

# Electric Bikes

Clean, Green and Affordable  
Transportation



Borrowed, modified and shared here by Hughes Pack

**How long has it been since you last rode a bike ??**



# Why an electric bike ?

Get to work faster without sweating OR  
Get your blood flowing on the way to work

Make hills a breeze

Cheap transport

Ride further

An alternative to your polluting car

No carbon

You're never too old to ride an electric bike

They are FUN to ride !

# The electric bike capital of the world



**Electric bikes come in all types imaginable:**



**Working bikes**



**Commuter bikes**



**Mountain bikes**



**Cargo bikes**



**Pedi cab**



**Folding bikes**



**Kid Bikes**



**Super bikes**



**Trikes**



**ELF**



**PEBL**

Introducing the PEBL: A Vehicle for a Sustainable Future.



**The PEBL will be here tomorrow, 9/24/17! Come back. [www.better.bike](http://www.better.bike)**

# Legal matters

Is an electrified bike still considered a regular bike ?

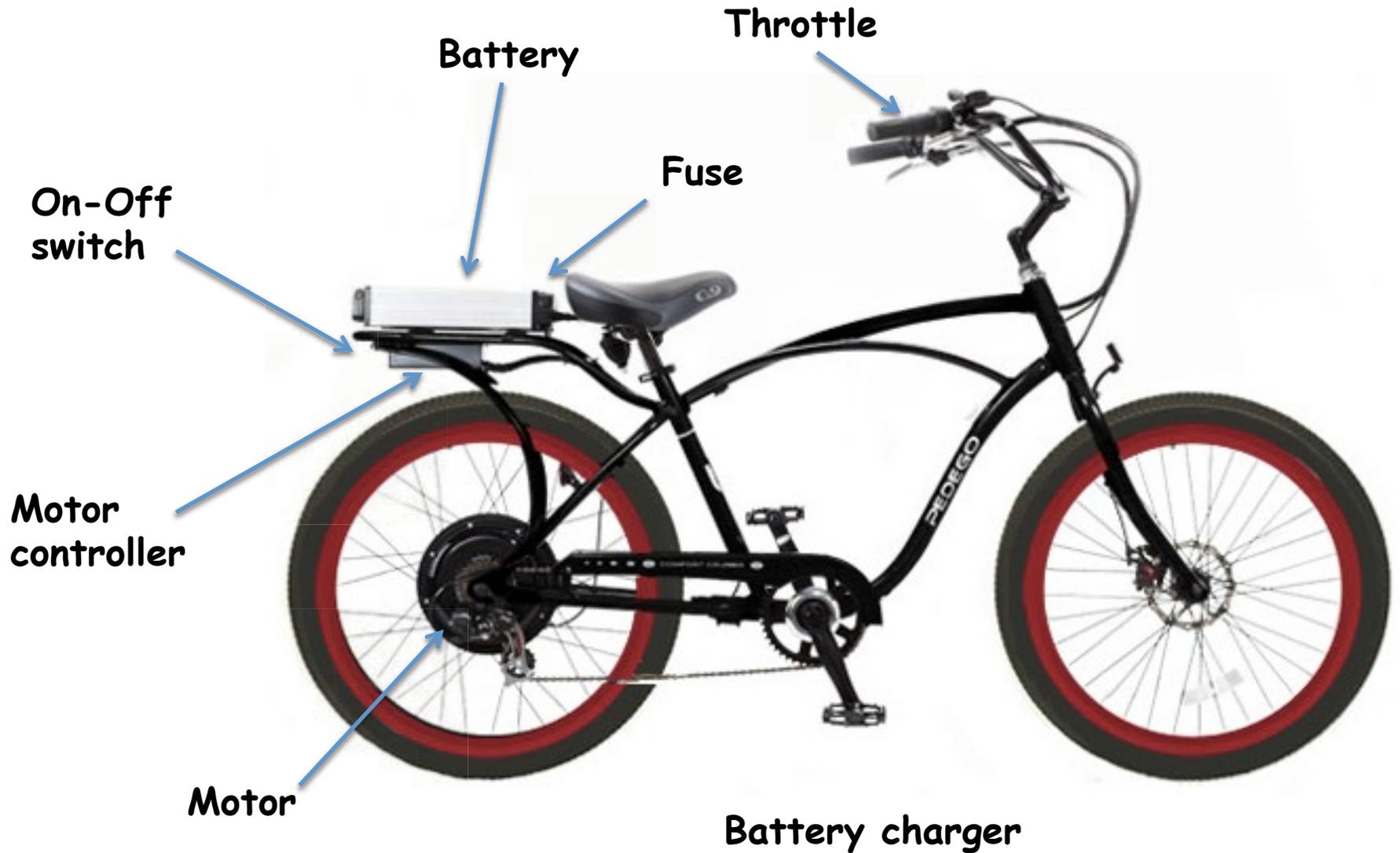
In Mass yes, if its maximum speed is 20 mph on electric drive and it has a motor rated 750 watts or less

Do I need to register an electric bike ?

No registration No Insurance No excise tax No license

Regulations on electric bikes vary from state to state

# Basic components of an electric bike



The parts can be hard to see:



# How does an electric bike work ?

1. The battery stores electricity
2. The electricity flows as current "pushed" by the battery voltage to the controller
3. The controller allows the electricity to flow to the motor depending on the position of the throttle or as your pedaling effort increases
4. The motor spins as fast as the throttle position allows making the bike go

# What's a Watt ?

Watts are a measure of POWER

POWER = Voltage x Current

$P = \text{Volts} \times \text{Amps}$

More **WATTS** means more **POWER**

More **POWER** means more **TORQUE** (higher speed and hill climbing ability)

The battery supplies a fixed voltage

The controller limits current to and thus the power of the motor

# What's it cost to get electrified ?

**Kits to convert any bike**

**\$300 to \$2000**

**Complete electric bikes available**

**\$300 to \$10,000**

## Some complete Electric Bikes



**Pedego City Commuter \$2495 40 mile range with assist**



**A2B Kuo lightweight electric folding bicycle    \$1,399**

**25 mile range with assist**



**eZip Trailz Low Step Electric Bike    \$479**

**15 mile range with assist**

## What does a kit include for the \$\$\$ ??

**\$300** - Low power motor - lead acid battery - 10 mile range

**\$1200** - Medium power motor - lithium battery - 20 mile range

**\$1900** - High power motor - lithium battery - 40 mile range

Installation by a shop can add up to a few \$100

# What will the different size motors do ?

## Low power motor - 250 to 350 watts

Will assist you to speeds of around 15 mph and help you on modest hills (low torque)

## Medium power motor - 350 to 750

Will assist you to speeds of 20 mph and help you up larger hills

## High power motor - 750 to 1200 watts

Will assist you to speeds of 25 mph+ and can power you up many hills with no pedaling



**Your bike wheel size will make a big difference**

**A smaller wheel equals lower speed and higher the torque**

OK, so do I want a front or rear drive ?

## Front Drive

Simpler installation

Better weight distribution

Limited power - 500 watt max





**IMPORTANT !!**

Front hub motors of 500 watts or more must have a torque arrestor.

## Rear Drive

More complex installation

More weight on rear end

No power limit



# Direct drive or indirect drive ?

## Direct Drive

Fix ratio 1 to 1

Very reliable

Minimum parts

Efficient



Hub motor

## Indirect Drive

Any ratio possible - torque !!

Maintenance needed

More parts

Lower efficiency



**Mid Drive**



**Stoke Monkey**

# Hub motors - Direct or geared ?

## Direct motors



No maintenance

Quiet

Best for higher speed

High efficiency at speed

High torque at higher speed

Slight cogging when coasting

Regeneration possible

Moderate price



# Many different sizes of direct motors



# Geared motors

Maintenance over time

Slight gear noise whine

Best for lower speed

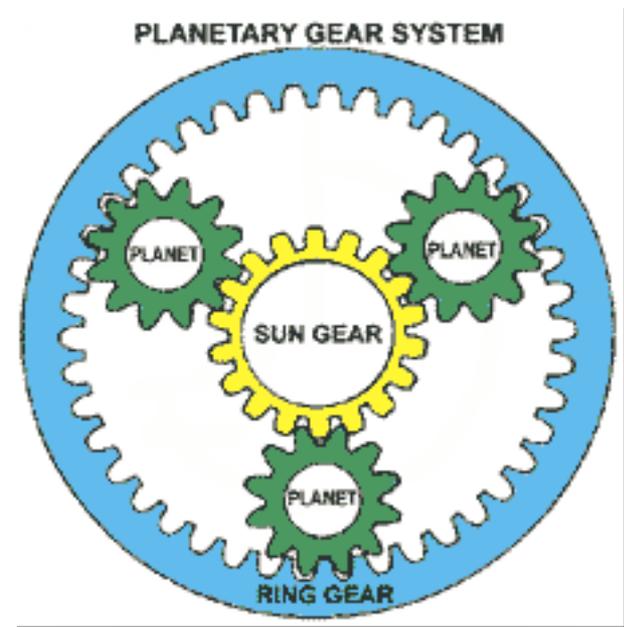
High efficiency at low speed

High torque at low speed

No resistance when coasting

No regen possible

Higher price



# Throttles



Half twist grip



Full twist grip



Thumb

A throttle can also be controlled by a torque sensor

## Other controls

Cruise control - set a speed and let go of the throttle

Auto shut off - shuts off the drive when the brake is used

# Batteries

## Most common types

Sealed Lead Acid

Lithium Iron Phosphate

Lithium Manganese

# Sealed lead acid



**Cheap**

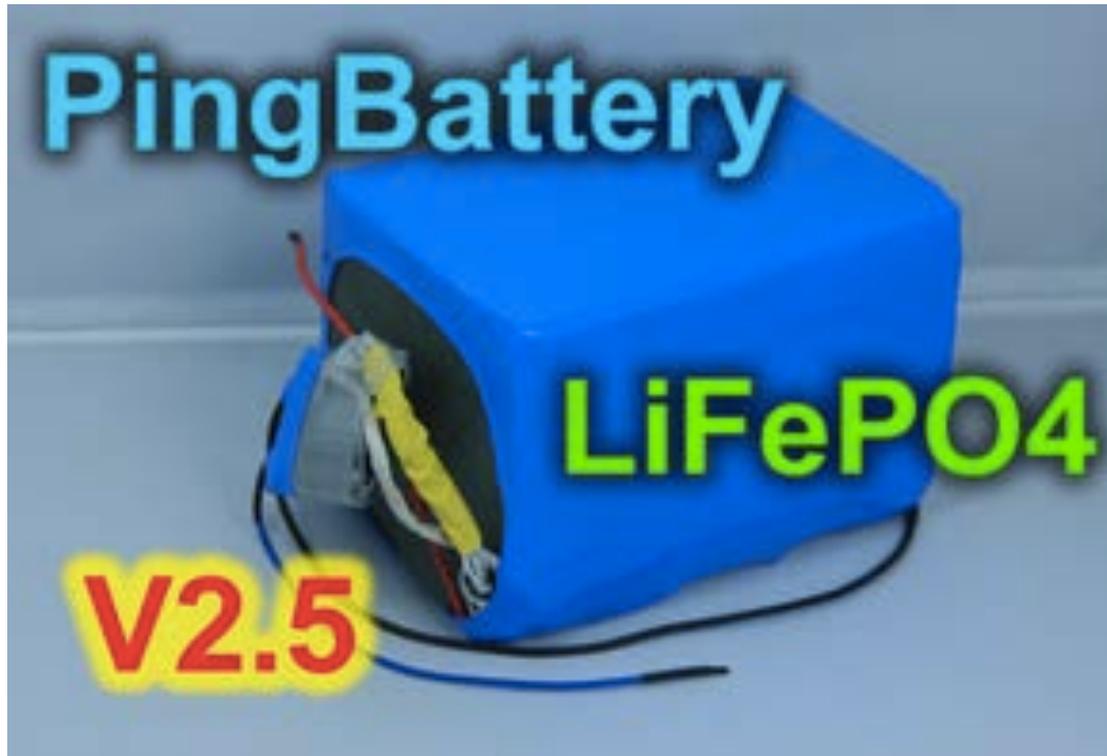
**200 cycles**

**Heavy**

**Big**

**Safe**

# Lithium Iron Phosphate



Expensive

2000 cycles

Medium weight

Small

Safe

Needs BMS

# Lithium Manganese

Most Expensive

800 cycles

Light weight

Small

Safe

Needs BMS



## A battery with more capacity gives more range

<b>RANGE Chart</b>		<b>Sealed Lead Acid Battery (12 AH)</b>	<b><i>LiFePO4</i> EV Battery (48V 20 AH)</b>
		Weight	40 lbs
Phoenix Racer 4840	Capacity	12AH	20AH
	Range 36 MPH	7-9	26
	Range 20 MPH	18*	61
	Weight	35 lbs	29.2 lbs
	Capacity	10AH	20AH
RoadRunner 4820	Range Full Throttle	14*	88*
Sparrow 4825	Range Full	12*	80*

# Where to put a battery ??



**Keep the weight low**



**Try to balance weight**

**Make it easy to remove if needed**



**Batteries can be located in parts of the bike frame or inside the hub motor.**

# Battery chargers



Get the proper charger for your type of battery

Best charger is rated at 20% of battery capacity

Auto shut off is good feature

Charger with a power factor of .9 or better best

# Gauges

Gives battery state

Shows instantaneous power draw

Can show speed and mileage

Clock for current time and time duration



**Cycle Analyst**



**Watts Up meter**

Many motor manufacturers have their own special meters

# Some complete kit packages

## BionX PL250, Lightweight Electric Bike Kit

weight  
**16** lbs

range  
**20** miles

speed  
**20** mph

\$999.00

## BionX PL350 High torque Electric Bike Motor Kit

weight  
**19** lbs

range  
**25** miles

speed  
**20** mph

\$1,499.00

## BionX SL350 48V, Premium Electric Bike Motor Kit

weight  
**16** lbs

range  
**35** miles

speed  
**20** mph

\$1,999.00

# BionX

## Made in Canada





**Ebay deal 48 volt - 1000 watt kit \$309 !!!!**

# Crystalyte made in China

## RoadRunner 3625

What's included?

**\$629.99**

Put in cart for shipping estimate

16 inch front motor Add \$0.00 ↕

- Heavy-duty kickstand for 26 inch bikes \$44.99
- Cruise Control with brake inhibits \$49.99
- Substitute: Lighted Twist Throttle \$0.00
- Upgrade: Joule 36V 3A Charger \$20.00
- Upgrade: Joule 36V 4.5A Charger \$70.00

Add To Cart

## RoadRunner 4825

What's included?

**\$729.99**

Put in cart for shipping estimate

16 inch front motor Add \$0.00 ↕

- Heavy-duty kickstand for 26 inch bikes \$44.99
- Cruise Control with brake inhibits \$49.99
- Substitute: Lighted Twist Throttle \$0.00
- Upgrade: Soneil Charger \$130.00
- Substitute: Battery Brackets for bag \$0.00
- Simu-Leather Saddlebags \$59.99

Add To Cart

## RoadRunner 3625 Power System Only

What's included?

**\$369.99**

Put in cart for shipping estimate

16 inch front motor Add \$0.00 ↕

- Heavy-duty kickstand for 26 inch bikes \$44.99
- Cruise Control with brake inhibits \$49.99
- Substitute: Lighted Twist Throttle \$0.00

Add To Cart

## RoadRunner 4825 Power System Only

What's included?

**\$419.99**

Put in cart for shipping estimate

16 inch front motor Add \$0.00 ↕

- Heavy-duty kickstand for 26 inch bikes \$44.99
- Cruise Control with brake inhibits \$49.99
- Substitute: Lighted Twist Throttle \$0.00

Add To Cart



**900 watt Crystalyte kit    \$640    base price**

# Hill Topper



\$399-\$1,195 with battery choice

**Very simple system to install**

# Copenhagen Wheel

The all in one  
package

Control through  
torque sensor and  
i-Phone

\$949 pre-order



# Smart Wheel by FlyKly

The all in one  
package

Control through  
torque sensor and  
i-Phone

\$1299



E-Bike PowerPoint will be posted on the website for this event.

My email is:

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I am Hughes Pack from Northfield.