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Panel Degradation — How Much Power Solar Panels Lose Each Year

Every panel fades a little; the question is how fast — and how to read the number

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What's Inside

Everything in this guide, with page numbers. Skip to whichever chapter answers your question right now.

The 60-Second Version 4
The Short Version 4
What Degradation Actually Is 5
How Much Do Panels Really Lose? 5
Why Panels Degrade at All 6
The First-Year Dip 7
How This Connects to the Warranty 7
What It Means for Your Savings 8
Does the Panel Type Matter? 9
Spotting Real Trouble vs Normal Fade 9
Watching It Without Worrying 10
Common Myths About Fading Panels 10
Questions Worth Asking 11
A Worked Example — Reading a Degradation Line 11
How to Tell on YOUR Quote 12
Northeast Ohio Weather and Fading 13
Red Flags a Salesperson Is Overselling Longevity 14
Words You'll Hear 14
When to Call Bill 15
Everyday Cheat Sheet 17

A Note From Bill 18

Your Visit — and My Promise 19

SUMMARY

The 60-Second Version

Every solar panel slowly loses a little power each year — that is degradation, and it is normal, not a defect. Good modern panels fade remarkably slowly: after a slightly larger first-year dip, they lose only around half a percent a year or less, so a quality panel still makes close to 90 percent of its original power after 25 to 30 years.

The performance warranty is simply that promise in writing, stating the guaranteed output at its end year. Newer N-type panels (TOPCon, HJT) age more slowly than older PERC. Watch your system by its monthly and yearly totals, not single cloudy days — a slow, even decline is healthy, while a sudden or lopsided drop is a problem to investigate.

- Fade is normal; the question is how fast, and good panels are slow.
- The performance warranty puts the fade in writing — read the end-year output.
- Sudden or uneven drops are trouble, not degradation.

1 The Short Version

Degradation is a big word for a simple idea: solar panels slowly lose a little of their power as the years pass. Every panel does it, it is normal, and on today's good panels it is remarkably slow. The real worry is not whether panels fade — they all do — but how fast, and that is where a quality panel earns its keep.

This guide explains how much power panels actually lose each year, why it happens, what the performance warranty promises, and how to tell a slow-fading panel from a quick one. You will finish able to read a degradation figure and know whether it is good news or a quiet warning.

- All panels lose a little output each year; it is normal, not a defect.
- Good modern panels degrade very slowly — often around half a percent a year or less.

- That means a panel can still make close to 90 percent of its power after 25-30 years.
- The performance warranty is the written promise about how slowly it will fade.

WATCH OUT

Do not fear degradation; measure it. A panel that loses a small fraction of a percent a year will still be a strong producer decades from now. The number to find is simply how slow the fade is.

2 What Degradation Actually Is

Over time, the materials inside a solar panel change slightly under constant sun, heat, and weather, and the panel becomes a touch less able to turn sunlight into electricity. That gradual decline is degradation. It is not a sudden failure or a sign something is wrong — it is the normal, expected aging of a product that sits outdoors for decades.

Think of it like the slow fade of almost anything exposed to the elements, except unusually gentle. A good panel ages so slowly that it remains a strong producer long after its warranty, just making a little less each year than the year before.

GOOD TO KNOW

Degradation is sometimes confused with a panel 'wearing out.' It is gentler than that. A degraded panel is not broken; it simply makes slightly less power than when it was new. Most reach old age still doing their job well.

3 How Much Do Panels Really Lose?

Here are the honest numbers. Good modern panels typically lose a small amount of output in their very first year, then settle into a slow, steady yearly decline — often around four- or five-tenths of a percent a year on quality N-type panels. Premium panels can be even slower. That steady rate is the number that matters most over the long run.

Multiply that slow yearly loss across twenty-five or thirty years and it still adds up to only a modest total. A panel losing half a percent a year is still making roughly ninety percent of its original power after two decades. That is why panels are sold with such long promises — because good ones genuinely hold up.

	Older / weaker panels	Good modern N-type panels
First-year loss	~2-3%	~1-2%
Each year after	~0.7% or more	~0.4-0.5% or less
Output at year 25	~80-82%	~87-90%+

TIP

When comparing panels, the steady yearly rate matters more than the first-year figure. A smaller yearly decline compounds in your favor across the whole life of the system.

4 Why Panels Degrade at All

A few natural processes cause the slow fade, and none of them mean the panel is defective. Knowing them helps you understand why a sturdier, better-made panel ages more slowly than a cheaper one.

- Constant sunlight gradually alters the silicon very slightly over years.
- Heat cycling — hot days, cool nights — stresses the materials over time.
- Weather, moisture, and the elements work on seals and surfaces slowly.
- An initial settling in the first weeks causes the slightly larger first-year dip.

GOOD TO KNOW

Better panels use higher-grade materials and construction that resist these effects, which is exactly why they can promise such slow degradation. The slow fade is not luck; it is built in.

5 The First-Year Dip

Panels often lose a little more in their first year than in any year after, and this surprises people who watch their monitoring closely. It is a normal settling effect, sometimes called initial or light-induced degradation, and it is accounted for separately in the warranty.

After that first-year settling, the panel drops into its slow, steady, lifelong rate. So do not be alarmed if a brand-new system shows a slightly larger decline in year one; it is expected, it is in the warranty, and it does not continue at that pace.

WATCH OUT

If someone quotes you only a 'year one' loss and leaves out the steady yearly rate, you are missing the number that matters over decades. Ask for both: the first-year allowance and the ongoing annual rate.

6 How This Connects to the Warranty

The performance warranty is simply degradation written down as a promise. It usually states a first-year allowance, a maximum yearly decline after that, and a guaranteed minimum output at the end of its term. If your panels ever fade faster than promised, the warranty is what protects you.

So the degradation figure and the performance warranty are two views of the same thing. A panel promising slow degradation should carry a performance warranty that reflects it — a high guaranteed output at year twenty-five or thirty. If the two do not match, ask why.

1. Find the performance warranty's guaranteed output at its end year.
2. Find the maximum yearly decline it permits.
3. Compare that to the panel's advertised degradation rate; they should agree.
4. Prefer a high end-year floor and a small permitted yearly decline.

TIP

A performance warranty guaranteeing around ninety percent at the far end is a sign of a slow-fading, confident panel. That single number is an easy way to rank two panels' longevity.

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7 What It Means for Your Savings

Degradation does slightly reduce your production as the years pass, so it is fair to ask what that means for the money. The honest answer is reassuring: because the fade is so slow on good panels, the effect on your yearly savings is gradual and small, spread across decades.

A system that covers most of your usage early on will still cover most of it many years later, just a hair less. Degradation is a slow, gentle tide, not a cliff. It is worth understanding, but it is not a reason to hesitate over good panels.

GOOD TO KNOW

A reputable installer's long-term savings estimate already includes degradation. If a projection seems to assume your panels never lose a thing, that is a sign it is too optimistic — real estimates account for the slow fade.

8 Does the Panel Type Matter?

Yes, and this ties back to the technology guides. The newer N-type panels, like TOPCon and HJT, generally degrade more slowly than the older P-type PERC panels. That slower aging is one of the main reasons the industry moved to N-type and why their warranties grew longer.

- N-type TOPCon: slow degradation, strong long warranties.
- HJT (premium): often the slowest degradation of all, with excellent warranties.
- Older P-type PERC: still good, but typically fades a bit faster.
- The panel type is a fair clue to how gracefully it will age.

> **TIP**
> If long-term longevity is a priority for you, the slow-degrading newer panels are worth a look. But weigh it against price and your roof, as always — a slightly faster fade on a cheaper panel may still suit a roomy roof just fine.

9 Spotting Real Trouble vs Normal Fade

It is worth knowing the difference between normal degradation and an actual problem, so you neither panic over nothing nor miss a real fault. Normal degradation is slow, even, and spread across all your panels. A genuine problem looks different.

- Normal: a small, gradual, even decline across the whole system over years.
- Trouble: a sudden drop in output from one day to the next.
- Trouble: one panel or section far below the rest (possible fault or shading).
- Trouble: output far below the warranty's promised level for the system's age.

> **WATCH OUT**
> A sudden or lopsided drop is not degradation — it is a sign to investigate. Monitoring makes this easy to catch. If your system's output falls off a cliff or one area lags badly, that is a warranty or repair matter, not normal aging.

10 Watching It Without Worrying

Most modern systems come with a monitoring app that shows your production. It is a wonderful tool, but it can also make you fret over every cloudy day. The trick is to watch the long trends, not the daily wiggles.

1. Check monthly and yearly totals, not single days, to judge health.
2. Compare this year's total to last year's; expect only a tiny decline.
3. Watch for any one panel or section consistently lagging the others.
4. Keep your warranty paperwork handy in case a real shortfall appears.

> **GOOD TO KNOW**
>
> A year-over-year drop of a fraction of a percent is degradation doing exactly what it should. It is only worth concern if the drop is large, sudden, or uneven. The app is there to reassure you, not to make you anxious.

11 Common Myths About Fading Panels

Degradation attracts a few myths, and clearing them up keeps you from worrying over the wrong things or being talked into the wrong panel.

- Myth: panels suddenly die at 25 years. Reality: the warranty ends, but good panels keep producing well past it.
- Myth: a panel at year 20 makes half its power. Reality: a good one still makes close to 90 percent.
- Myth: degradation means your panels are defective. Reality: it is normal, gentle, expected aging.
- Myth: you can stop degradation with special cleaning or coatings. Reality: you cannot; it is the materials aging.

GOOD TO KNOW

The 25- or 30-year warranty is a promise floor, not an expiration date. Many panels keep doing useful work for years beyond it, just making a little less each season. Think of the warranty as a guarantee, not a shutoff.

12 Questions Worth Asking

A few plain questions pin down how well a panel will age before you buy.

- "What is this panel's yearly degradation rate after the first year?"
- "What output does the performance warranty guarantee at its end year?"
- "Does your savings estimate account for degradation?"
- "Is this an N-type panel, which tends to age more slowly?"

TIP

Clear numbers in response are a good sign. Vagueness about degradation, or a savings projection that ignores it, tells you the quote may be rosier than reality.

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13 A Worked Example — Reading a Degradation Line

Numbers on a page feel abstract until you walk one through, so let us do that with a plain example. Imagine a quality panel rated at 400 watts when new, with a first-year settling loss of about one percent and a steady decline of about four-tenths of a percent each year after that. Those are typical figures for a good N-type panel today.

The first year it drops to roughly 396 watts. Each following year it loses a little under two watts. Keep that up and the panel is still making close to 360 watts after twenty-five years — about ninety percent of where it started. That is the whole story of degradation in one line: a small first step, then a very slow, steady glide.

Year	Roughly what the panel makes	Share of new
New (year 0)	400 W	100%
Year 1 (after settling)	~396 W	~99%
Year 10	~383 W	~96%
Year 25	~360 W	~90%
Year 30	~353 W	~88%

WATCH OUT

You do not need to do this arithmetic yourself. The point is to see the shape: the fade is gentle and spread across decades, so a good panel is still a strong producer long after the warranty's end year.

14 How to Tell on YOUR Quote

Two numbers on a quote or spec sheet tell you almost everything about how a panel will age. They are easy to find once you know their names, and holding them up side by side is the single most useful check you can do.

1. Find the panel's spec sheet (the installer can hand you the one-page PDF for the exact model).
2. Look for the yearly degradation rate — often written as an annual percentage after year one, sometimes in a small table of output by year.
3. Find the performance warranty's guaranteed output at its end year — usually a percentage at year 25 or 30.

4. Check the two agree: a small yearly rate should go with a high end-year floor. If the rate is tiny but the floor is low, ask why.
5. Write both numbers down so you can compare them across competing quotes.

> **GOOD TO KNOW**
>
> A spec sheet will often show two warranties side by side: a 'performance' (power) warranty about output over time, and a 'product' (workmanship) warranty about the panel itself not failing. They are different promises — the next chapter's glossary keeps them straight.

15 Northeast Ohio Weather and Fading

Folks here naturally wonder whether our cloudy winters, summer heat, and freeze-thaw swings make panels fade faster. The honest answer is reassuring, with one nuance worth knowing.

- Cloudy days lower how much a panel makes that day, but they do not speed up degradation — a resting panel is not an aging one.
- Cold is actually kind to panels: they run a touch more efficiently in the cold, and winter sun on snow can even give a small boost.
- Heat is the real stressor. Our hot, humid summers matter more for long-term aging than our winters do.
- The daily hot-day, cool-night cycle is normal stress that every panel is built and warrantied for.

> **GOOD TO KNOW**
>
> So a normal Portage County year does not shorten a good panel's life. Judge the panel by its warranty and build quality, not by our weather. If anything, our cold, snowy winters are a mild help on the days the sun is out.

16 Red Flags a Salesperson Is Overselling Longevity

Most installers are straight with you. But degradation is an easy place to blur the picture, so here are the phrases and gaps that should make you slow down and ask another question.

- A savings projection that seems to assume the panels never lose any power at all over decades.
- A 'year one' loss quoted with no mention of the steady yearly rate that matters over the long run.
- A promise that some coating, spray, or special cleaning 'stops degradation' — nothing does; it is the materials aging.
- A performance warranty with a low end-year floor paired with boasts of 'barely any' yearly fade — the two do not match.
- Pressure to decide today 'before the panels change' — degradation facts do not expire this week.

WATCH OUT

None of these mean the salesperson is dishonest, but each is a sign the numbers deserve a second, neutral look before you sign. A confident, slow-fading panel is sold with clear figures, not vague reassurance.

17 Words You'll Hear

A short plain-English glossary so none of these terms trips you up on a quote or a spec sheet.

Term	What it means in plain English
Degradation	The slow yearly loss of power output; normal, not a defect

First-year / initial loss	A slightly larger settling dip in year one, then a slow steady rate
Performance warranty	The written promise about output over time — find the end-year floor
Product warranty	A separate promise the panel itself won't fail (often 25 years now)
N-type / P-type	Two silicon recipes; newer N-type (TOPCon, HJT) fades more slowly
Nameplate / rated watts	The panel's power when brand new, before any fade
LID / LeTID	Technical names for mild light-related settling in the early life

WATCH OUT

You never have to use these words yourself. But recognizing them means a spec sheet stops looking like a foreign language, and you can spot the one or two numbers that actually matter.

18 When to Call Bill

You do not have to sort any of this out alone, and there is real value in having someone with no panel to sell read a quote beside you.

I do not sell or install solar — I am the independent local tech who helps folks in Portage County, with 30-plus years of putting technology into plain English. If a quote's long-term numbers look too good, or you want to understand how gracefully a panel will age, I can help you read the degradation figures and the performance warranty together and see whether the promise is honest.

- A savings projection seems to assume the panels never lose power.
- You want to compare how two panels will age over decades.

- Your monitoring shows a drop and you cannot tell if it is normal.
- You want a neutral read of the degradation and warranty numbers.

CHEAT SHEET

Everyday Cheat Sheet

Keep this handy when a quote talks about output over time.

I want to...	Do this...
Understand degradation	The normal, slow yearly loss of output; every panel does it
Know the good numbers	Good panels lose ~0.4-0.5%/year, still ~90% after 25-30 years
Read the warranty	Performance warranty = degradation as a promise; find the end-year output
Judge by panel type	N-type TOPCon and HJT age more slowly than older PERC
Tell fade from trouble	Normal = slow, even; trouble = sudden or one section lagging
Watch calmly	Check monthly/yearly totals, not single cloudy days
Get help	Call Bill: (330) 200-8042

BEFORE YOU GO

A Note From Bill

A quick note from Bill. I write these guides to make home tech a little less frustrating, and I do my best to keep every step accurate and up to date. Still, every home, device, and setup is a bit different, so I can't promise a guide will match yours exactly or fix your particular problem. These guides are for general information only — they're not professional, legal, or financial advice, and they don't replace your device's own manual or the manufacturer's instructions. Please go slow, use your own good judgment, and use everything here at your own risk. If a step involves electrical wiring, a gas appliance, a water heater, plumbing, or climbing a ladder — or if anything just doesn't feel safe — please stop and call a licensed professional (or give me a call at 330-200-8042). Bill's Home Tech and Bill Davis can't be responsible for any damage, data loss, or injury that results.

HOW I CAN HELP

Your Visit — and My Promise

You don't have to remember all of it — just that a friendly, patient person is one call away, whenever you'd rather have a hand.

KEY SPECS

In your home — $99 flat for the first visit, no contracts and no surprises, with a 30-day come-back-free follow-up. In-home visits cover Portage County, Ohio and nearby communities.
Outside the area? Remotely — $49 for a screen-share session (free for Support Plan members, $39/mo), refundable if I can't fix it — and credited toward a visit if you'd rather have me in person. Book either at billshometech.com/book.

GOOD TO KNOW

My promise — If you're not 100% satisfied with your visit, I'll come back at no charge, or refund the full $99. No questions, no awkwardness. That's how I'd want to be treated.

Whenever you're ready, I'll come to your home anywhere in Portage County, Ohio and nearby communities, at your pace. Too far for a house call? I also help remotely. Book at billshometech.com/book or call (330) 200-8042. — Bill

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