

A GUIDE TO BUYING AN eBIKE

ELECTRIC BIKE



FURTHER™

A partially unbiased e-bike buying guide compiled to help you make informed decisions. *And hopefully encourage you to buy a Further eBike*

THANKS GO TO:

Our friends at MeloYelo in New Zealand for doing most of the research and publishing the guide for the New Zealand market. We have made revisions and customized this publication for the USA market.



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Contents:

- 1) Introduction
- 2) What is an e-Bike?
- 3) Is riding an e-Bike cheating?
- 4) What are the advantages?
- 5) How much should I pay?
- 6) Sensors: Cadence vs torque sensors explained
- 7) Hub motors vs mid drive motors
- 8) Batteries
- 9) Components

1) Introduction

Congratulations on making the decision to research buying an Electric Bicycle (e-bike). Two years ago, I knew nothing about e-bikes and had never considered buying an e-bike. Then I started hearing about the flood of Electric Scooters and e-bikes for rent in cities throughout the US and even more so abroad. I took a test ride, which was the first time I had been on a bicycle in 25 years. I quickly decided the e-bike eliminated most of the reasons I had not been on a bicycle in all those years.

Learning about them was not necessarily difficult, but I found there were a lot of options and features that clouded the buying decision.

In this Buyers Guide we will attempt to give you clear facts and some opinions. There are a wide range of types, manufacturers, components and options available on e-bikes and I will not attempt to cover everything. But after

reading this guide you should at least have a better idea of what type of e-bike you are interested in purchasing and what questions to ask...

2) What is an e-bike?

It's a bike with an electric motor which tops up the energy you're putting into pedaling, depending on the assist level you've chosen. Some e-bikes (including those from Further) have throttles which will propel you along without pedaling (which means your battery charge will drain faster). You recharge the battery by plugging the charger into the wall, just like charging a laptop computer.

3) Is riding an e-bikes "cheating"?

No. You still need to pedal, and several European studies have established that e-bikers experience levels of exercise and consequent well-being similar to that of standard cyclists – in part because they ride their e-bikes more often and ride further. The National Institute for Transportation and Communities believe e-bikes remove barriers to cycling, such as physical limitations and challenging

topography. After riding an e-bike for the purpose of transportation you may not be all sweaty and in need of a shower. See the Washington Post link at the end of this Guide.

4) **What are the advantages?**

Climb hills easier. When you are approaching a hill, you have two options to make it easier to get up the hill: (1) shift into a lower gear and (2) add more boost from the motor, achieved by simply pushing a + button on the handlebar-mounted controls.

Wind resistance. The electric motor eliminates the extra effort you must make while battling head winds on a regular bike.

Range. E-bikes make riding fun, which means you will want to go further. While a 20- or 30-mile ride may be out of the question on a regular bike, it's a breeze on an e-bike.

Keep up with the guys, the kids, the grandkids. Maybe you've stopped riding because friends, hubby, the kids or the grandkids ride too fast or too far. Well, now you can go riding with them, keep up with them, and have just as much fun or even more fun than them.

Go faster. European brands of e-bikes are typically limited to 15.5 mph of motor assist, because that is the legal limit in Europe. Other bikes, such as the Further e-bikes do not have this limit and can reach 25 mph with their 500-watt motors.

5) **How much should I pay?**

You can spend \$10,000 if you really want to spend that much. You can buy a functioning e-bike for a few hundred dollars. But keep in mind it is still a bicycle so for a quality e-bike you need to start with a quality bike.

There are trail e-bikes, commuter e-bikes, working bikes for delivery, folding e-bikes, fat tire e-bikes and other specialty e-bikes. We are currently focusing on the more common "Commuter" and "Light Trail" e-bikes.

The electronics & battery will generally cost between \$600 and \$2200 depending upon various options. For a quality e-bike you can expect to pay \$2,000 to \$3,000. Further e-bikes retail at \$2,399 (Tranzit model) and \$2,499 (ROAM model) but are currently available on IndieGoGo at very special prices.

Things to be wary of when choosing a cheap e-bike include:

- ✓ **The electric system.** Chances are that cheap e-bikes use motors, controllers, sensors, displays and battery cells from suppliers that do not have a proven track record for reliability. Often, you will also find that each of these components come from a different manufacturer, meaning they have not been designed together to work together from the outset. Off brand conversion kits and cheap e-bikes found online may not be around to provide warranty service or replacement parts leaving you stuck with a lemon. Make sure it is matched with an appropriate battery. A cheap battery may need to be replaced in a year or less at a cost of hundreds of dollars.

- ✓ Further uses an integrated electric system from Bafang, Asia's undisputed quality leader in e-bikes electrics. The integrated system is designed together to work together and is guaranteed together.

ORIGINAL BAFANG DRIVE SYSTEM



COMPONENTS

⑤ Rear hub motor



⑥ LCD Display



④ Torque sensor



⑦ Controller



⑧ Water-proof connector



Bafang is the undisputed Chinese quality leader in ebike electrics.

And now MeloYelo ebikes feature an integrated Bafang electric system comprised of a strong **350W hub motor (limited to 300W)**, a large **LCD display** for easy reading of ride stats and battery level, a **9-mosfet controller** for more power, **torque sensor** for the most natural feeling boost to your ride, and a set of **waterproof, quick release cables** for easy installation, maintenance and after-sales service.

- ✓ **The warranty.** Don't purchase an e-bike unless it has a warranty of at least 2 years on the electric system. (Further has a **2-year warranty** on the electric system, **6-year warranty** on the frame, and a 12 month warranty on other parts.)
- ✓ **The availability of parts.** When an electric component fails on an e-bike, it can take 2-3 months to get a replacement part under warranty. So, look for a supplier who maintains an inventory of spare parts. (Further maintains an inventory of spare parts at its facility near Austin, Texas, including batteries, motors, controllers, displays, sensors and brake levers.)

6) What's all this I hear about sensors?

Sensors are used to determine what the motor does to assist your pedaling. There are two types of sensors: Cadence Sensors, which measure IF you are pedaling and Torque Sensors which measures HOW HARD you are pedaling.

Cadence Sensors

The basic cadence sensor uses a magnet on the crank, it turns the motor ON when you start pedaling and turns it OFF when you stop pedaling. It works like a switch. You must control the boost level and speed by adjusting the assist mode manually up and down. Most basic e-bikes have this type of sensor.

The advantage is that it's an inexpensive way to get some sort of pedal assist onto the bike, but the disadvantage is that the pedal assistance can feel jerky, laggy and counter-intuitive. Also, if you want to pedal faster than the motor is spinning, the motor will actively work against your efforts.

Torque Sensors

The torque sensor is a totally different technology that uses a precision strain gauge. It measures your actual force on the pedal, sampling at 1,000 times per second over the entire pedal stroke.

The harder you pedal, the more power it gives to the motor. If you pedal lighter, less power goes to the motor. It makes

this adjustment in real time, so it is technically amplifying your every input. It feels like you are bionic, many first time riders say it makes them feel like “Superman or Superwoman”. Most higher-end e-bikes use torque sensors, Further does.

Will I feel the difference in the way the e-bike rides?

If you have a chance to ride a cadence-only e-bike and a torque-sensored setup back-to-back you will instantly notice the difference. The torque sensor setup makes the bike feel weightless due to the amplification effect. You also feel more in control of the bike.

All Further eBikes come equipped with a torque sensor.

Some of these e-bikes look like ladies' bikes. Is it okay for “men” to ride this style of e-bike?

They're not ladies' bikes, they're step-through frames, and it appears that buyers are getting over any such preconceptions. A lot of guys are now buying bikes with step-through frames. Step-through doesn't mean it is a

lady's bike, it means a really practical bike for getting on and off, especially for those with hip, leg, or knee mobility challenges. Personally, I am 6'-3" and weight 235 lbs. and it has never been a concern when riding my step-through Further e-bike.



7) Hub motors vs mid-drive (crank) motors

The two most common electric motor styles used in today's e-bikes are rear hub motors and mid-drive motors. Rear hub motors, which place the electric motor in the center of the rear wheel, are the most common form of electric bicycle motors. Mid-drive motors, which house the motor closer to the center of the bicycle and transfer the motor's power to the rear wheel via the bicycle's chain drive, have become much more common over the last 2-3 years.

Both have a number of unique advantages and disadvantages, so choosing the right motor for you will largely depend on your requirements and which advantages seem more useful to your needs.

Hub motor advantages. One of the biggest advantages of hub motors is that they require little or no maintenance. They are an entirely independent drive system that retain all their components inside the motor casing, leaving nothing for you to mess with or maintain. This enclosed system also means there is a lot less to fail.

Hub motors also help reduce other bike maintenance tasks compared to mid-drive motors. This is especially important when upgrade your e-bike or have it serviced at a regular bike shop. Since they don't connect to the main pedal drive system, hub motors don't add any extra stress to your chain or shifters, and don't cause any of those parts to wear out more quickly. If anything, your chain will probably last longer than a non-electric bike because the hub motor will be doing more work and reducing the stress on the chain.

As an independent drive system, hub motors also add redundancy. Since the hub motor and the pedal drive system are completely independent, you can lose one and still get home on the other. If your chain breaks while you're hitting it hard on a trail, toss the chain in your bag and ride home on just electric power. If the hub motor somehow fails, pedal back. Either way, you've got a backup. This can be huge if you're far from home, especially for older riders or those who use e-biking as a form of rehabilitation.

Lastly, hub motors are less expensive than mid-drives. Hub motor e-bikes are mass-produced by the hundreds of thousands, perhaps even millions depending on the factory.

Hub motor disadvantages. Of course, hub motors aren't perfect. Hub motors are usually heavier than mid-drives, and that weight is unsprung weight on suspension bicycles, which can reduce the effectiveness of bicycle suspension and transfer more bumps to the rider. However, this is easily overcome by adding a suspension seat post to the bike.

Tire changing can be more difficult with hub motors, depending on the electric cabling system used. Be sure and check on this if you're buying a bike with a rear hub motor. Further e-bikes feature waterproof plug-and-play cabling from Bafang, so disconnecting the electrics to remove the rear wheel is straightforward.

Mid-motor advantages. Mid-drives have a lot of improvements over older hub motor technology, but they have their own unique issues. There's a reason hub motors have been around so long – they work. Further's ebikes feature "State of the Art" rear-hub motors.

The main advantages of mid-drive include lower weight and better gear usage, which makes them more appropriate for off-road use and those with hilly terrain to traverse. A mid-drive motor in low gear can climb steeper hills than a hub motor of similar power and can climb hills for longer than a hub motor. A mid-drive motor is also usually smaller and lighter than a hub motor of similar power.

Mid-motor disadvantages. Mid-drive motors can be brutal on your drive system, which is perhaps their single biggest flaw. A healthy human can put out 100 W of power for a pretty long time, and 250 W of power during a hard sprint is reasonable. But mid-drive motors can output 250-750 W of power *continuously*. That's like having a professional cyclist hammering on your pedals all day. A cheap bicycle chain just doesn't stand a chance. Snap!

Because of the increased number of moving parts in a mid-drive motor, there are more points of failure. If the motor does fail, and it's a motor that is built directly into the frame of the bicycle, it can be more expensive to replace than just swapping out a hub motor. In fact, mid-drive motors in

general are also more expensive than the tried and true, mass-produced hub motors found on many e-bikes.

There is another downside of mid-drive motor that a lot of people don't consider until the first time they come to a stop. You can't shift gear unless the bicycle is moving (except for bicycles with internally geared rear hubs, which are a minority). That means that if you were in top gear while flying down the street but are then forced to stop at a red light, you'll want to remember to downshift before coming to a stop. Otherwise you'll be stuck in top gear when you try to pull away from the light and your acceleration will suffer.

And don't even think about shifting while under motor power. Doing so is the best way to rip your chain in two. There's simply too much torque in an electric motor, and the extra stress can easily break the chain when it is between cogs. Nicer mid-drive e-bikes have gear shift interrupters that briefly cut the throttle when you shift gears. But many e-bikes lack this feature, and so it is on the rider to remember to relax the throttle when changing gears.

Hub motor or mid-drive motor? Although mid-drives have made improvements over older hub motor technology, hub motors of today are greatly improved. There's a reason hub motors have been around so long – they work. Further' s models feature rear-hub motors.

The main advantages of mid-drive include lower weight and better gear usage, which makes them more appropriate for off-road use and those with hilly terrain to traverse.

Hub-motors, on the other hand, are relatively bulletproof and low maintenance, and thus are usually better for commuters, recreational trail riders and those that want a simple, reliable e-bike with very little maintenance.

Batteries. Look for reputable “brands” of battery cells such as those from LG, Samsung, or Panasonic and make sure that the warranty covers the battery for at least 2 years. Lithium ion batteries are typically said to last 800 charge cycles before beginning to degrade. They survive longer with careful use, so you should get at least 2000 half-charge cycles. A full charge typically takes between three to six hours. (Further e-bikes come with LG brand cells and 3-amp chargers versus the standard 2 amp, so they charge 50% faster than most.)

Size. Battery pack sizes vary considerably, with the typical range being from around 10 Amp-hours to 17 Amp-hours. The size you need depends on what you intend using your bike for, and how far you intend to ride on your longest ride. Following are some examples, but just remember that the range you will get depends on several different factors not the least of which is how hard you are pedaling:

City/town riding. Riding on city streets on a bike that has a 36-volt power system with a 10 Amp-hour battery (360 Watt-hours), you might expect to use around 12 Watt-hours per mile. So, your expected range would be 30 miles (360/12);

Off-road riding. Riding on an off-road trail where you are using higher levels of battery boost and perhaps also using the thumb throttle more often, you might expect to use around 19.4 Watthours per mile. So, your expected range with a 10 Amp-hour battery and a 36-volt system would be 18.6 miles (360 Watthours/12 Watt-hours/km).

What about components? You want to know about what kind of componentry is involved especially for the gear shifting system and the braking system. Shimano is a trusted name in gear systems but understand also that there are a number of different Shimano systems such as Tourney, Altus, Alivio and Deore, and that the number of gears may range from 7 to 10 or more. Likewise, Tektro is a trusted name in braking systems, but there again there are variables such as rotor size, mechanical disk brakes, hydraulic disk brakes.

Further uses components from the following trusted brands:

- ✓ Shimano gear systems
- ✓ Tektro brake systems
- ✓ Suntour suspension systems
- ✓ LG battery cells
- ✓ Bafang motors, controllers, sensors, cabling and displays
- ✓ (integrated electric system)
- ✓ Spanninga lighting systems
- ✓ Selle Royal saddles
- ✓ Kenda tires

About Further

Further is an American owned company based out of Georgetown, Texas. Further primarily uses the direct to consumer model through IndieGoGo and our own website. Our team takes our e-bikes out to community events, expos, sporting events and active retirement communities, etc.

Our engineers work together to define the specifications for each of our models. We then have our bikes built to those specifications under the watchful eye of Holger, our German engineer living in China. Holger and his team inspect and test our bikes before they are shipped.

What makes Further eBikes one of the most reliable in the sub-\$3000 price bracket?

- ❖ We use an integrated electric system from Asia's top brand in EBikes electrics, Bafang. Motor, controller, torque sensor, cabling and display: Designed together, work together, guaranteed together.
- ❖ Our German engineer (and partner) Holger and his inspection team live in Shanghai and oversees our

manufacturing, quality control, final inspection and testing.

- ❖ Our team of engineers and bike experts specifies all the componentry on our e-bikes.
- ❖ Further maintains an inventory of spare parts in Texas, including spare wheels with motors, spare batteries, controllers, torque sensors, displays, etc. If anything were to go wrong, we can get our customers up and running again quickly, without having to wait for warranty parts to come from China.
- ❖ Further offers a 2-year warranty on electric components, 6 years on the frame, 12 months on other parts.

Further Tranzit Model



Further ROAM Model



This guide has been compiled by Further EBikes using a variety of sources, including:

- ✓ <https://www.juicedbikes.com/pages/torque-vs-cadence-sensors>
- ✓ https://www.washingtonpost.com/lifestyle/wellness/the-ebike-trade-off-seems-to-be-less-exercise-more-enjoyment-and-fewer-showers/2018/05/05/5990770a-4ede-11e8-b725-92c89fe3ca4c_story.html?utm_term=.b1e4f366bca5
- ✓ <https://electrek.co/2018/06/07/electric-bicycle-hub-motors-vs-mid-drive/>
- ✓ Electric Bike Forum - <https://electricbike.com/forum/forum/main-forum/general-discussions/7891-what-is-your-efficiency-watt-hours-per-mile-with-your-ebike>
- ✓ Explain That Stuff - <https://www.explainthatstuff.com/electricbikes.html>
- ✓ <https://www.inc.com/kevin-j-ryan/this-10000-e-bike-can-travel-100-miles-on-a-single-charge.html>

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