



ROI & ENERGY PAYBACK ANALYSIS

Architectural VIG

ROI & Energy Payback

US Architectural - Imperial / USD

APPLICABLE STANDARDS & REFERENCES

- ASHRAE Fundamentals 2021 §18
- EPA eGRID 2023
- IECC 2021 Climate Zones
- EIA Energy Prices 2024
- NFRC 500

KEY RESULT

Annual Cost Savings

\$0

Simple payback: N/A



PROJECT INPUTS

Glazing area	1,000.0 ft2
Baseline glazing U	0.48 Btu/h.ft2.degF
THERMGLASS whole-window U	0.2 Btu/h.ft2.degF
U-value improvement	0.280 Btu/h.ft2.degF (58%)
Climate	IECC Zone 5
Cooling energy cost	\$0.16/kWh
Heating fuel	gas
Heating fuel cost	1.35 \$/therm
VIG premium over baseline	\$15/ft2
Incremental cost	\$15,000
Heating system efficiency	95%
Cooling COP	3.5
Discount rate	5.0%
Analysis period	25 years

ANNUAL ENERGY SAVINGS

ANNUAL COST SAVINGS \$0 per year	TOTAL ENERGY SAVED 0 kWh/yr per year
HEATING SAVINGS 0 kWh/yr per year	COOLING SAVINGS 0 kWh/yr per year

PAYBACK & INVESTMENT

SIMPLE PAYBACK PERIOD N/A Check U-value delta	INCREMENTAL COST \$15,000 \$15/ft2 x 1,000.0 ft2
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NET PRESENT VALUE

NPV AT 10 YEARS \$0 5.0% discount rate	NPV AT 20 YEARS \$0 5.0% discount rate	NPV AT 25 YEARS \$0 Analysis period
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NPV = discounted cumulative savings minus incremental cost. Positive = net financial benefit over the period.

CARBON IMPACT

ANNUAL CO2 REDUCTION 0 kg CO2 per year	LIFETIME CO2 (25 YR) 0 kg CO2 total avoided emissions
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ENERGY MODEL

Heating energy model (ASHRAE Fundamentals 2021 §18 / EN ISO 13790)

$Q_{\text{heat}} = U_{\text{delta}} \times \text{Area} \times \text{HDD} \times 24 \text{ h/day}$

$\text{Savings}_{\text{heat}} (\text{kWh}_{\text{thermal}}) = Q_{\text{heat}} / \text{heating_efficiency} / \text{unit_conversion}$

$\text{Cost}_{\text{heat}} = \text{kWh}_{\text{thermal}} \times (\text{fuel_cost} / \text{kWh_per_unit})$ [fuel: gas]

$U_{\text{delta}} = \text{baseline } U - \text{THERMGLASS } U = 0.280 \text{ Btu/h.ft}^2.\text{degF}$

Cooling energy model (annual solar irradiance)

$Q_{\text{cool}} (\text{kWh/yr}) = \text{SHGC_delta} \times \text{Area} \times H_{\text{solar}} / \text{cooling_COP}$

H_{solar} = annual incident solar irradiance, vertical south (kWh/m²/yr), NREL TMY3

Actual savings vary with orientation, shading, and glazing-to-wall ratio.

FINANCIAL MODEL

Annual cost savings

$\text{Cost savings} = \text{Heating savings} \times \text{fuel rate} + \text{Cooling savings} \times \text{electricity rate}$

Heating and cooling are priced at their respective fuel rates independently.

Simple payback period

$\text{Payback (years)} = \text{Incremental cost} / \text{Annual cost savings}$

$\text{Incremental cost} = \text{VIG premium } (\$/\text{ft}^2 \text{ or EUR/m}^2) \times \text{glazing area}$

Net Present Value (NPV)

$\text{NPV} = \text{Annual savings} \times [(1 - (1+r)^{-n}) / r] - \text{Incremental cost}$

Where r = discount rate, n = analysis period (years)

Discount rate used: 5.0% | Analysis period: 25 years

CLIMATE DATA SOURCES

US climate zones per IECC 2021 (zones 1-8, base 65 degF).

HDD/CDD midpoints derived from IECC 2021 zone boundary definitions.

Zone HDD midpoints: Zone 1: 500 . Zone 2: 1,500 . Zone 3: 2,750

Zone 4: 4,450 . Zone 5: 6,300 . Zone 6: 8,350 . Zone 7: 11,000 . Zone 8: 14,000 degF.days.

Solar irradiance (H_{solar}): NREL TMY3, vertical south-facing surface.

Zone 1: 900 . Zone 2: 1,100 . Zone 3: 950 . Zone 4: 850 . Zone 5: 750 . Zone 6: 650 . Zone 7: 550 . Zone 8: 400 kWh/m²/yr.

ASSUMPTIONS & LIMITATIONS

This model uses a simplified steady-state approach. It does not account for:

- . *Dynamic thermal mass effects or transient heat storage in the building envelope*
- . *Infiltration, ventilation heat recovery, or internal heat gains*
- . *Orientation-specific solar gain (a single peak irradiance proxy is used)*
- . *Partial shading, overhangs, or external blinds*
- . *Degradation of glazing performance over time*
- . *Local utility rate structures, time-of-use pricing, or demand charges*

Results should be used as a comparative planning tool, not a certified energy audit.

For project-specific analysis, consult a licensed energy engineer and THERMGLASS technical support at thermglass.com.