COP 3.5–4¹

256,000

BTU stored for evening
and overnight heat

Up to 5%

more PV power on hot
days²

Zone specification

PVT array	10 × 600 W (6.0 kWdc)
Rear HX	Finned copper, closed loop
Panel loop	14 L/min · 25/41 °C (77/106 °F)
Heat pump	6-ton water-to-water, VFD
Compressor input	1.8–5.8 kW, soft start
PCM storage	256,000 BTU · 55–58 °C (131–136 °F)
Tank size	~600 gal (vs ~1,700 gal water)
Building supply	50–55 °C (122–131 °F) hydronic

How it runs

SUN UP • CHARGE

The compressor follows the sun at 30–100% speed, holding panel water near 25 °C (77 °F) while it charges storage.

STORAGE FULL • PROTECT

The compressor throttles back and the zone blower sheds surplus heat, so the panels stay cool.

EVENING • DISCHARGE

The heat pump shuts off and the building draws steady 50–55 °C (122–131 °F) heat from the PCM.

Scales by the zone: 100 panels = 10 zones, about 60 tons of heat pump and 2.56 million BTU of storage. Heat pump plus PCM serving building heat may qualify as thermal energy storage under §48E.³

317-505-9200

modernthermaldesign.com

¹ Heat collection field-measured at peak sun by Modern Thermal Design Pakistan Office and R&D; heat pump and storage are design values for one zone at that output; results vary by site. ² Projected from the module's -0.29%/°C coefficient at about 40 °C (104 °F) cooled vs 57 °C (135 °F) uncooled panel temperature; not yet field-validated. ³ Credit applies to incremental storage cost only; confirm eligibility with the owner's tax adviser.