BILL'S HOME TECH

Home & Small Business Tech Solutions

An Extended Guide · No. 1670

# Reading Battery Capacity: Amp-Hours vs Watt-Hours

What the numbers on the label actually mean

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**! Read this first — a few battery-safety basics**

A battery stores a lot of energy in a small package, so a few plain habits keep everyone safe — no matter the chemistry. Charge with the charger made for that exact battery, on a hard, non-flammable surface, and never charge one that is swollen, cracked, leaking, hot, or wet. Keep batteries away from open flame, sparks, and high heat, and give a lead-acid battery plenty of fresh air while it charges, because it can give off explosive hydrogen gas. Never puncture, crush, short the two terminals together, or throw a battery in a fire. Around lead-acid batteries wear eye protection — the acid inside can burn skin and eyes. And when any battery finally wears out, it does not belong in the household trash: batteries are recycled at the right drop-off, never thrown away. The reassuring part is that the LiFePO4 chemistry — also written LFP — inside most of today's power stations and backup batteries is one of the safest and most stable there is. Reading a label is about capacity, not danger — but the same battery that holds a lot of energy still deserves the plain handling habits below, whatever its amp-hour or watt-hour rating.

# Making sense of the numbers on the label

Amp-hours here, watt-hours there, a voltage somewhere in between — battery labels can read like a foreign language. This guide hands you the translation.

I'm Bill, and I run Bill's Home Tech here in Portage County, Ohio. One of the most common mix-ups I help untangle is what the capacity numbers actually mean — and why two batteries that look the same on the shelf can hold very different amounts of energy.

By the end of this guide you'll be able to pick up a battery or power station, read its label, and know what you're really getting. I won't quote you made-up numbers — I'll teach you to read the true ones printed on your own gear, which is the only honest way to do it.

**★ No math anxiety allowed**

There's a tiny bit of arithmetic here, but nothing you can't do on a napkin — and I'll keep it gentle. Stuck on a label? Call or text me at (330) 200-8042 and we'll read it together.

# The whole idea, on one page

If you read nothing else, these are the ideas that make any battery label make sense.

- ❑ Amp-hours (Ah) roughly measure current over time — like the size of the bucket.
- ❑ Watt-hours (Wh) measure the actual energy stored — the honest 'how much can this run' number.
- ❑ Watt-hours are amp-hours times voltage, so Wh already accounts for voltage and Ah does not.
- ❑ Only compare amp-hours between batteries at the same voltage; otherwise compare watt-hours.
- ❑ 'Rated' capacity and 'usable' capacity differ — with lead-acid you use less of the rating; with LiFePO4, most of it.
- ❑ Power stations are rated in watt-hours because it's the fair way to compare.

> **✔ One number to remember**
> If only one term sticks, make it watt-hours (Wh). It's the closest thing to a true measure of how much a battery can run.

# Why the label trips people up

It's not you — battery labels genuinely mix several different measures together.

A single label might show amp-hours, watt-hours, a voltage, and a few other figures, all crowded together. Each measures something different, and if you don't know which is which, it's easy to grab the wrong one and compare apples to oranges.

The good news is that only two of those numbers matter for 'how much will this run,' and once you can tell them apart, the fog lifts. Let's take them one at a time — amp-hours first, then watt-hours.

> **✔ You only need two words**
> Amp-hours and watt-hours. Get comfortable with those two and you can read almost any battery label with confidence.

# Amp-hours (Ah): the size of the bucket

Amp-hours are the number you'll see most often, so let's make them friendly.

Amp-hours (Ah) are a rough measure of how much current a battery can deliver over time — loosely, the size of the bucket. A bigger amp-hour number generally means a battery that can run something for longer before it's empty.

That's genuinely useful, and for a lot of everyday shopping it's the figure people reach for. But amp-hours have a catch that trips up even careful shoppers — and it's worth understanding before you lean on the number too hard.

> **✔ Think 'bucket size,' not 'energy'**
> Amp-hours tell you roughly how big the bucket is. They don't, by themselves, tell you how much energy is in it — and that difference is the whole point of this guide.

# Watt-hours (Wh): the real energy

If amp-hours are the size of the bucket, watt-hours are how much is actually in it.

A watt-hour (Wh) measures the real amount of energy stored in a battery, no matter its voltage. That makes it the honest, fair way to compare one battery against another — it's the closest thing to a true 'how much can this run, and for how long' number.

This is why watt-hours are the term I trust most, and the one I steer people toward when they're comparing. It already bakes in the voltage, so you're not fooled by two batteries that share an amp-hour number but hold very different amounts of energy.

> **✔ Watt-hours are the honest number**
> When you want to know what a battery can genuinely do, watt-hours are the figure to find. Everything else is a supporting detail.

# The key difference, side by side

Here's the whole distinction in one breath.

Amp-hours describe how much current flows over time at a battery's voltage. Watt-hours describe the actual energy stored, folding the voltage in for you. Two batteries can share the same amp-hours and still hold different energy — but if they share the same watt-hours, they hold the same energy, period.

So amp-hours are a fine rough guide when nothing else changes, and watt-hours are the reliable measure when you're comparing batteries that might differ. Keep that one sentence and you're most of the way to reading any label.

> **✔ Same watt-hours means same energy**
> That's the sentence to remember. Amp-hours can mislead across different voltages; watt-hours never do.

# Why voltage changes everything

This is the trap that catches good, careful people — so let's shine a light right on it.

Imagine two batteries that both show the same amp-hours, but one is a 12-volt battery and the other is a 24-volt battery. Because energy (watt-hours) is amp-hours multiplied by voltage, the 24-volt battery holds about twice the energy — same amp-hours, very different real capacity. The amp-hour number alone would have fooled you into thinking they were equal.

That's the heart of it: amp-hours only tell the full story when you're comparing batteries at the same voltage. The moment the voltages differ, amp-hours stop being a fair comparison, and you have to look at watt-hours instead.

> **! Don't compare amp-hours across different voltages**
> Two batteries can share an amp-hour number and hold very different amounts of energy if their voltages differ. To compare apples to apples, use watt-hours — every time the voltages aren't identical.

# How the two numbers relate (gentle math)

There's one small piece of arithmetic that ties amp-hours and watt-hours together, and it's genuinely simple.

A battery's watt-hours are roughly its amp-hours multiplied by its voltage. That's the whole relationship. If a label gives you amp-hours and a voltage but not watt-hours, you can get close to the watt-hours yourself just by multiplying the two together.

You don't need to be precise about it — this is for rough comparison, not engineering. But knowing that watt-hours come from amp-hours and voltage explains, in one stroke, why watt-hours are the fair measure and amp-hours alone are not.

> **✔ Amp-hours times volts is about watt-hours**
> Keep that little rule in your back pocket. It turns a confusing label into a number you can actually compare.

# Rated capacity vs usable capacity

Here's the second big idea, and it surprises almost everyone: the number on the box isn't always the number you get to use.

Every battery has a 'rated' capacity — the figure the maker prints. But how much of that you can safely use depends on the chemistry. With some batteries you should only draw down part of the rating, so the 'usable' capacity is meaningfully less than the label suggests.

That means two batteries with the same rated capacity can hand you different amounts of real, usable energy. It's not a trick or a defect — it's just how the chemistries differ. So when you compare, it pays to ask not only 'what's the rating' but 'how much of it can I actually use.'

> **✔ Rated is the promise; usable is the delivery**
> The rating tells you what's in the tank. Usable capacity tells you how much you can actually pour out without harming the battery.

# Usable capacity, by chemistry

The gap between rated and usable is where lead-acid and LiFePO4 part ways.

## Lead-acid — use only part of it

With lead-acid (and AGM), draining the battery deeply, over and over, wears it out fast. To get a good life from it, you should only use a portion of the rated capacity — so the usable share is smaller than the label makes it look.

## LiFePO4 — most of it is yours

LiFePO4 tolerates deep discharge far better, so most of its rated capacity is genuinely usable, and its BMS stops it from going dangerously low. That's a quiet advantage: a LiFePO4 battery often does more real work than its rating alone suggests, while a lead-acid battery does a bit less.

> **✔ Same rating can mean different real energy**
> When you compare a lead-acid battery to a LiFePO4 one, don't stop at the rating. Ask how much of each is usable — that's the fair comparison.

# Why power stations are rated in watt-hours

Pick up almost any power station and you'll see its size given in watt-hours. That's no accident.

A power station's whole job is to run your things during an outage, and watt-hours are the number that tells you how much running it can do. Because watt-hours already account for voltage, they let you compare one power station to another fairly, without getting tangled in amp-hours and voltages.

- Watt-hours tell you roughly how much you can run, and for how long.
- They let you compare two power stations apples-to-apples.
- They pair naturally with the wattage of your devices, which is also in watts.
- With LiFePO4 inside, most of that watt-hour rating is genuinely usable.

> **✔ Watts and watt-hours are cousins**
> Your devices draw watts; a power station stores watt-hours. Matching the two is how you estimate runtime — our sizing guide walks through it.

# Two kinds of homes, two sets of needs

The numbers on the label mean the same thing everywhere, but how many watt-hours you actually need depends a lot on where you live.

## If you live in town or the suburbs

In town or the suburbs, outages tend to be shorter, so you're usually sizing for a few hours of essentials rather than days.

- A smaller watt-hour rating often covers phones, the internet, a medical device, and the fridge for a short outage.
- You can recharge from the wall between outages, so you needn't store days of energy.
- Comparing two power stations? Look at watt-hours (Wh) to see which truly holds more.
- Remember usable capacity — with LiFePO4, most of the rating is yours to use.

## If you are out in the country on a well

Out in the country on a private well, outages run longer, and when the power stops the well pump stops — so no running water until it's back. You're often sizing for more watt-hours and longer stretches.

- Longer outages mean you'll care more about total watt-hours — and how much of it is usable.
- A big 240-volt well pump needs far more power than a small power station's label can deliver — see our well-pump and sizing guides.
- Pairing with solar adds watt-hours back during the day, which stretches a long outage.
- Add up the watt-hours of what you must run, then compare that to a battery's usable rating — don't guess from amp-hours alone.

> **★ Not sure how many watt-hours you'd need?**
> That's a sizing question, and one of my favorites — I'll help you add up your must-run list honestly. Call (330) 200-8042. For a whole-house or well-pump load, I'll also help you line up a licensed electrician.

# How to read a battery label

Let's put it to work. Here's how I read a battery label, step by step, right there in the aisle.

- ❑ Find the voltage (a number followed by V).
- ❑ Find the amp-hours (a number followed by Ah).
- ❑ Look for watt-hours (a number followed by Wh) — the honest energy figure.
- ❑ No watt-hours printed? Multiply amp-hours by voltage for a rough figure.
- ❑ Note the chemistry (lead-acid, AGM, or LiFePO4) — it tells you how much is usable.
- ❑ Only compare amp-hours between batteries at the same voltage.

Do that once or twice and it becomes second nature. The label stops being a wall of numbers and starts being a short story about what the battery can do.

# How to read a power station label

Power stations put the friendly number front and center, which makes them easier to read once you know what you're seeing.

- **The big watt-hour number** is the size of its energy tank — how much it can store.
- **A separate watts figure** (sometimes called output or continuous watts) is how much it can power at once.
- **Watt-hours are for 'how long'**; watts are for 'how much at once.' You need both to match it to your needs.
- **The chemistry** is almost always LiFePO4 now, so most of that watt-hour rating is usable.

So a power station with a big watt-hour tank but a modest watts output can run small things for a long time but can't start a big, hungry appliance. Reading both numbers keeps your expectations honest. Our power-station and sizing guides go deeper.

# The 'more amp-hours' myth

This is the single most common capacity mistake I see, so it's worth its own page.

The myth goes: 'more amp-hours always means more battery.' It sounds right, and it's true only when the voltages match. Compare a battery at one voltage with a battery at another using amp-hours alone, and you can badly misjudge which one actually holds more energy.

The fix is simple and you already know it: when the voltages might differ — or when you just want to be sure — compare watt-hours instead. Watt-hours fold the voltage in, so they never play this trick on you.

> **! More amp-hours is not always more energy**
> Only at the same voltage do more amp-hours mean more energy. Across different voltages, trust watt-hours, not amp-hours — or you may pay for less battery than you think.

# When amp-hours are perfectly fine to use

I don't want to leave you afraid of amp-hours — they're a genuinely useful number in the right spot.

- **Same voltage:** comparing two 12-volt batteries by amp-hours is fair and easy.
- **Like-for-like replacement:** matching a new battery to the old one's voltage and amp-hours.
- **Rough runtime feel:** at a fixed voltage, more amp-hours does mean longer run.
- **Deep-cycle sizing within one voltage:** amp-hours are the common yardstick there.

So amp-hours aren't the enemy — they're just a tool with one rule: keep the voltage constant. The instant it changes, switch to watt-hours and you'll never be misled.

# Matching capacity to what you run

Reading the label is step one; the next question is 'how much do I actually need?' Here's the honest, no-numbers way to think about it.

Start with what you'd want to keep running in an outage and roughly how long. Each device has a wattage; add those up and think about the hours, and you get a feel for the watt-hours you'd want on hand. Then compare that to a battery's usable watt-hours — not just its rated figure — to see if it fits.

I'm keeping this general on purpose, because the right size depends entirely on your home and your must-run list. Actual sizing — with your real devices and hours — is what our sizing guide is for, and it's a great thing to work through together.

> **✔ Size by usable watt-hours, not amp-hours**
> When you're matching a battery to your needs, watt-hours are the currency — and usable watt-hours are the honest ones. Amp-hours alone won't get you there.

# Where to find the real numbers

I won't make up figures for you, and neither should anyone else. Here's where the true numbers actually live.

- **The label** on the battery or power station itself — the first place to look.
- **The manual** or quick-start guide that came in the box.
- **The maker's spec sheet** or website product page.
- **The display or app** on a power station, which often shows state of charge and more.
- **The warranty**, which may state rated capacity and terms.

If a number you need isn't printed anywhere, ask the maker rather than guess. A reputable company will tell you — and if they're cagey about the watt-hours or the usable capacity, that itself is worth noting.

# Common Questions

The questions I hear most about reading capacity.

### Q: What's the real difference between amp-hours and watt-hours?

Amp-hours (Ah) roughly measure current over time — the size of the bucket. Watt-hours (Wh) measure the actual energy stored, which is amp-hours times voltage. Watt-hours are the honest way to compare batteries.

### Q: Why do power stations use watt-hours?

Because watt-hours tell you how much you can actually run, whatever the voltage. It's the fair, apples-to-apples number, so makers put it front and center on a power station.

### Q: Can I compare two batteries just by amp-hours?

Only if they're at the same voltage. At different voltages, the same amp-hours can mean very different energy. When in doubt, compare watt-hours.

### Q: What does 'usable' capacity mean?

It's how much of the rated capacity you can safely use. With lead-acid you should use only part of the rating; with LiFePO4 most of it is usable. Two batteries with the same rating can deliver different real energy.

### Q: Where do I find these numbers?

On the battery's label, in the manual, on the maker's spec sheet, and sometimes on a power station's display. If a number isn't printed, ask the maker instead of guessing.

> **★ Bring me a label you can't crack**
> Read me the numbers over the phone, or show me in person, and I'll translate it plainly. Call or text (330) 200-8042 — there's no such thing as a silly label question.

# Reading capacity: a quick recap

Here's the whole skill on one page, ready to keep on the shelf.

- ❑ Amp-hours (Ah) = bucket size; watt-hours (Wh) = the energy actually in it.
- ❑ Watt-hours are amp-hours times voltage — the fair number to compare.
- ❑ Compare amp-hours only at the same voltage; otherwise compare watt-hours.
- ❑ Rated capacity is the promise; usable capacity is what you can safely use.
- ❑ Lead-acid gives you less of its rating; LiFePO4 gives you most of it.
- ❑ Power stations use watt-hours — and size your needs in usable watt-hours.

> **✔ Keep this page handy**
> Tape it inside a cabinet door with your battery gear. Next time a label looks like alphabet soup, this turns it back into plain English.

# A word on trusting the numbers

Now that you can read a label, a little healthy skepticism will serve you well.

Most reputable makers print honest figures, but marketing can still put the flattering number in big type and the important one in small. A giant amp-hour figure with the voltage buried, or a rated capacity with no mention of how much is usable, is a nudge to look closer — not necessarily a red flag, but a reason to read the fine print.

Lean on watt-hours, ask about usable capacity, favor a recognized safety listing and a solid warranty, and trust a maker who states its numbers plainly. You don't need to be an engineer — you just need to know which number is the honest one, and now you do.

> **★ When a label doesn't add up, ask**
> If the numbers seem too good, or don't quite make sense, that's a great moment to get a second opinion. I'm happy to be that second pair of eyes — no sales pitch, just an honest read.

# You don't have to do this alone

You just have to remember that a friendly, patient person is one call away.

I hope this guide made reading battery capacity — amp-hours versus watt-hours feel a little less daunting and a lot more doable. Keep it in a drawer with your other home papers, come back to a page whenever you need it, and don't worry about memorizing anything.

When you'd rather have a hand, that's exactly what I do. I come to your home, work at your pace, and never make you feel rushed or silly for asking. A first visit is a flat $99, and for the parts that don't need me on-site I can often help right on your screen for $49. Every visit comes with a 30-day, come-back-free guarantee. I don't do licensed electrical work or open up sealed battery packs myself — for anything hardwired, or for panel work, I'll help you line up a trustworthy local pro.

> **★ Bill's Home Tech — real help, close to home**
> Call or text me at (330) 200-8042, or visit BillsHomeTech.com. Serving Atwater and all of Portage County. 30+ years of patient, plain-English tech help — and if you're ever not 100% happy with a visit, I'll make it right or refund it. That's a promise. — Bill

# Amp-Hours vs Watt-Hours

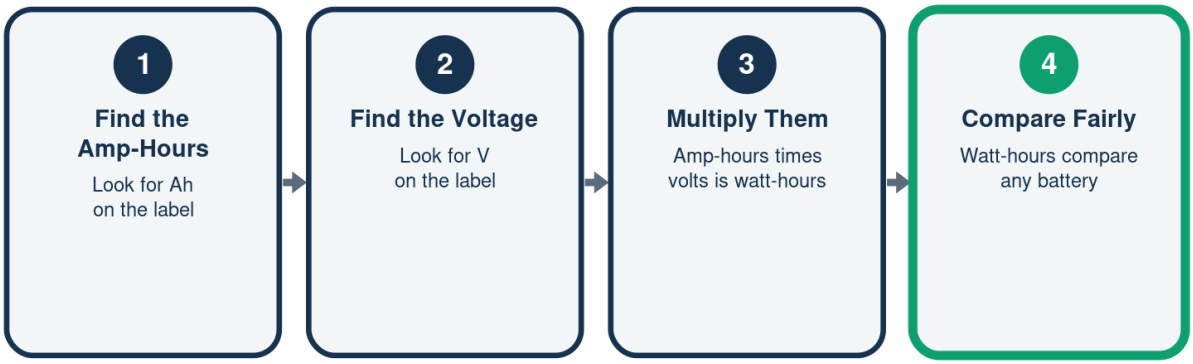
Two numbers, two different jobs

| | Amp-hours (Ah) | Watt-hours (Wh) |
|---|---|---|
| **Measures** | Amps over time | Real energy |
| **Needs voltage?** | Yes, to compare | Already counted |
| **Compare across V** | Not fairly | Yes, fairly |
| **Best used for** | Same voltage | Any battery |
| **On power stations** | Sometimes | Usually |

When in doubt, compare watt-hours — they already count voltage.

# Turning Amp-Hours Into Watt-Hours

A little arithmetic makes the label fair




Rough is fine — this is for comparison, not engineering.

# Rated vs Usable Capacity

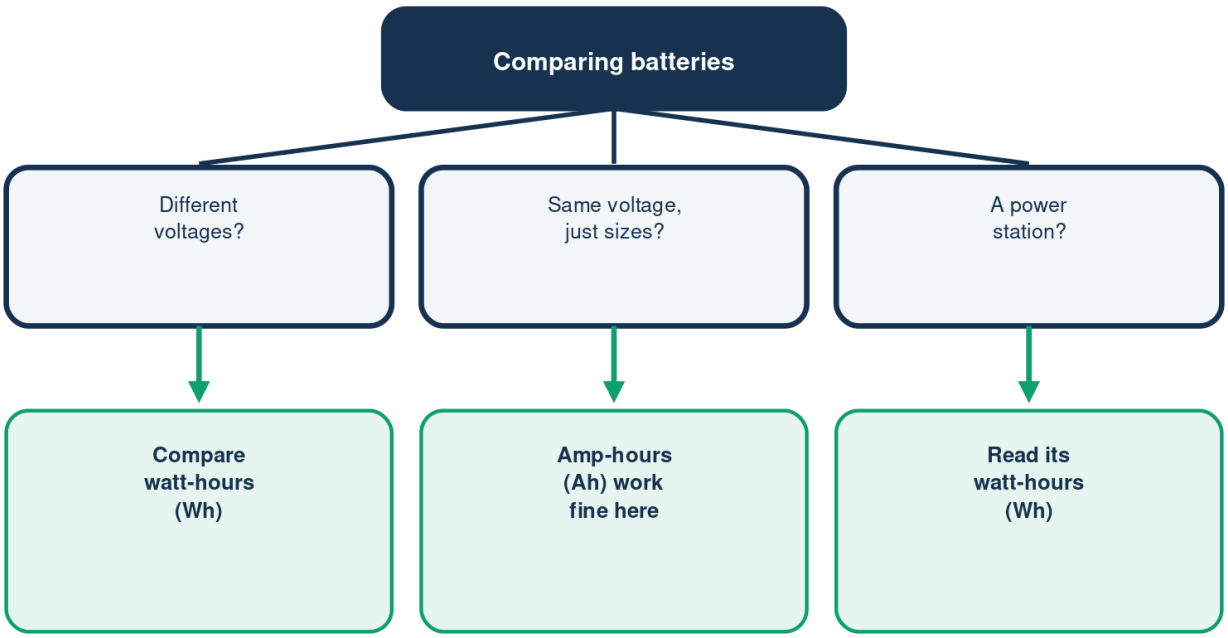
The label's promise vs what you can use

| | Lead-Acid | LiFePO4 |
|---|---|---|
| **Rated capacity** | On the label | On the label |
| **Safe to use** | Only part | Most of it |
| **Deep discharge** | Wears it fast | Handles it |
| **Real usable energy** | Less | More |

Same rating can mean different real energy — ask what's usable.

## Which Number Should You Compare?

A starting point, not the final word




In doubt? Compare watt-hours (Wh) — it's the true energy number.

Illustration - a schematic, not to scale. Your setup may differ.

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# Need a Real Person?

You do not have to remember all of it.
You just have to remember you can call.
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# 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 comes from using these guides. Thanks for reading, and stay safe out there.

***— Bill***

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