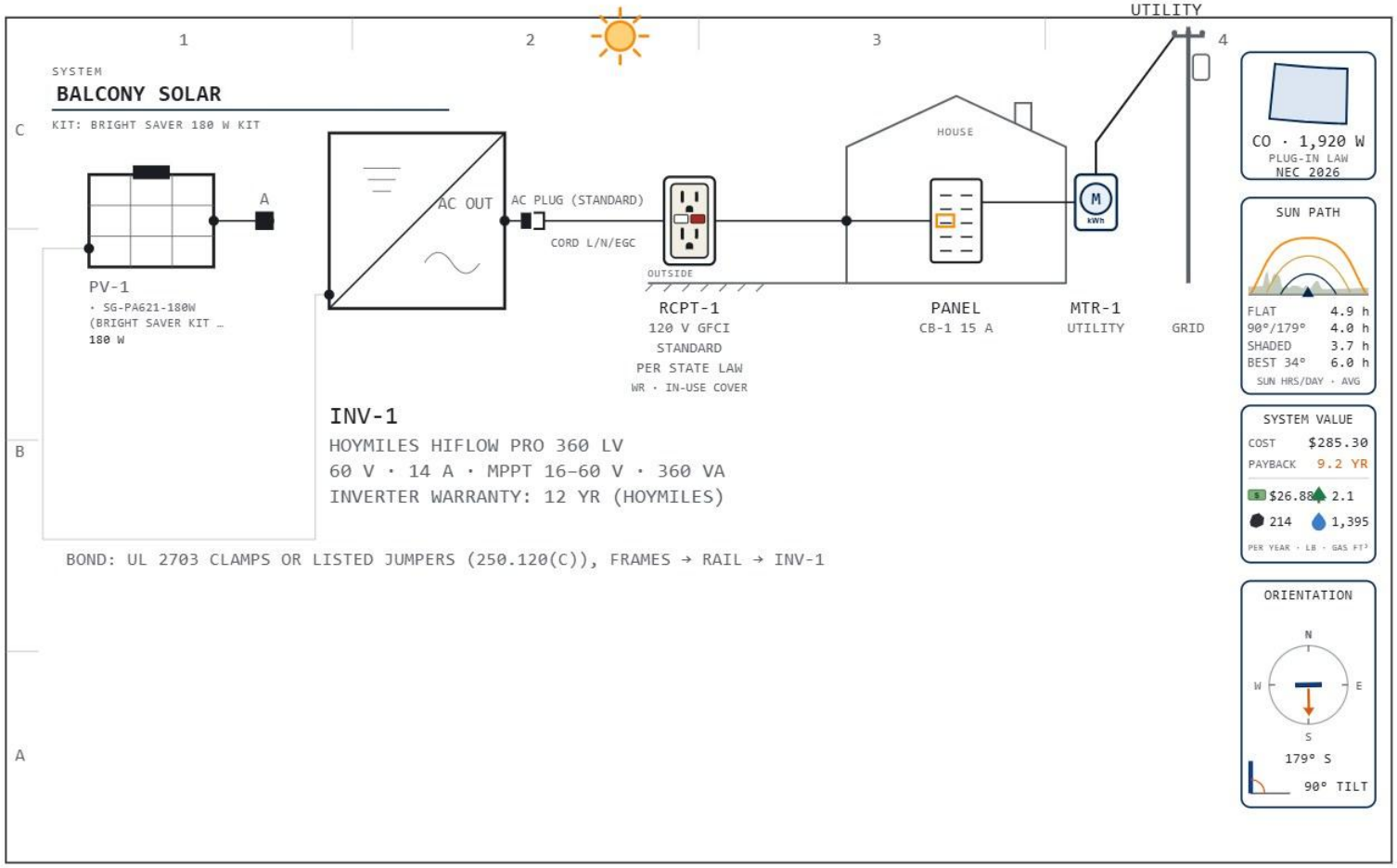
Balcony PV — Electrical

Denver, Colorado · October 28, 2026

SUN SAFE

Prepared with the Sun Safe Designer · sunsafepv.com



BALCONY PV — ONE LINE

COLORADO HB 26-1007 · NEC 690.7(A)(1) · NEC 210.8 · HTTPS://SUNSAFEPV.COM/SOURCES

NOT FOR CONSTRUCTION – EXAMPLE ONLY
FOR DEMONSTRATION PURPOSES ONLY

AC NOTES

[1] Branch circuit: 120 V · 15 A (listing), RCPT-1
[2] RCPT-1: Standard 15 a receptacle, wr (state law)
[3] GFCI: Standard Class A; NEC 210.8
[4] Grounding: RCPT-1 needs a working EGC, not 'no equip ground'
[5] Dedicated circuit: Not required by listing; recommended

STATE REGULATIONS

[6] Utility may: Ask for notice of device size

OVER 25 YEARS — ESTIMATED SAVINGS

$772.79 (after $285.30 cost) · 50 · 5,049 lb · 32,860 ft³

1,043 SPECIFIC YIELD · SHADED
kWh/kWp/yr
188 kWh AC ÷ 0.180 kWp DC

Cold voltage NEC 690.7(A)(1) · GFCI NEC 210.8 · grounding NEC 690.43 · limits from datasheets · module ratings from the CEC list or label · https://sunsafepv.com/sources

Code-compliant installation; a practicing electrician is recommended. Not covered: Article 705, labels (690.13, 705.10); your AHJ decides.

State rules in plain words: sheet 2. Law: Colorado HB 26-1007. Not for construction – example only.

MODULE — 1 TOTAL	
Model	SG-PA621-180W (Bright Saver kit panel)
Pmax	180 W
Voc / Vmp	48.90 / 41.80 V
Isc / Imp	4.52 / 4.31 A
βVoc / γPmax	NEC table ×1.20 / 0.47 (est.) %/°C
αIsc / NOCT	0.06 (est.) %/°C / 45.0 °C
Frame	Framed, grounded
Warranty	Not published by Bright Saver: ask them

INVERTER / INPUT UNIT	
Model	Bright Saver 180 W kit
Type	Complete kit
Max DC input	60 V
MPPT range	16–60 V
Max input current	14 A
Max input Isc	20 A
Output	360 VA
Inputs	1
Warranty	12 yr (Hoymiles, per Bright Saver)

DC CIRCUIT, PER INPUT	
Configuration	1 series × 1 parallel
Design temps (ASHRAE)	-23.6 / 37.6 °C
Voc at -24 °C (690.7)	58.7 V
Vmp hot, 69 °C cell	33.2 V
Isc hot / Imp hot	4.6 / 4.4 A
Array DC	180 W
Mounting	Balcony rail, open behind
Bonding	Frames → rail → INV-1 (690.43)
Ground path	EGC in AC cord to RCPT-1

AC CONNECTION	
Branch circuit	120 V · 15 A[1]
RCPT-1	Standard 15 a receptacle[2]
GFCI	Standard Class A[3]
Grounding	Working EGC[4]
Dedicated circuit	Not required by listing[5]
State limit	1,920 W AC
Utility may	Ask for notice of[6]
INV-1 360 VA ≤ 1,920 W	No derate needed

PROJECT	Balcony Solar
SITE	Denver, Colorado
PREPARED WITH	Sun Safe Designer
DATE	October 28, 2026
REVISION	A — not for construction – example only
SHEET	1 of 6

Planning estimate, not an engineered, stamped or approved design. Install per the adopted NEC, the equipment listings and local rules; permits and inspection may apply.

Balcony PV — Checks and flags

Denver, Colorado · October 28, 2026

Clean design: all 10 checks passed, nothing flagged

Every check the Designer ran on this design, and your state's rules. Flags don't block the design; each one says what to confirm.

COLORADO'S PLUG-IN SOLAR RULES · COLORADO HB 26-1007

- Up to 1,920 W to the grid: one system per address, one device per outlet
- 391 W or less: a listed inverter on a standard outlet is enough; no listing rules that would mean rewiring
- Over 391 W: the whole system must be listed; none is certified yet (Oct 8, 2026)
- Over 391 W: not exempt from the solar installation law; plan on a licensed electrician for AC-side work
- From January 1, 2027, devices over 391 W must be UL listed to be sold, leased or rented
- No approval, fee or extra equipment; the utility may ask the device's size
- From January 1, 2027, HOAs and owners can't unreasonably ban it
- Electrical code: NEC 2026, State Electrical Board Rule 1.5, in effect since August 1, 2026 (checked October 8, 2026)

CHECKED AND PASSED (10)

Cold-morning voltage — PASS

58.7 V against a 60 V limit

Hard limit. NEC 690.7. Panels make their highest voltage on a clear, freezing morning before they warm up. One morning over the limit can damage the inverter.

Tracking range — IN WINDOW

Hot 33.2 V · cold 51.3 V · window 16–60 V · in the window all year (TMY weather)

Estimated. No γPmax entered, so 0.47 %/°C is used (PVWatts V5 standard module; V8 uses 0.37, so this reads lower). Outside the window costs energy, not equipment. Below the floor the inverter can't hold the panel at its best point on

Current on a hot day — PASS

Isc 4.6 A / 20 A · Imp 4.4 A / 14 A

Hard limit. Current rises only slightly with heat, so the hottest afternoon is the worst case.

Current on the outlet — PASS

3.0 A at 120 V from 360 W · 15 A circuit

Solar output is a continuous load (NEC 210.19, 210.20). On a shared circuit, house loads up to the breaker rating plus 3.0 A of solar can flow on the same wire, and the breaker only sees the house side. Keep big loads off this circuit,

State output limit — PASS

360 W within Colorado's 1,920 W

From Colorado's plug-in solar law, listed on the Plug-In Solar page.

Outlet protection — PASS

Standard GFCI outlet with a working ground: Colorado waives rewiring rules at 391 W or less

A standard GFCI can be damaged by power fed back through it. Check the outlet with a plug-in tester before connecting.

Grounding and bonding — IN DESIGN

Frames → rail → INV-1, ground through the cord

Whether the cord's ground can serve the whole array is your inspector's call.

Outage shutoff (UL 1741 / IEEE 1547) — PASS

UL 1741, IEEE 1547

Listed on the HiFlow Pro LV datasheet.

Plug-in listing (UL 3700) — PASS

CSA certificate 80310016

Look it up: CSA product listing (csagroup.org/testing-certification/product-listing), certificate 80310016 · certificate PDF.

+ 1 more: see the check on the Designer page

FLAGS: READ BEFORE BUYING (0)

None. Nothing to fix.

Sources: NEC 690.7, 690.43, 210.8, 210.19/210.20 · UL 1741 / IEEE 1547.1 (2 s outage shutoff) · UL 3700 · datasheets and certificates · state rules from each law, checked Oct 13, 2026: https://sunsafepv.com/plug-in-solar.html

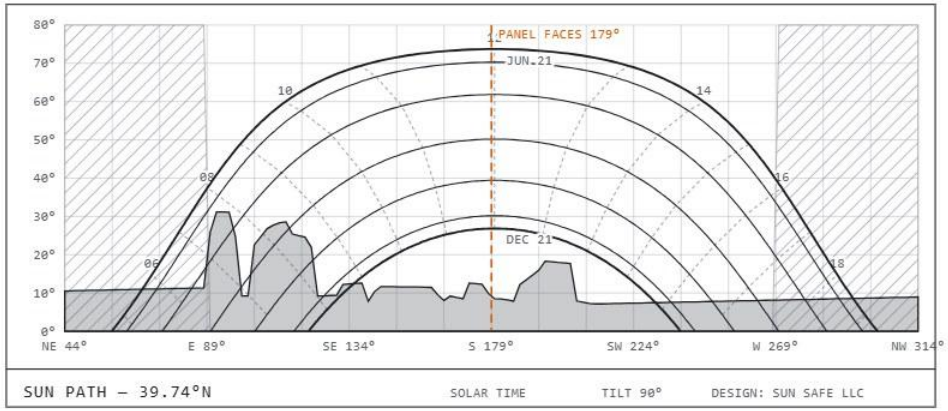
PROJECT	SITE	PREPARED WITH	DATE	REVISION	SHEET
Balcony Solar	Denver, Colorado	Sun Safe Designer	October 28, 2026	A — not for construction – example only	2 of 6

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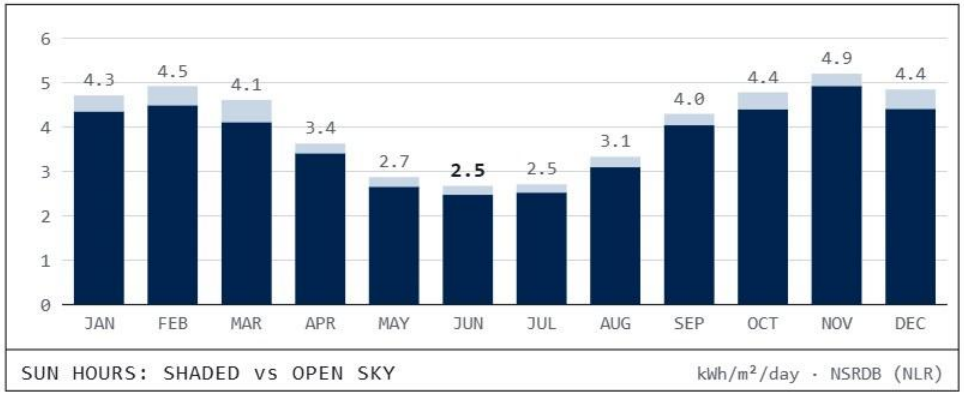
Balcony PV — Sun and production

Denver, Colorado · October 28, 2026

SUN PATH WITH YOUR SKYLINE



SUN HOURS ON THE PANEL, BY MONTH (LIGHT = OPEN SKY)



FLAT GROUND
4.89
sun hours a day

TILTED 90° SOUTH
4.04
−17% vs flat

YOUR BEARING 179°
4.04
the same vs south

AFTER SHADE
3.73
−5% over the year, from shade
−4%
−6%

ESTIMATED OUTPUT
188
kWh a year

FROM SUNLIGHT TO kWh, OVER A YEAR

STEP				kWh	CHANGE
Panel nameplate × sun hours 180 W × 3.73 h × 365				245	
Glass reflection sun striking at low angles bounces off				236	−3.9%
Panel temperature cells average 33 °C while producing; 0.47%/°C				227	−3.6%
System losses 11.3% PVWatts standard (generic 3% shade removed: traced shade is modeled)				201	−11.3%
· Soiling	−2%	· Mismatch	−2%		
· Wiring	−2%	· Connections	−0.5%		
· Light-induced degradation	−1.5%	· Nameplate rating	−1%		
· Availability	−3%				
Inverter efficiency 96% nominal, lower at low power				188	−6.8%
Output limit 360 W maximum				188	0%
Estimated output				188	77% of the start

Method after NLR PVWatts: NSRDB typical-year (TMY) weather, the same PVWatts uses;
PVWatts itself, open sky, for this system: 202 kWh/yr;
Perez 1990 sky model, 0.2 ground reflectance, glass reflection, NOCT cell temperature; 96% inverter.
System losses: standard PVWatts derating losses (NLR defaults) without the generic 3% shade, about 11.3% combined.
Sun hours = kWh of sunlight per m² per day. Estimates for planning, not a production guarantee.
Step-by-step method and every source: sunsafepv.com/sources.html

MONTH BY MONTH

Sun hours a day	Flat ground	Facing south	Your panel, open sky	With shade	Estimated kWh
Jan	2.54	4.71	4.71	4.34	20
Feb	3.52	4.92	4.92	4.48	19
Mar	4.88	4.61	4.61	4.10	18
Apr	5.85	3.63	3.63	3.40	14
May	6.56	2.87	2.88	2.65	10
Jun	7.37	2.67	2.68	2.47	9
Jul	7.03	2.70	2.71	2.52	9
Aug	6.24	3.32	3.33	3.09	12
Sep	5.39	4.29	4.30	4.04	16
Oct	3.93	4.78	4.78	4.40	19
Nov	2.99	5.21	5.20	4.92	21
Dec	2.30	4.85	4.85	4.40	20
Year	**4.89**	**4.04**	**4.04**	**3.73**	**188**

Includes the shade traced on your site panorama (sheet 6). A rough estimate, only as good as the photo.

PROJECT	SITE	PREPARED WITH	DATE	REVISION	SHEET
Balcony Solar	Denver, Colorado	Sun Safe Designer	October 28, 2026	A — not for construction – example only	3 of 6

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Balcony PV — Cost and payback

Denver, Colorado · October 28, 2026

Example costs and bill (Rutland test stand) still in use: Payback. Enter your own for your payback.

WHAT IT COST	
Kit — Bright Saver 180 W kit	$285.30
Panels — included in kit	$0.00
Mounting	$0.00
Electrician	$0.00
Other	$0.00
Total	$285.30

ASSUMPTIONS	
Made in a year	188 kWh
Used at home	95% (exports earn nothing)
Your price	$0.150 per kWh
Price rise	4.1% a year
Panel aging	0.5% a year

GROSS SAVINGS, YEAR 1

$26.88

179 of 188 kWh used at home, at today's price

PAYBACK

9.2 yr

prices rising 4.1% a year

NET AHEAD AFTER 25 YEARS

$772.79

net of $285.30 cost

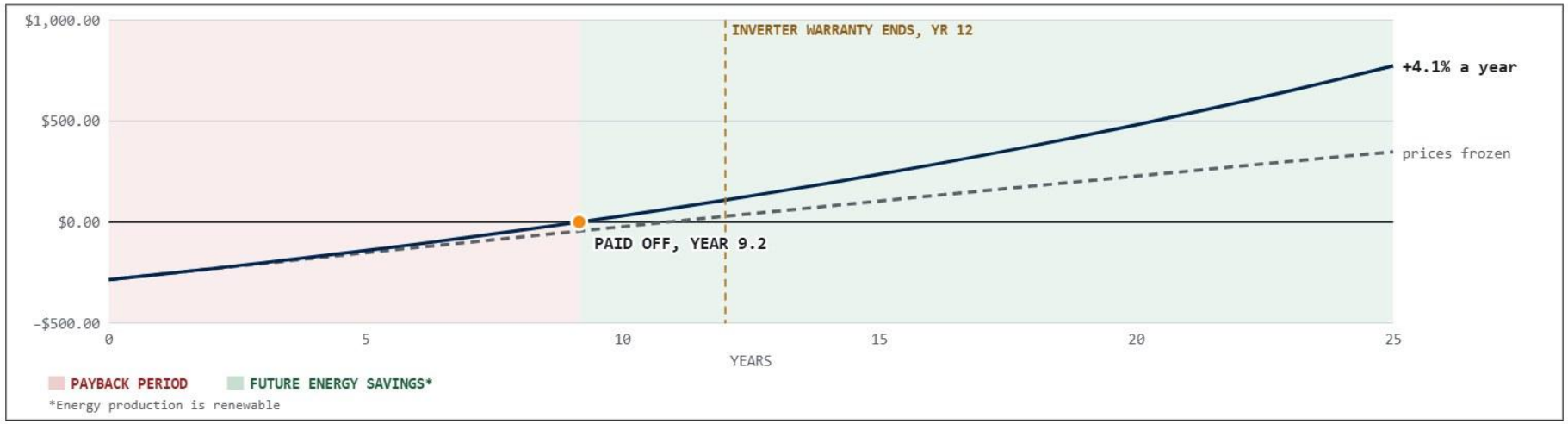
IF PRICES NEVER ROSE

10.9 yr

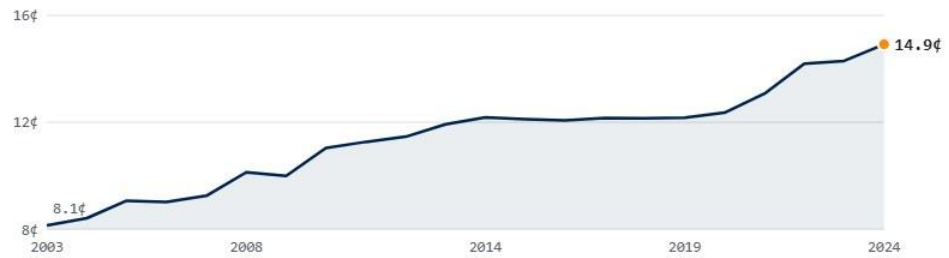
payback at today's price

MONEY AHEAD OR BEHIND, YEAR BY YEAR

No inverter replacement included



COLORADO HOME ELECTRICITY PRICE, 2003–2024 (U.S. EIA)



How to read the curve: it starts at minus what you paid and climbs with each year's savings. Where it crosses zero, the system has paid for itself. The dashed line is the same system if electricity prices never rose.

Colorado home electricity went from 8.1¢ to 14.9¢ a kWh in 21 years: 2.9% a year (last 10 years 2.0%). This report uses 4.1%.

Savings count only power your home uses at the time; under most plug-in laws, exported power isn't paid for. Simple payback arithmetic, not a financial forecast. Price trend: U.S. EIA State Energy Data System (Table ET3). Production from NSRDB (NLR).

Includes the shade traced on your site panorama (sheet 6). A rough estimate, only as good as the photo.

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Balcony Solar	Denver, Colorado	Sun Safe Designer	October 28, 2026	A — not for construction – example only	4 of 6

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Balcony PV — 25 years of offsets

Denver, Colorado · October 28, 2026

1 panel · 4,429 kWh over 25 years

Each year: $26.88 gross savings · 2.1 trees · 214 lb coal or 1,395 ft³ gas (also on sheet 1)

PAYBACK PERIOD · $285.30

GROSS SAVINGS

$1,058.09

= $50.00

5× a one-year icon

TREES, IN CO_2 TERMS

50 trees

= 5 trees grown 10 years

5× a one-year icon

COAL NOT BURNED

5,049 lb

= 50 lb of coal

5× a one-year icon

OR NATURAL GAS NOT BURNED

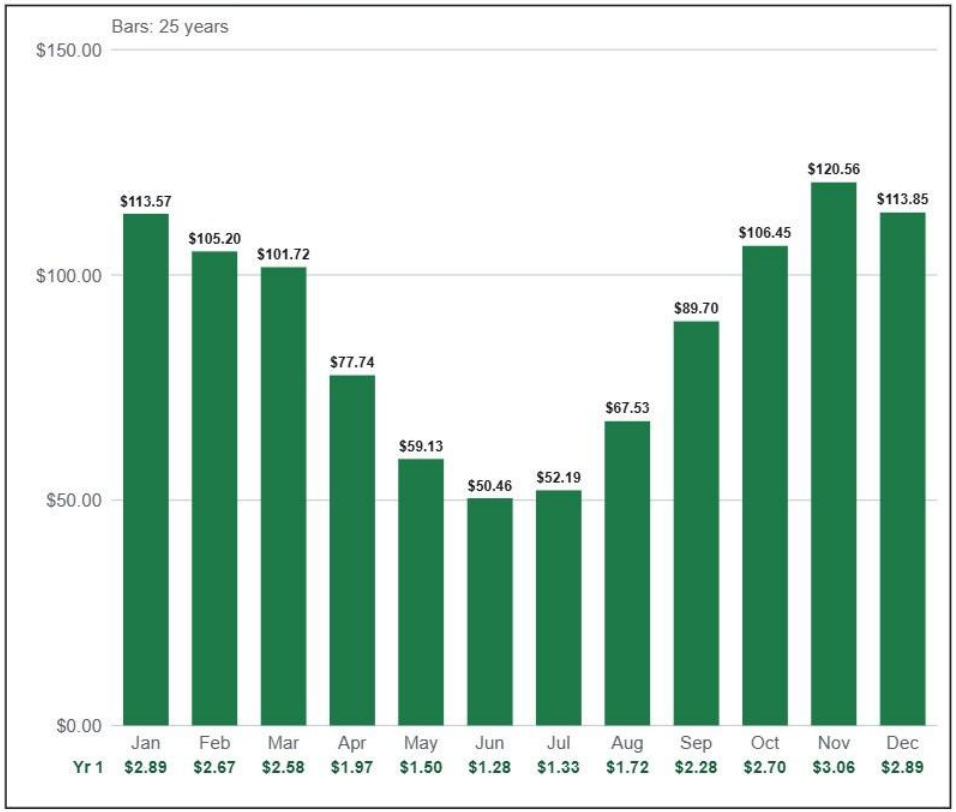
32,860 ft³

= 500 ft³ of gas

5× a one-year icon

ESTIMATED SAVINGS BY MONTH

Year 1 $26.88 · 25 years $1,058.09



Bars: each month's total over 25 years. Green row: the same month in year 1, with prices rising 4.1% a year and panels aging 0.5% a year.

6,561 lb of CO_2 kept out of the air over 25 years. Coal and gas are alternatives, not added together.

Money assumes 95% used at home at $0.150 per kWh, prices rising 4.1% a year, panels aging 0.5% a year.

Sources: EIA (1.14 lb coal and 7.42 ft³ gas per kWh); EPA Greenhouse Gas Equivalencies (CO_2 per kWh; 0.060 t CO_2 per tree seedling grown 10 years).

Includes the shade traced on your site panorama (sheet 6). A rough estimate, only as good as the photo.

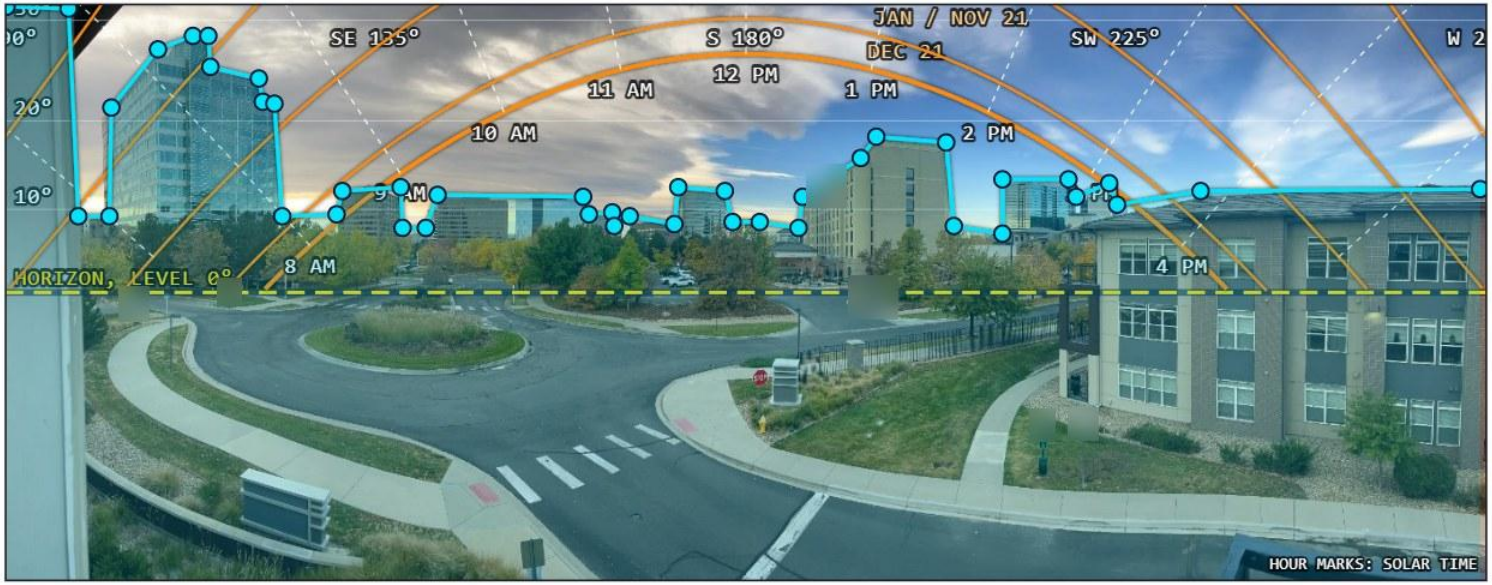
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Balcony PV — Site shading profile

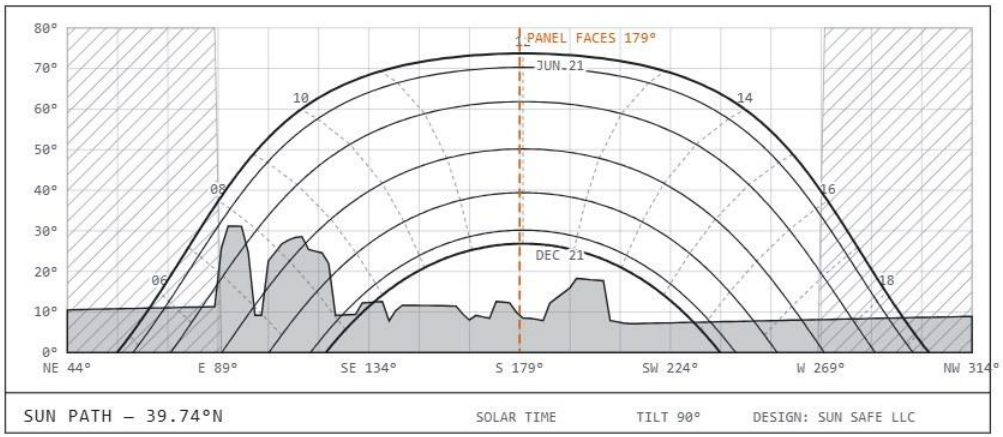
Denver, Colorado · October 28, 2026

YOUR PANORAMA WITH THE SUN'S PATHS AND THE TRACED SKYLINE



Your photo. Orange: the sun's path on the 21st of each month. Dashed: hours, solar time. Blue: solid skyline. Green: tree outlines (sky around them stays clear).

YOUR TRACED SHADE ON THE SUN PATH



SOLAR ACCESS BY MONTH: SHARE OF OPEN-SKY SUN KEPT

JAN 4.3 of 4.7 h — **92%**	FEB 4.5 of 4.9 h — **91%**	MAR 4.1 of 4.6 h — **89%**	APR 3.4 of 3.6 h — **94%**
MAY 2.7 of 2.9 h — **92%**	JUN 2.5 of 2.7 h — **92%**	JUL 2.5 of 2.7 h — **93%**	AUG 3.1 of 3.3 h — **93%**
SEP 4.0 of 4.3 h — **94%**	OCT 4.4 of 4.8 h — **92%**	NOV 4.9 of 5.2 h — **95%**	DEC 4.4 of 4.8 h — **91%**

OPEN SKY
198 kWh
a year, no shade

WITH YOUR SHADE
188 kWh
−5% over the year, from shade
−4%
−6%

SOLAR AVAILABILITY
92%
3.73 of 4.04 sun hours a day

PAYBACK
9.2 yr with shade
was 8.8 yr with open sky

Shade sets what to expect from this spot; it isn't a pass or fail. Any extra PV still helps.

A rough estimate, only as good as the photo: the photo width and level line are the biggest sources of error, and sky outside the photo is assumed open. Good for telling a sunny spot from a shady one, not a shade report.

Includes the shade traced on your site panorama (sheet 6). A rough estimate, only as good as the photo.

PROJECT	SITE	PREPARED WITH	DATE	REVISION	SHEET
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