BILL'S HOME TECH

Home & Small Business Tech Solutions

An Extended Guide · No. 1420

Watts vs. Watt-Hours, Made Simple

The two numbers that tell you what a power station can do

Tech Made Simple — Service Made Personal

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✔ The best news first — this one is safe indoors

Here is the best news about a portable power station, and the reason it earns a place in your home: it is a big rechargeable battery in a case, not an engine. It burns no fuel, so it gives off no exhaust and no carbon monoxide — the invisible, deadly gas that makes a gas generator a strictly outdoors-only machine. That means a power station is safe to use right inside your home, in any room, with the windows closed — beside your chair, on the nightstand, next to a medical device. A few simple habits keep it that way: charge it with the cord it came with, give it a little air while it works (don't bury it under a blanket or shut it in a tight cabinet), keep it away from water and from baking heat, and never use one that is cracked, soaked, or swollen. These two numbers are what let you use one confidently right in your living room — knowing what it can run, and for how long, is what turns a battery in a box into peace of mind.

Two little numbers, and you'll understand any of them

Almost everything printed on a power station comes down to just two numbers: watts and watt-hours. They sound alike, but they answer two completely different questions. Once you can tell them apart, you can read any power station on any shelf. This guide makes that easy.

I'm Bill, and I run Bill's Home Tech here in Portage County, Ohio. In 30-plus years of helping folks, I've found this is the one spot where good people get tangled — and it's honestly simpler than it looks. We'll use a picture you already know: a tank and a pipe.

You won't find any product's real numbers in here, and that's on purpose. Numbers change with every model and every year. Learn the two ideas instead, and you'll read the labels on your own devices and your own station like an old hand.

★ No sales pitch, just plain sense

I don't sell power stations and earn no commission, so this is just honest teaching. If a label ever leaves you puzzled, call or text me at (330) 200-8042 and we'll read it together — free.

The whole idea, on one page

If you remember only these things, you already understand the two numbers and how to use them.

- ❑ Watts measure how much power something uses or a station can put out right now — think of the width of a pipe.
- ❑ Watt-hours measure how much energy the battery holds — think of the size of a tank.
- ❑ You need enough of both: a wide-enough pipe to run your things at once, and a big-enough tank to last.
- ❑ Motors need a brief starting surge — several times their running watts — so a fridge or pump asks for extra at the moment it kicks on.
- ❑ Runtime, roughly, is the tank divided by the draw, minus a little loss to the inverter. Always check YOUR real numbers.
- ❑ Heat is hungry: anything that makes heat gulps power and drains a battery fast.

> **✔ One line to hold onto**
> Watts decide whether it can run at all; watt-hours decide how long. Get those two jobs straight and the rest falls into place.

Watts: how much at once

Watts tell you how much power is flowing at this very moment. It's the first of our two numbers, and the easiest to picture.

Think of watts as the width of a pipe. A device's watts are how much it needs flowing to it to run. A station's output watts are how much it can push out at once. If everything you plug in adds up to less than the station's output, the pipe is wide enough and things run.

Plug in more than the pipe allows — too many things, or one hungry thing — and the station simply protects itself and shuts off the outlets. It isn't broken; it's telling you the pipe's too narrow for that much at once. Unplug something and it's happy again.

> **✔ Watts answer one question**
> Watts answer 'can it run this, right now?' They say nothing about how long. A wide pipe can still run dry quickly if the tank behind it is small — which brings us to watt-hours.

Watt-hours: how long it lasts

Watt-hours are our second number, and they answer the question watts can't: not whether it runs, but for how long.

Think of watt-hours as the size of a tank. A bigger tank holds more energy, so it keeps your things running longer before it's empty. A station with more watt-hours carries you through a longer outage, or runs more before needing a recharge.

The tank drains faster when you draw more at once and slower when you draw a little. A single lamp sips from the tank for a long, long time; a houseful of gear gulps it down quickly. Same tank — the drain depends on how wide you open the pipe.

> **✔ Watt-hours answer the other question**
> Watt-hours answer 'how long will it last?' A huge tank is wasted if the pipe's too narrow to run what you need; a wide pipe is wasted if the tank's too small to last. You want both.

The tank and the pipe, together

Here's the whole idea in one picture. Hold onto this and the numbers stop being scary.

Picture a water tank with a pipe coming out the bottom. The pipe's width is watts — how much can flow at once. The tank's size is watt-hours — how much is stored to flow. To be happy, you need a pipe wide enough for what you're running and a tank big enough to last as long as you need.

A narrow pipe on a huge tank can't run the fridge, even though it could run a lamp for weeks. A wide pipe on a tiny tank can start the fridge but empties in a hurry. The right station has both sized to your needs — and our how-to-choose guide walks you through matching them to your list.

> **✔ Say it to yourself once**
> Pipe is watts, how much at once. Tank is watt-hours, how long it lasts. That single sentence is most of what anyone needs to know about power-station numbers.

The starting surge that motors need

Here's the one wrinkle that trips people up. Anything with a motor asks for a brief extra gulp of power at the instant it starts.

A fridge, a freezer, a fan, a pump, some power tools — each has a motor, and a motor needs a jolt to get spinning that can be several times the power it uses once it's running. That brief spike is called the starting surge, and it lasts only a moment, but the station has to be able to deliver it or the motor won't start.

That's why a station lists a separate surge, or peak, watt figure alongside its steady output. The surge tells you the biggest jolt it can give for that instant. Some stations, especially smaller ones, can't muster enough surge to start a big motor at all, even if they could run it once spinning.

> **! Check the surge for anything with a motor**
> If a fridge, freezer, or pump is on your list, don't look only at the running watts — check that the station's surge rating covers the motor's starting jolt. A station that can't surge enough simply won't start it.

Finding the watts on your own devices

The numbers you need are already printed on the things you own. Here is where to look and what to do if watts aren't listed.

Most devices have a small label, sticker, or stamped panel — often on the back or bottom, or on the power brick. Look for a number followed by 'W,' for watts. That's how much that device draws while running, and it's the number you'll add up.

If you see volts and amps instead of watts, you can get close by multiplying them: volts times amps is roughly watts. So a label showing its volts and its amps just needs the two multiplied together. When a device lists a range, use the bigger number to be safe.

> **✔ A little detective work pays off**
> Ten minutes with a flashlight, jotting the watts off the labels of the things you'd want to run, is the single most useful thing you can do before you shop. Snap photos of the labels if the print is small.

Adding up what you'd run at once

Once you have the watts off your devices, the output side of the math is just addition. Here's the simple method.

List the things you'd have running at the same time, write the watts beside each, and add them up. That total is how wide a pipe you need — how much output the station must supply at once. Make sure the station's output rating comfortably covers your total, with a little room to spare.

Then look for any motor on your list and remember its starting surge on top of the running total, since it may kick on while other things are already going. If your total plus the biggest surge fits under the station's surge rating, you're in good shape for running everything together.

> **✔ Add the ones that overlap**
> You only add up what runs at the same moment. If the lamp and the router are always on but the microwave runs alone for a minute, it's the overlapping loads that set the pipe you need.

Roughly how long will it last?

The capacity side of the math is just as simple: divide the tank by the draw. Let me show the shape of it with made-up, round numbers.

The rough rule is: watt-hours divided by the device's watts, minus a little for the inverter's own losses. So, purely to show the method: imagine a tank of about 100 watt-hours and a lamp that sips about 10 watts. 100 divided by 10 is 10 — so, very roughly, about 10 hours, before we shave off a bit for losses. Those numbers are invented and round; no real unit is implied.

Notice what that tells you. A thirsty device — one drawing many times the lamp's watts — empties the same tank many times faster. That's the whole reason a small, steady load lasts for ages and a big, hot one is gone in no time.

> **✔ Always run YOUR real numbers**
> The only estimate that matters is the one from the watt-hours printed on YOUR station and the watts on YOUR device. Bring me both and I'll do the arithmetic with you — it takes a minute and clears up a lot.

Two kinds of homes, two sets of needs

How much you fuss over these numbers depends a good deal on where you live. The math is gentle for town folks and a bit more demanding out in the country.

If you live in town or the suburbs

In town, in the suburbs, or in an apartment, outages tend to be short and your water keeps flowing from the city main. Your list is usually small and steady, so the arithmetic stays easy and a modest tank goes a long way.

- A short list of small, steady loads — phones, the internet, a lamp, a CPAP — keeps the pipe narrow and the tank lasting a long time.
- You rarely have to sweat a big surge, since city water means no pump to start.
- Wall charging refills the tank quickly between short outages.
- The numbers are forgiving here — easy to get right with a little adding up.

If you are out in the country on a well

Out in the country the numbers ask more of you. Outages run longer, so you need more watt-hours to last, and a way to refill the tank as you go. And there's one number no portable station can meet.

- Longer outages mean you want a bigger tank — more watt-hours — and solar to refill it as the days pass.
- Be honest about the well pump: it's a 240-volt motor with a big starting surge that's beyond a portable station's pipe and jolt. That stays a generator's job.
- Store drinking water for the outage, since the pump may be down while the power's out.
- Do the math for the essentials indoors, and let a generator carry the heavy 240-volt loads.

> **★ Let's do the arithmetic together**
> Whether your list is a short town one or a longer rural one, I'm glad to add up the watts and estimate the hours with you — no guessing. Call or text (330) 200-8042.

Why heat-making things drain a battery so fast

If there's one lesson to carry out of this guide, it's this: heat is the enemy of runtime. Here's why.

Making heat takes an enormous amount of power. A space heater, a hair dryer, a microwave, a toaster, a kettle, a coffee maker — these don't sip, they gulp, often drawing many times what your lamp and router use combined. That's a very wide pipe pulling from the tank, so even a big tank empties startlingly fast.

On top of that, a heat-maker's draw may be so wide it exceeds a smaller station's pipe entirely, so the station won't run it at all. A big station might run one briefly, but it'll watch the tank drop like a stone. This is the number-one surprise folks hit, so it's worth knowing cold.

> **! The disappointment to head off**
> 'Why won't it run my space heater?' is the most common let-down, and it's pure watts and watt-hours: heat-makers draw too wide and too long for a battery. Plan to stay warm another way, and let the station carry the steady, sensible loads.

Leaving a little headroom

Just as you wouldn't drive with the gas gauge always on empty, it's wise not to run a station right at the ragged edge of its numbers.

If your loads add up to nearly the station's full output, you're running the pipe wide open, and there's no room for a surprise — a motor kicking on, a device drawing a touch more than its label. Leaving some room to spare means the station isn't straining, runs cooler and quieter, and isn't about to trip its own overload protection.

The same goes for the tank. Planning to drain it bone-dry every time leaves you nothing in reserve if the outage runs long. A little headroom on both numbers makes for a calmer, longer-lived unit and a less anxious you.

> **✔ Aim to run comfortably, not maxed out**
> Size so your everyday loads sit comfortably under the ratings, not right up against them. Headroom is cheap insurance, and it's easy on the machine.

The numbers printed on the station itself

Turn a station around and you'll see a few figures. Here's which ones matter and what each is telling you.

- **Continuous output (watts):** how much it can run steadily, all day — the honest 'how much at once' number.
- **Surge or peak (watts):** the bigger, brief jolt it can give to start a motor. Only for that starting instant, not for running.
- **Capacity (watt-hours):** the size of the tank — how long it lasts.
- **Sometimes volts and amps per outlet:** useful for matching a specific device, but the three above are what you'll use most.

> **✔ Three numbers do the work**
> Continuous output, surge, and capacity. Find those three and you can judge whether a station will run your list, start your motors, and last your outage — no engineering degree required.

Don't be fooled by the big bold number

Marketing loves to splash the biggest number it can across the box. Often that's the peak surge — and it's not the one that runs your things.

The continuous output is the number that matters for everyday running. It's the pipe you can keep open all day. The peak, or surge, is a brief burst for starting motors, and because it's the bigger figure, it's the one you'll often see in giant type on the front.

So when two units seem to boast the same big number, look closer: one may be quoting its steady output and the other its brief peak. Compare like with like — continuous to continuous — or you'll think a weaker unit is stronger than it is.

> **! Compare the honest number**
> When you size or compare stations, use the continuous output, not the peak. The peak is real and useful for starting a motor, but it can't run your household all day — and it's the one most likely to mislead you.

A worked example, in plain words

Let's walk one all the way through, start to finish, using made-up round numbers just to show how the thinking goes.

Suppose your list is a lamp, your Wi-Fi router, and a phone charger, all running together. You jot the watts off each label and add them up; say, purely for illustration, they come to a small total — well under any station's output. So the pipe is easily wide enough; everything runs at once with room to spare. Those figures are invented to show the method.

Now for how long. You take the station's watt-hours — the tank — and divide by that small total draw, then trim a little for inverter losses. Because the draw is small, the answer is a good long while. Add a hungry heat-maker to the same list, though, and both the pipe you need and the drain on the tank shoot up — which is exactly why we leave those off.

> **✔ The method, not the numbers**
> Every real case works this same way: add the watts for the pipe, divide the watt-hours by the draw for the hours. Learn the steps and the actual numbers — yours — just drop into place.

A quick thrifty-versus-hungry reference

You don't need exact watts to get a feel for what's gentle on a battery and what's brutal. Here's the shape of it, no numbers needed.

Thrifty (sips power)	Hungry (gulps power)
Phones and tablets	Space heaters
Wi-Fi router and modem	Hair dryers
LED lights	Microwaves
A CPAP, no heater	Toasters and kettles
A small fan	Coffee makers

See the pattern? The thrifty side is electronics, lights, and communication — small, steady sips. The hungry side is anything that makes heat — wide, greedy gulps. A power station loves the left column and struggles with the right.

> **✔ A rule you can carry anywhere**
> If it makes heat, it's hungry — expect it to drain a battery fast or not run at all. If it's electronics or a light, it's thrifty and will run a good long while.

Common mistakes with the numbers

Nearly all the number-related trouble comes from a handful of mix-ups. Now you'll recognize them.

- **Confusing the two numbers.** Watts are how much at once; watt-hours are how long. They aren't interchangeable.
- **Forgetting the surge.** Sizing to a motor's running watts and ignoring its starting jolt, so it won't start.
- **Sizing to the peak.** Trusting the big bold surge number instead of the continuous output for everyday running.
- **Ignoring inverter losses.** Expecting the tank math to be exact; always shave off a little for the inverter.
- **Trying to run heat-makers.** A space heater or hair dryer will empty even a big tank fast, if it runs at all.

> **! The costly mix-up**
> Buying on watt-hours alone, thinking a big tank means it can run anything, is the pricey mistake. A big tank behind a narrow pipe still can't start the fridge. Check both numbers, every time.

A couple of myths, cleared up

Two number-mix-ups come up so often they're worth naming outright.

Q: 'A bigger watt number means it lasts longer.'

No — that mixes up the two numbers. A bigger watt number means it can run more at once, a wider pipe. How long it lasts is set by the watt-hours, the tank. A unit can have a big output and a small tank, and it'll run a lot but not for long.

Q: 'If it fits the running watts, it'll start anything.'

Not for motors. A fridge, freezer, or pump needs a starting surge several times its running watts. If the station can't deliver that brief jolt, the motor won't start, even though it could run once spinning. Check the surge rating.

Q: 'The number on the front of the box is the one that counts.'

Often it's the peak surge, chosen because it's the biggest. The number that runs your household all day is the continuous output. Compare continuous to continuous, not peak to peak.

> **✔ When a number confuses you, ask**
> There's no silly question about any of this. If a spec sheet leaves you unsure which number is which, that's a fine reason to call me before you buy, not after.

A few questions to ask yourself

Before you shop, these plain questions turn the two numbers into a real decision.

- What would I run at the same time, and what do their watts add up to? (That's the pipe I need.)
- Is there a motor on my list — a fridge, a fan, a pump — with a starting surge to cover?
- How many hours do I need it to last, so I know how big a tank — how many watt-hours — to look for?
- Am I trying to run anything that makes heat? (If so, expect it to be hungry, or off the menu.)
- Have I left a little headroom on both numbers, so I'm not running at the ragged edge?

> **★ We can answer these together**
> If you're unsure how to answer even one, that's normal, and it's just what I'm here for. Bring me your list and your labels and we'll settle them in a few minutes. Call or text (330) 200-8042.

A calm, four-step way to size it

Put it all together and sizing a station is a short, tidy routine. No dread required.

- ❑ List the things you'd run at the same time.
- ❑ Add up their watts — that's the output, or pipe, you need.
- ❑ Add the biggest motor's starting surge on top, and make sure the station's surge covers it.
- ❑ Decide how many hours you need, and pick enough watt-hours — the tank — to last, with a little to spare.
- ❑ Leave headroom on both numbers, and lean on solar to refill the tank in a long outage.

> **✔ That's the whole job**
> Pipe wide enough, tank big enough, surge covered, headroom left. Follow those steps with your real numbers and you'll size a station right the first time.

Common Questions

The number questions I hear most, answered plainly.

Q: What's the difference between watts and watt-hours?

Watts are how much power flows at once — the width of the pipe. Watt-hours are how much energy is stored — the size of the tank. Watts decide whether it can run something; watt-hours decide for how long.

Q: How do I figure out how long it'll run my device?

Roughly, take the station's watt-hours and divide by your device's watts, then trim a little for inverter losses. A small, steady draw lasts a long time; a big, hot one drains it fast. Always use the real numbers off your own gear.

Q: What is the starting surge, and why does it matter?

Motors need a brief jolt to start that's several times their running watts. A station lists a separate surge, or peak, figure for that instant. If it can't surge enough, a fridge or pump simply won't start, even if it could run once going.

Q: Why won't it run my space heater or hair dryer?

Those make heat, which takes enormous power — a very wide pipe pulling hard on the tank. A small station can't supply that much at once, and even a big one drains fast. Heat-makers are the classic thing a battery struggles with.

> **★ Still have a number question?**
> That's what I'm here for, and there's never a silly one. Call or text me at (330) 200-8042 and I'll give you a straight, friendly answer.

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 the numbers on a power station 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 myself — for anything that needs to be wired into your home, 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

Watts vs. Watt-Hours

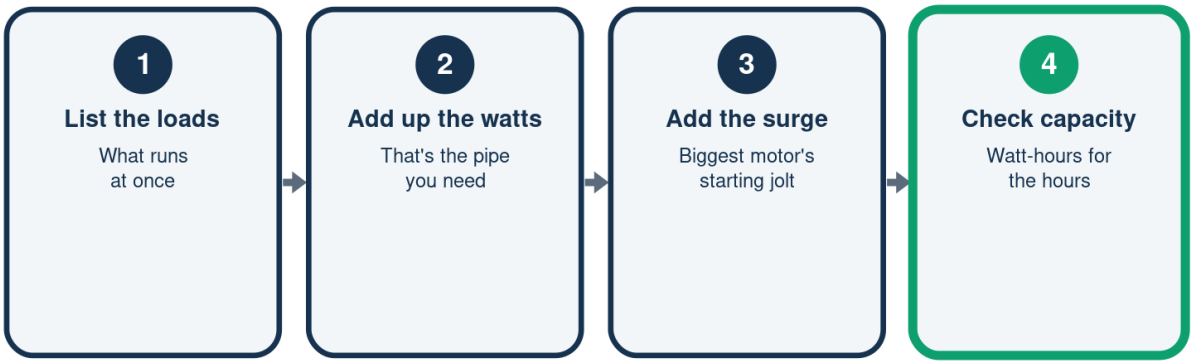
Two numbers, two different questions

	Watts	Watt-hours
What it measures	How much at once	How long it lasts
The picture	A wide pipe	A big tank
It tells you	What you can run	How long it runs

You need enough of both: pipe and tank.

Sizing in Four Steps

From your list to the right numbers



Watts decide whether; watt-hours decide how long.

Thrifty vs. Hungry

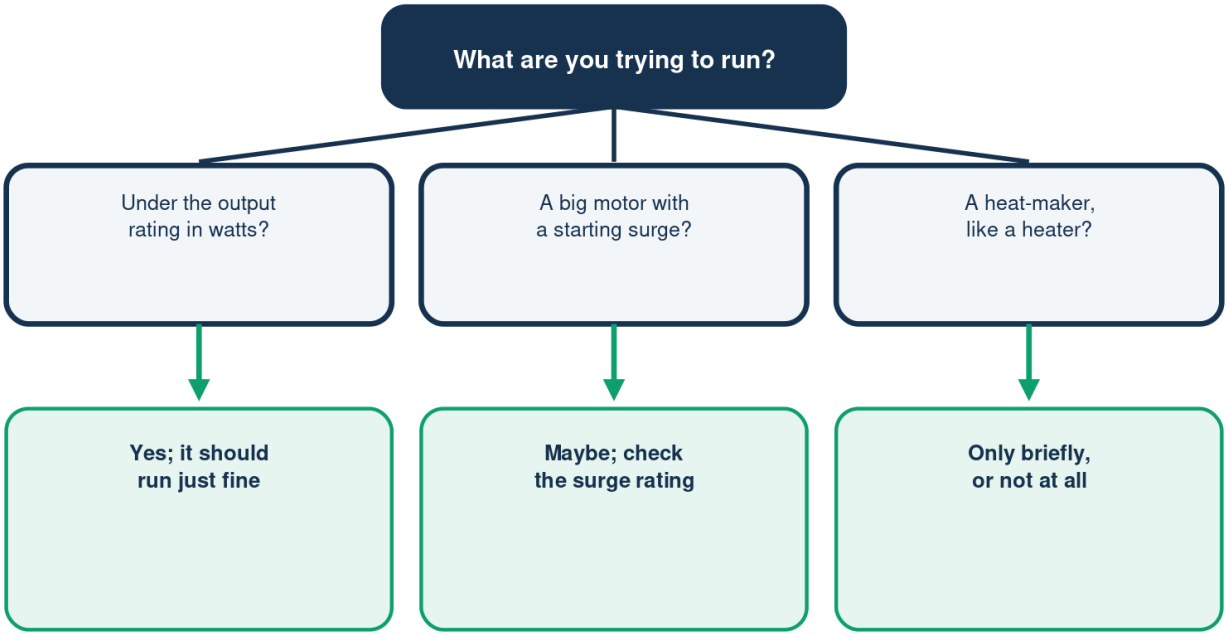
What sips power, and what gulps it

	Thrifty	Hungry
Staying online	Router, phones	Space heater
Light and air	LED lamp, fan	Hair dryer
By the bed	CPAP, no heat	Microwave

If it makes heat, it is hungry. Expect a fast drain.

Will It Run This?

Two questions settle almost anything



Heat is hungry: heaters, dryers, and kettles drain a battery fast.

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

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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.

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