

THE **SWITCH YOUR THINKING** GUIDE TO



# ELECTRIC BIKES

E-bikes can help you get around and stay fit without the costs, emissions and traffic hassles of a car – and they're great fun!

**Switch your thinking** gratefully acknowledges support from the following organisations.



**switch**  
your thinking

**Switch your thinking** is a joint initiative of the City of Armadale, City of Gosnells and Shire of Serpentine Jarrahdale working together as the South East Regional Energy Group.

# WHAT'S IN THIS GUIDE?

**Switch your thinking** supports the community in their sustainability actions. E-bikes offer you a practical alternative to driving in urban areas. Skip the traffic, get active and reduce your emissions by switching car trips for e-bike rides.

What is an e-bike?

How does an e-bike work?

Benefits of e-bikes

Choosing the right e-bike for you

E-bike safety

E-bike security

Rules and legislation

E-bikes on public transport



Australia Post  
have a fleet of more  
than 1,000 e-bikes  
for staff to use on  
short trips.



# WHAT IS AN E-BIKE?

An electric bike (e-bike) is similar to a traditional bicycle with the addition of a battery pack and an electric motor that assist the rider's efforts.

E-bikes can make cycling a more enjoyable and feasible option, especially if you:

- ⚡ Commute long distances
- ⚡ Live in a hilly area
- ⚡ Can't easily pedal a traditional bicycle
- ⚡ Enjoy tailwinds but not headwinds

In Western Australia, there are two main types of e-bikes:

**Pedal-assisted e-bikes** require you to pedal to activate the electric motor and have a sensor to detect the pedalling speed and force. Pedal-assisted e-bikes have a maximum legal output of 250 watts and a top assisted speed of 25km per hour.

Most pedal-assisted e-bikes allow you to choose the level of motor assistance. The level of assistance is set as a percentage



of the overall power. For example if you choose 25 percent assistance, the motor will give you a quarter of the power which you are producing with your legs.

**Power-on-demand e-bikes** have a motor that is activated by a throttle, usually handlebar-mounted just like on a motorbike. The maximum legal output of these e-bikes is 200 watts.

## How does an e-bike work?

E-bikes share their major components with traditional bicycles but also have an electric motor, handlebar display and rechargeable battery.

## Motor

There are different types of motors used in e-bikes that have varying cost and complexity.

- ⚡ **Front wheel hub motor:** Provides good stability as the battery is often mounted on the rear rack, distributing the weight across the e-bike.
- ⚡ **Rear hub motor:** Rear wheel drive has the advantage of better traction which is great for hills and inclines. Rear wheel hubs are ideal for mountain, hybrid or commuting e-bikes.
- ⚡ **Mid drive motor:** Offering greater weight distribution and motor efficiency, quality mid drive motors are more powerful, smoother and durable than hub motors. They are also generally more expensive.

# HOW DOES AN E-BIKE WORK?



Image courtesy of KTM electric bikes.

## Battery

Lithium ion batteries are considered to be the most reliable and practical batteries currently available. They are light weight, reliable and have a relatively long range, making them the preferred battery for most quality e-bikes.

## Display

Typically allows the selection of power level as well as providing a range of information including speed, distance travelled and battery level. Higher quality systems provide substantially more information.

## E-bike parts

- |                    |                      |
|--------------------|----------------------|
| 1 Frame            | 9 Crank arm          |
| 2 Chain stay       | 10 Handlebar display |
| 3 Front derailleur | 11 Shock absorber    |
| 4 Drive chain      | 12 Front brakes      |
| 5 Gears            | 13 Valve             |
| 6 Rear brakes      | 14 Motor             |
| 7 Rear derailleur  | 15 Battery           |
| 8 Cassette         |                      |



# BENEFITS OF E-BIKES

## Health

Riding a pedal assisted e-bike shares many of the health benefits of traditional cycling, including:

- Strengthened cardiovascular system
- Strengthened muscular system
- Improved mobility and posture
- Reduced back and joint pain
- Relieved mental stress
- Strengthened immune system
- Reduced tiredness and fatigue

E-bikes make it easier and more comfortable to cycle further with less effort. This means that you may not achieve the same workout as you would riding the same distance on a traditional bicycle. You can always adjust the amount of assistance you receive from the motor or use your e-bike more than you would your traditional bike to achieve a

harder workout. Riding an e-bike is also still a much healthier option than taking the car.

## Wealth

Purchasing and maintaining an e-bike is generally more expensive than owning a traditional bicycle but offers significant cost savings if used in place of a car or motorbike.

## Planet

E-bikes don't produce emissions as you ride them but the batteries do have an environmental impact.

Life cycle analysis shows that e-bikes have a significantly lower environmental impact than cars and some forms of public transport. *For example, e-bikes use 18 times less energy than a big car.*

## Compare your transport costs...

| Cost                                                | Bicycle                                             | E-bike                                                      | Car                               |
|-----------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------|-----------------------------------|
| Initial purchase (new)                              | \$100 to \$10,000                                   | \$995 to \$7,999                                            | \$12,000 to \$22,000              |
| Servicing (per year)                                | \$100 to \$200                                      | \$89 to \$260 depending on use                              | \$925 to \$1,125                  |
| Fuel (per 100 km)                                   | \$0                                                 | \$0.22                                                      | \$11.60                           |
| Battery replacement                                 | \$0                                                 | \$800-\$1000 per 25,000 to 40,000 km                        | \$145 as required                 |
| Parking                                             | One-off cost of a good lock and chain               | One-off cost of a good lock and chain                       | \$80 (per week for CBD commuters) |
| On-road costs (registration and insurance per year) | \$0 (usually can be included on contents insurance) | approx \$50 (usually can be included on contents insurance) | Up to \$2,414                     |

Note: costs are approximate



At the end of its life, your e-bike's battery can be recycled. Never put Lithium ion batteries in your bin for curb side collection, they create a fire danger when compacted in the truck.

For recycling options near you contact Battery World (13 17 60) or look for a Household Hazardous Waste program drop-off site on the Waste Authority's website ([wasteauthority.wa.gov.au](https://wasteauthority.wa.gov.au)).

# USING YOUR E-BIKE

## Ride

If you are used to riding a bike, the pedal assist e-bikes might feel quite natural for you.

Typically, e-bikes have different levels of assistance:

- ⚡ **Low pedal assist:** a little electric assist while you provide more pedal power (most similar to traditional cycling)
- ⚡ **Medium pedal assist:** provides a balance of your pedal power and the motor power (feels like a strong tail wind)
- ⚡ **High pedal assist:** provides maximum power to help you climb steep hills, shorten journey times or to give you a rest

## Charge

You can charge your e-bike's battery in a normal wall socket with the small charger supplied with the e-bike. Batteries are removable for convenient charging but can usually be charged whilst on the bike, and typically take 3-6 hours to fully charge.



Your e-bike battery can be recharged at any ordinary power point.

## Maintain

It is recommended that you get your e-bike serviced three months after purchase. The frequency of subsequent services will depend on how often you ride and how you use your e-bike. Your bike shop will be able to give you some guidance following the initial service.

The two main components of an electric bike (the motor and the battery) are sealed units and are not serviceable. They only need to be kept clean and maintained as per your owner's manual.



# CHOOSING THE RIGHT E-BIKE

## Types of e-bikes

There are many different types of e-bikes available in a range of styles and prices.

- ⚡ **Mountain e-bikes:** durable frames, strong wheels, sporty looks, knobby tyres, front suspension forks and an upright riding position
- ⚡ **Hybrid e-bikes:** great for commuting because they combine speed, efficiency and comfort. They usually have 28 inch wheels, front suspension and flat handlebars
- ⚡ **Folding e-bikes:** light-weight and pack down for easy storage, making them popular with commuters who use public transport for a leg of their journey
- ⚡ **Commuter e-bikes:** traditional Dutch-style upright bikes, easy and comfortable to ride. Most moving dirty parts of the bike (like the chain) are enclosed or covered. A very comfortable bike for people with back, neck and hip issues
- ⚡ **Cargo e-bikes:** like a traditional bicycle but with the added benefit of being stronger with a longer rack on the front or rear designed to fit a whole range of accessories including children's seats, boxes or crates up to 120 kilograms plus the rider. They are very popular in Europe and are designed as an alternative to a car
- ⚡ **E-trikes:** the extra wheel gives better balance on the straight. Trikes usually have a good carrying load and no need to support the bike when stopped



When storing your e-bike for longer periods, charge it regularly in accordance with your owner's manual. The longer a battery sits uncharged, the shorter its lifespan.

## Battery range and size

Batteries vary according to voltage, charge capacity, weight and performance.

There is a relationship between range, speed and cost. For example, a moderate weight and speed enable a reasonably high range. Higher speeds will make the range significantly shorter.

While the operating costs of e-bikes are minimal, replacement batteries are not cheap but should last thousands of kilometres. The lifespan of a battery pack varies depending on the brand, type of usage and size. Quality batteries range from approximately \$800-\$1,000 to replace and should provide between 500-800 full cycle charges (dependant on manufacturer). Therefore, based on 50 kilometres per charge, you will get between 25,000 and 40,000 kilometres from your battery.

## Warranties

Aim to buy a quality e-bike from a reputable dealer. It will really pay off if something goes wrong. A quality e-bike should have a two year full warranty on all electrical components including the battery.



# STAYING SAFE ON YOUR E-BIKE

## Safety equipment

It is compulsory to wear an approved helmet that meets Australian Standards when riding an e-bike.

## Lights

If riding at night or in reduced visibility conditions, you must have an appropriate level of lighting on your e-bike including a front light that flashes or a steady white light that is clearly visible for at least 200 metres in front of your e-bike. You must also have a red rear light. Most e-bike lights are powered by the battery and are usually LED low power lights.



When riding in low-visibility and bad weather:

- ⚡ Ensure that your rear red reflector, orange pedal reflectors and front white reflector are intact and not obscured
- ⚡ Make sure your rear red light and front white light are functioning correctly and have adequate power supply
- ⚡ Wear highly visible (and at night reflective) clothing that will contrast with your surroundings

## Ride to the conditions

Ensure you have a safe journey by monitoring your speed (especially in areas with a lot of pedestrians), being mindful of wet conditions, allowing yourself adequate distance to brake and allowing enough distance and time when overtaking other cyclists and pedestrians.



# SHARING PATHS

- ⚡ You are not permitted to ride an e-bike on footpaths but you can ride on shared paths
- ⚡ You must keep left on shared paths and give way to pedestrians (please slow down while passing them)
- ⚡ At path intersections you must signal your intention to turn and give way to motor vehicles entering or exiting an intersecting road
- ⚡ You can only travel in single file on all paths, though you can travel two abreast on a road (no more than 1.5 metres apart)
- ⚡ When approaching pedestrians from behind, always ring your bell approximately 30 metres before reaching them. If they are aware of your presence with plenty of time to spare, they are less likely to make sudden sideways movements
- ⚡ Animals must not be tied to a moving bike

If you spot a hazard while riding on paths or roads you can report it by visiting the Department of Transport website ([transport.wa.gov.au](https://transport.wa.gov.au)) or calling the Main Roads WA hotline on 138 138.



The Department of Transport website has more information on cycling rules and safety. [transport.wa.gov.au](https://transport.wa.gov.au)



# E-BIKE SECURITY

### Locking up your e-bike

Many e-bikes are manufactured with a lock that bolts the battery to the bike's frame. Look out for this feature when purchasing an e-bike or ask your retailer if the model you are interested in can accommodate a retrofitted battery lock.

Alternatively you can remove your battery and take it with you when storing your e-bike. This can be a good option for commuters who wish to top up their battery while they work.

Follow these tips to keep your e-bike safe:

- Lock your bike to a fixed object (like a bike rack) that cannot be broken, cut or removed easily
- Always lock your bike using a high quality lock, securing the back wheel and also the frame to a fixed object. When using a lock, position your bike frame and wheels so that you fill as much of the space within the lock as possible. This makes it harder for thieves to use tools to break your lock
- For maximum security, it's even better to use a combination of locks. Consider using a chain lock to secure the front wheel and frame to a fixed object
- Avoid locking your bike in the same place regularly – thieves may notice the pattern
- Take your helmet and any easily removed accessories (such as lights) with you
- Remember, many thieves carry bolt cutters which will easily cut through standard cable or chain locks, so they are of little value when used alone

### Identifying your e-bike

Ensure that you have a way to identify your e-bike in the event it goes missing. The WA Police often recover stolen bikes but are unable to return them to their rightful homes if they can not be identified. Use the space on the next page to record the serial number and identifying features of your e-bike.

### Insuring your e-bike

Insurance coverage for cyclists is not compulsory but can be useful. Many cycling groups in Western Australia provide insurance for cyclists.

Cycling-specific insurance benefits can be limited and you may want to consider personal insurance, private health cover, ambulance cover and contents insurance.

Ensure that you inform your insurer that you have purchased an e-bike and ask under what conditions it is covered under your policy. *For example, is it only covered if it is stolen or damaged at your home? Or is it also covered for incidents outside your house?*



PLACE PHOTOGRAPH OF YOUR E-BIKE HERE

|                                                                |       |
|----------------------------------------------------------------|-------|
| Make                                                           |       |
| Model                                                          | Style |
| Frame serial number                                            |       |
| Key number                                                     |       |
| Battery serial number                                          |       |
| Date/place of purchase                                         |       |
| Value                                                          |       |
| Other features: (e.g. Modifications, markings, engravings etc) |       |
|                                                                |       |
|                                                                |       |
|                                                                |       |



# RULES AND LEGISLATION

## Power-assisted pedal cycles

In Western Australia, e-bike riders are bound by the same rules and responsibilities as other bicycle riders. The only difference is that e-bikes cannot be ridden by people younger than 16 years of age.

Riders of compliant e-bikes do not require registration or a license and can ride on roads and shared paths, except where bicycles are explicitly excluded.

An e-bike which uses an engine as the primary source of power and/or has an engine capacity which exceeds 200 watts is classified as a motorbike and must be registered and ridden by a licenced rider and cannot be ridden on shared paths.

## Road Rules

Most rules applying to motor vehicle drivers/riders also apply when riding an e-bike on a road.

There are, however, a few rules that only apply to e-bike riders (and cyclists) including:

- ⚡ You must have at least one hand on the handlebars while in motion
- ⚡ You must ride in a bicycle lane if one is provided and it is in a reasonable condition
- ⚡ You must not ride within two metres of the rear of a motor vehicle, over a distance of more than 200 metres
- ⚡ You must not hold onto another moving vehicle or be towed by it
- ⚡ You must use the correct hand signals to turn left or right and to stop
- ⚡ You can use the left lane of a roundabout when turning right, provided you give way to all exiting traffic
- ⚡ You must not ride in a pedestrian mall
- ⚡ You cannot overtake on the left side of a motor vehicle if that motor vehicle is moving and indicating to turn left
- ⚡ You cannot ride across a marked foot crossing unless the crossing displays bicycle crossing lights (and they are green)



You must be at least 16 years old to ride an e-bike.

# PUBLIC TRANSPORT

## E-bikes on public transport

In Perth, you can take your e-bike on a train or a ferry without additional charges to your ticket.

You may take your e-bike on the train except during these peak times on weekdays:

**Towards the Perth City Station between 7.00 am and 9.00 am.**

**Away from Perth City Station between 4.30 pm and 6.30 pm.**

During the above times e-bikes cannot be taken on trains departing or passing through Perth, Perth Underground or Elizabeth Quay Stations.

- ⚡ Fold-up e-bikes are permitted at any time, provided they are contained within a carry bag (other conditions apply).
- ⚡ Cyclists are to use the lift and walk their e-bike throughout train stations.



You can find more information on taking your e-bike on Transperth services, bike parking or reporting a hazard in railway precincts by visiting [transperth.wa.gov.au](https://transperth.wa.gov.au) or calling 13 62 13.





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[switchyourthinking.com](http://switchyourthinking.com)



In Western Australia e-bikes and e-bike riders must comply with the following legislative requirements:

[European Standard EN 15194, AS/NZS2063:2008](#)

[Road Traffic Code 2000 \(WA\)](#)

[Helmet standards AS/NZS 2063:2008](#)

[Road Traffic Act 1974](#)

[Road Traffic \(Bicycles\) Regulations 2002](#)

**Switch your thinking** are proud to have considered the environment in the printing of this handbook. It has been produced on carbon neutral paper that is manufactured using post consumer waste recycled and FSC certification mix paper.