

Electric Bicycles For Seniors

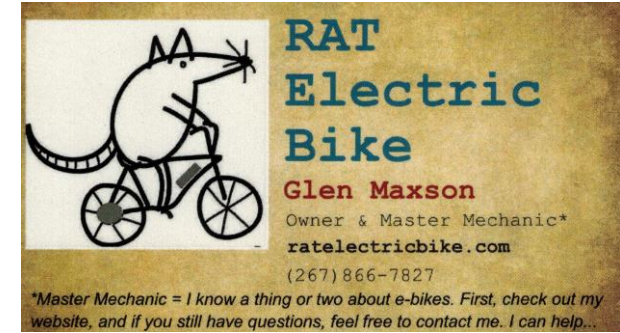
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Presentation link:

Who Am I



- Penn State grad 1977
- Information Technology (1978-2011)
 - Retired from Intel 2011
- Tech advisor (<http://seniortechadvisor.com/>)
- E-bike enthusiast (<http://ratelectricbike.com/>)
- E-bike advocate (<https://doylestownpa.org/government/boards-and-commissions/bike-and-hike-committee/>) — *meets 3rd Tuesday each month*
- EV influencer (<https://drivethefuture.tech/>)



Today's Discussion

- Why consider an e-bike?
- What is an electric bicycle?
- E-bike Vocabulary
- Motors and Batteries
- Cadence vs Torque sensors
- E-bike power specs
- Battery tech
- E-bike laws
- Safety and Maintenance

Why consider an e-bike?



- **Benefits** of e-bikes for ‘seniors’ ([source](#))
 - [Riding an electric bike for seniors is one of the best ways to stay active](#), improve cognitive function, and stimulate your mind
 - Helps **improve** your cardiovascular **health** and lower blood pressure, while reducing stress on your joints and muscles
 - Can be **safer**, and is certainly more **environmentally friendly**, than driving a car
 - It’s a great way to **reduce stress** levels because it helps you get away from your everyday life for a little while
 - Can help you **lose weight**
 - Can enhance **social interaction and gets you outside**, enjoying nature and spending time with others...

A short video

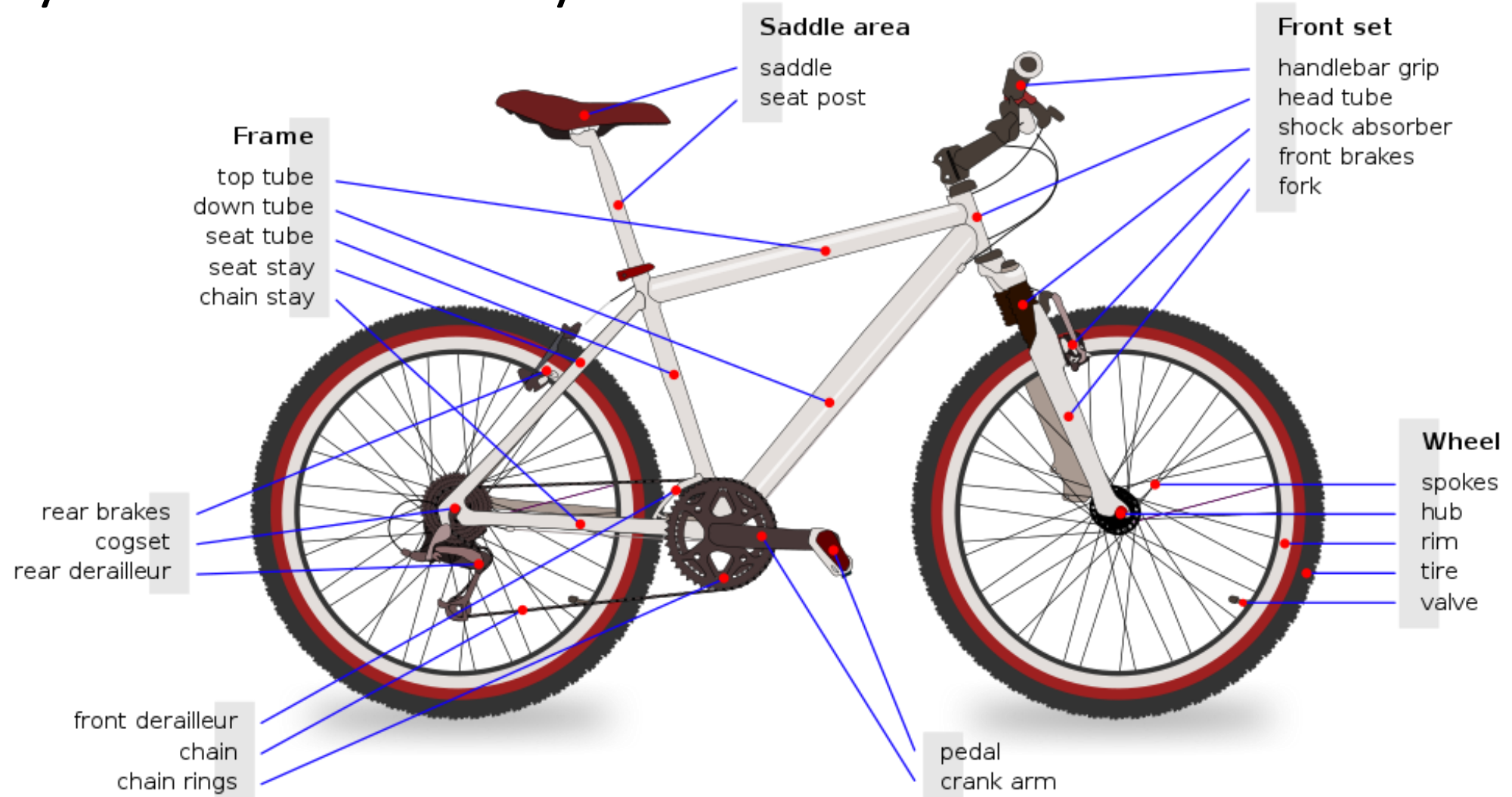


What is an electric bicycle?

- An **electric bicycle** (**e-bike**, **eBike**, etc.) is a [motorized bicycle](#) with an integrated [electric motor](#) used to assist propulsion.
- E-bikes generally fall into two broad categories:
 - bikes that assist the rider's pedal-power (i.e. [pedelecs](#))
 - bikes that add a throttle

Note: E-bikes MUST have 'fully operable' bicycle pedals

Bicycle Vocabulary



E-Bike Vocabulary

- **Hub motor** - an electric motor located in the front or rear hub
- **Mid-drive** - a motor located at the center of a bike, typically between the pedals
- **Battery** - energy storage that delivers a specific voltage and current to power an electric motor
- **Controller** - an electronic circuit that controls the speed of the electric motor
- **Display** - multifunction lcd display, used to access a variety of functions
- **Motor cutoff switch** - cuts off all power to the motor when a brake lever is squeezed
- **PAS** (Pedal Assist System) - the motor delivers additional power in proportion to the effort being exerted by the rider (incl. cadence vs. torque sensing)
- **Throttle** – located on the handlebar, allows the rider to engage motor power while pedaling or without pedaling

E-Bike Vocabulary



Motors

Common locations for an electric motor on an e-bike

- [Rear hub](#)
- [Mid-drive](#)
- [Front hub](#)



- See also:
 - [Electric bike motors: everything you need to know](#)
 - [E-Bike Conversion Kit Buying Guide](#)

Batteries

E-bike power specs and what they mean

Watt - a unit of power (used to [quantify](#) the rate of [energy transfer](#))

Watt Hour - a unit of energy equivalent to one watt (1W) of power expended for one hour

Volt - the [electric potential](#) between two points of a [conducting wire](#)

Amp - the 'strength' of an electrical current

Or an ampere is an electrical current equivalent to 10^{19} elementary charges passing every 1.602176634 seconds

Amp Hour - how many fixed number of Amps a battery can sustain for one hour

- factor Voltage and Amp Hours together to determine how far you might travel on a full charge*

Calculate - Watts / Volts = Amps

E-bike motors are rated in Volts and Watts

- Bafang BBSHD 48v 1000w mid-drive motor

E-bike batteries are rated in Volts and Amp Hours

- Joyisi 48v 14.5ah battery

See also: [Understanding E-Bike Power, Range, And Energy](#)

Amp-Hours (**Ah**) x Voltage (**V**) = Watt-Hours (**Wh**)

$$14 \text{ Ah} \times 36 \text{ V} = 504 \text{ Wh}$$

Approximate:

1-mile requires 25 Wh

$$504 \text{ Wh} \times \frac{1\text{-mile}}{20 \text{ Wh}} = 25\text{-miles}$$



So how far will you go on a single charge?

- It depends:
 - Using a real life example:
 - $14.5\text{ah} * 48\text{v} = 696\text{wh}$, then $696\text{wh} * (1/20) = 34.8\text{miles}$ (~**35 miles** on a 100% charge)
 - Caveat - As long as you use only the throttle, ride on a smooth, level surface with no wind at sea level and 82.4 degrees Fahrenheit, and weigh 170 pounds...
 - In reality, you'll be adding energy through pedaling, so I usually use 35 miles as a worse-case number and expect to get significantly more miles per charge – *I'm actually getting around 60 miles on a 100% charge on my 12.5ah battery! More on a 14.5ah battery I expect (I'm still figuring this out)...*

Battery Design

- E-bike battery packs are made up of individual battery “cells”
- The most common form-factor for an e-bike battery pack is the 18650, which is a cylindrical cell with a nominal voltage of 3.7 volts
- Look for cells from Panasonic, LG, and Samsung which have a good reputation for quality
- E-bike battery tech will change as tech for EVs improves



18650

Refers to the diameter of the cylindrical cell in millimeters.

Identifier that the cell is a cylindrical cell

Refers to the height of the cylindrical cell in millimeters.

Care and Feeding of Your Battery

1. The thing that will kill your battery faster than anything else is leaving it fully charged at elevated temperatures.

1. If it's 80 degrees outside and you have your e-bike battery fully charged, move it indoors where it's cooler and try to drain the battery as soon as possible.

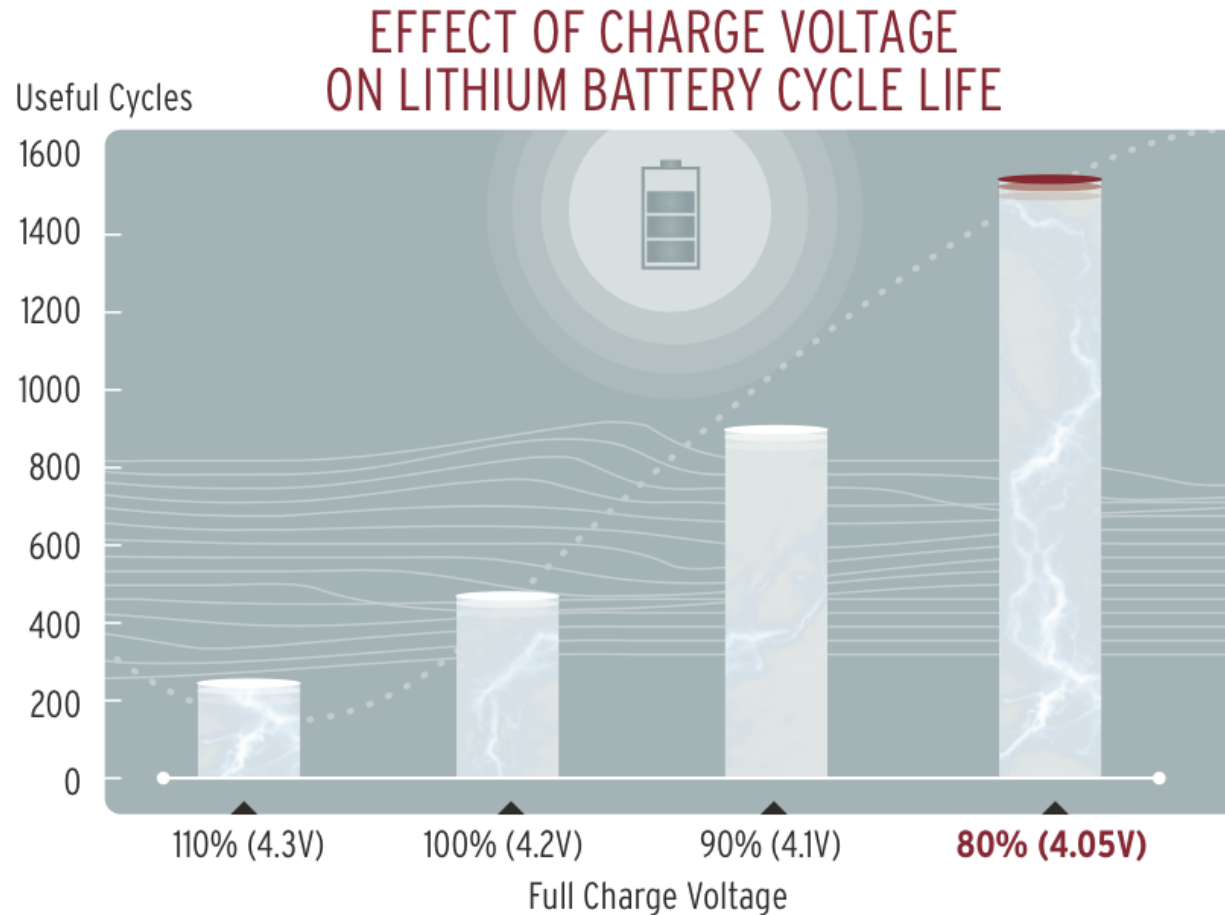
2. Charge your battery at room temperature as often as possible.

3. When sourcing an e-bike battery charger, the slower the charge rate the better.

1. For example, if you have a 2-Amp charger, and your battery is a 14 Ah battery pack, you are charging at $14 \text{ Ah} / 2\text{-Amps} = 7\text{-hours}$. This is a nice, slow charge which will improve the longevity of your battery. Avoid charging at rates that are faster than 2-hours for a full charge.

Summary: *Slow charge, avoid storing or charging at hot/cold temperatures, and leave the battery at around 30-50% charge if you don't plan on using it for a while.*

Effect of charge voltage on battery cycle life



Note: This applies to ALL Lithium-ion (li-ion) batteries in cell phones, laptops, e-bikes, and even your electric car!

Sensors

Torque Sensor vs. Cadence Sensor on Electric Bikes

- Your e-bike will likely be equipped with either (or both) of these sensors: Cadence or Torque
 - These sensors communicate with your bike's pedal-assist system (PAS) to engage the motor and propel the bike forward
- A cadence-based pedal assist system engages the e-bike's motor when a rider begins to pedal
 - As the rider's pedaling speed (cadence) increases, the pedal-assist will reduce the motor's output (power contribution)
 - As a rider's pedaling speed decreases, PAS will increase the motor's output to propel the rider forward
- Think of cadence pedal assist as on-off switch.

Torque Sensor vs. Cadence Sensor on Electric Bikes

- A **torque** sensor measures how much force a rider applies to the pedals, then determines how much power the motor should output to the e-bike
- Torque sensors make these adjustments in real-time, increasing or decreasing the motor's output in unison with the amount of pedal force a rider applies
 - The harder you pedal, the more output your motor will provide, up to the preset limit for a given PAS level.
 - The less intense you pedal, the motor will meet you where you're at and output less power.
- Torque pedal assist makes sense if you want an experience that's closer to pedaling a conventional bike

What's changed?

- Many e-bikes on the market now allow you change the sensor on the fly, which puts you in control of what works best for you!



[Velotric Discover 3](#)



[Level 4 REC](#)

The Law

E-bike laws - Federal

- At the **federal level**, a 2002 law enacted by Congress, [HB 727](#), amended the Consumer Product Safety Commission definition of e-bikes. The law defined a low-speed electric bicycle as “A two- or three-wheeled vehicle with fully operable pedals and an electric motor of less than 750 watts (1 h.p.), whose maximum speed on a paved level surface, when powered solely by such a motor while ridden by an operator who weighs 170 pounds, is less than 20 mph.” The federal law permits e-bikes to be powered by the motor alone (a “throttle-assist” e-bike), or by a combination of motor and human power (a “pedal-assist” e-bike).

E-bike laws – Pennsylvania State

- At the **Pennsylvania state level** ([2014 Act 154](#)), “Pedalcycle with electric assist.” A vehicle weighing not more than 100 pounds with two or three wheels more than 11 inches in diameter, manufactured or assembled with an electric motor system rated at not more than 750 watts and equipped with operable pedals and capable of a speed not more than 20 miles per hour on a level surface when powered by the motor source only.
- In addition, e-bikes “do not require a certificate of inspection or insurance” and “are afforded ALL of the rights and responsibilities of other bicycles under [PA law](#)”.
- See also: [PENNSYLVANIA E-BIKE LAW](#) handout, and

Questions and Answers about Electric-Assist Bicycle Laws

Key E-bike Rules for Pennsylvania:

- **Classes Allowed:** Generally **Class 1** (pedal-assist only) and **Class 2** (pedal-assist + throttle) e-bikes are permitted on trails where traditional bikes are allowed.
- **Speed & Power:** Maximum motor power is **750W**, and max speed via motor is 20 mph.
- **Weight Limit:** The e-bike must weigh no more than 100 pounds.
- **Pedal Requirement:** The bike must have fully functional, **operable pedals**.
- **Restrictions:** E-bikes are prohibited on trails specifically marked as closed to bikes and in PA State Gamelands.
- **State Forest/Park Specifics:** In PA State Forests/Parks, **throttles are allowed on roads but often restricted on trails**, where only pedal-assist should be used.
- **Etiquette:** **Keep right, pass on the left**, use bells or voice to warn others, and obey local trail speed limits (**often 15 mph in local county parks**).

Finally, an local Ordinance that makes sense!

- **Ordinance NO. 432** (March 17, 2026), establishing Chapter 120, Bicycles, E-Bike and E-Scooters, to regulate the use of bicycles , E-Bikes and E-Scooters within **Doylestown Township**.
- **Where E-Bikes Are Permitted**
 - Allowed on Township trails, parks, and roadways
 - E-bikes and e-scooters are not permitted on trails less than 8 feet wide or where posted
 - Sidewalk use is generally not permitted, except for riders under 16 accompanied by an adult
- **Must have:**
 - Working brakes
 - A bell or audible warning device
 - Lights/reflectors when used at night
- **Speed Limit**
 - **Maximum speed is 15 mph on Township property**, or lower as conditions require
- **Enforcement**
 - Enforced by Township Police
 - Fines: \$100 for first violation, \$250 for second violation, Up to \$500 for future violations

Montgomery County Announces Increased Fine for E-Bike Violations

- August 14, 2025 - The Montgomery County Board of Commissioners approved an amendment to the County's trail policy aimed at enhancing safety for users of its increasingly popular trail network. The County's trail policy restricts e-bike use by weight, power, and speed. Use of an e-bike that exceeds those limits can result in a fine of up to \$300, increased from \$100 with today's vote.

An E-Bike (pedalcycle/bicycle with electric assist) is a bicycle equipped with an electric motor that assists the rider when they are pedaling. E-bikes shall weigh no more than 100 pounds, shall be equipped with a motor no more than 750 watts and shall be equipped with fully functional, operational pedals. The speed of bicycles with electric assist such as E-bikes, scooters, tricycles, and other similar wheeled devices must not exceed 15 mph. (**Basically Class 1**)



What's going on with New Jersey ebike laws

As of January 19, 2026, New Jersey has enacted **the nation's most restrictive e-bike laws, requiring registration, insurance, and a driver's (or specialized) license for most e-bikes**. Signed by Governor Phil Murphy, the law reclassifies Class 2 and 3 e-bikes as "motorized bicycles".

Key Aspects of the New Jersey E-Bike Law (2026):

- **Licensing & Age:** Riders must be at least 15 years old and possess a valid driver's license or a specialized "motorized bicycle" license (requires a written/vision/road test). Riders under 15 are prohibited from riding on public property.
- **Registration & Insurance:** All e-bikes must be registered with the Motor Vehicle Commission. Class 2 and 3 e-bikes require liability insurance.
- **Helmets:** DOT-approved helmets are mandatory for Class 3 riders and anyone under 17.
- **Restrictions:** The law prohibits riding on sidewalks and generally bans them on natural surface trails. It also mandates safety equipment like lights and a horn.
- **Upcoming Deadlines:**
- **July 20, 2026:** **Deadline to register your e-bike.** The first year of registration is free.

New Jersey's E-Bike Law: What Retailers and Riders Need to Know About [S4834](#)

UPDATE: All electric bicycles in New Jersey require a license and registration



peopleforbikes

DEFINITIONS

LOW-SPEED ELECTRIC BICYCLE

- Two-wheeled bicycle with fully operable pedals
- Motor provides pedal-assist only (no throttle)
- Motor assistance cuts off at 20 mph
- No upper motor power limit
- No e-bike class system (Class 1/2/3 eliminated)

MOTORIZED BICYCLE / MOPED

- Includes former Class 2 electric bicycles in addition to Class 3 (included since 2019)
- Includes devices with motors up to 1,125 Watts
- Includes devices that can go up to 28mph using a throttle

NEW CATEGORY:

ELECTRIC MOTORIZED BICYCLE

- Two wheels with fully operable pedals
- Electric motor over 750 watts
- Capable of speeds greater than 28 mph
- Excludes low-speed electric bicycles
- Does not include e-motos without pedals
- Online advertising and sales prohibited for one year

REQUIREMENTS (ALL)

- Annual vehicle registration required
- License plate must be displayed
- Motorized bicycle license or driver's license required
- Vehicle modification is prohibited
- Liability insurance required (not clear if this applies to low-speed electric bicycles)
- Minimum age: 15 (with "motorized bicycle" license)
- All of these requirements also apply to off-road use on public lands

EFFECTIVE DATE

Immediately, except for a six-month grace period to obtain a license, registration, or insurance if not previously required (Class 1 and 2 e-bikes)

WHAT'S NEXT

The law sets New Jersey up to become the most unfriendly state for bicycling in the country. PeopleForBikes is disappointed this bill is now law but is encouraged by the unity of the many bicycling and transportation advocates who quickly rallied in support of amending and improving the bill language.

In the coming weeks, PeopleForBikes will be asking the public, retailers and bicycle manufacturers to contact their representatives to help fix this law and protect Class 1 and Class 2 electric bicycles while redirecting the focus of regulatory and safety efforts on **e-motos**, the high-speed electric mopeds, motorcycles, and dirt bikes being marketed to kids in New Jersey.

[source](#)

Safety

Safety

- Ebikes are usually **heavier** than a standard bicycle
- One might be inclined to ride an ebike **faster** than a standard bicycle
 - Weight and speed factor into stopping distance – know your ebike's limits
- Someone new to ebike riding must take time to **master the controls**
 - Know how your 'PAS' and throttle work and how to use them effectively
- Install and **use all safety equipment**
 - Mirror(s), bell (or other warning device), lights, helmet, reflective gear
- **Obey ALL 'rules of the road'** on and off the trails

Maintenance

Maintenance

- Know how to inspect and care for your e-bike
 - How to adjust your gear selector and brakes
 - Maintain correct tire pressure and know how to repair/change your tires*
 - Monitor spoke tension, etc.
- Know what tools and spare parts you need to carry with you when you ride
- And know when to call the pros!

**Rear hub motors make changing a rear tire flat more challenging. Having the right tools and parts, and knowing how to remove the rear wheel, are important considerations!*

E-Bike Rider's Backpack

- Identification and medical card
- Cash
- USB charging cable (for your phone)
- Water
- Granola bar(s)
- Small medical kit (incl. mask & gloves)
- Allen wrench(es)
- Tire valve stem removal tool
- Spoke tensioner tool
- Tire removal levers
- Tire pump (or have one on the bike)
- Spare tire
- Spare fuse (as needed)
- Crescent wrench (for rear wheel removal)
- Not shown
 - Cell phone (never leave home without it)
 - Security lock/alarm remote



With room to spare for clothing layers...

Or a simple Repair Kit to keep on the bike if preferred

- Spare tube (check size)
- [Tire pump](#) (or [electric*](#))
- [Tire levers](#)
- Bicycle multi-tool (like this one)
 - [Crankbrothers M19 Multi-Tool w/ Case](#)
- [Crescent wrench](#)
- And a place to store it all:
 - [Bike Seat Bag](#)

