STATUS OF E-BIKES
REGULATIONS

LEVER Workshop – Nov. 3, 2014

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TREC at Portland State University
WHAT IS AN E-BIKE?
What is an electric bike?

- Battery
- Motor (Hub or Chain drive)
- Power controls & Gear shifts
Come in all shapes and sizes
Even more shapes, sizes, & types
Different types of the e-bikes

- **Throttle**
  - Powered bicycle (PB)

- **Pedelec**
  - Powered-assisted bicycle (PAB)
What are these bikes called?

**Powered bicycle (PB, E-PB)**
- Throttle-assisted bicycle; electrically propelled bicycle (EPB); electric bike power-on-demand (POD); on-demand bikes; motorized bicycle

**Power-assisted bicycle (PAB, E-PAB)**
- Pedal-assisted bicycle; electrically assisted bicycle (EAB); pedal electric cycle (pedelec); electric pedal assist cycle (EPAC); human-powered hybrids

- Low-Speed Electric Bicycles (LSEB)
- Bicycle-Style Electric Bicycles (BSEB)
- Scooter-Style Electric Bicycles (SSEB)

- Motorized bicycle, motor assisted cycle, moped, e-scooter, etc.
Not considered “e-bikes”? 

Moped  

Scooter
INTERNATIONAL REGULATIONS REVIEW
## International Comparison of E-bikes

<table>
<thead>
<tr>
<th>Region</th>
<th>Power limit</th>
<th>Top speed</th>
<th>PB</th>
<th>PAB</th>
<th>Other conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>750 W</td>
<td>20 mph</td>
<td>Yes</td>
<td>Yes</td>
<td>Operable pedals required</td>
</tr>
<tr>
<td>Canada</td>
<td>500 W</td>
<td>20 mph</td>
<td>Yes</td>
<td>Yes</td>
<td>Power assistance only above 2 mph</td>
</tr>
<tr>
<td>Australia</td>
<td>250 W ^a</td>
<td>No limit</td>
<td>Yes</td>
<td>Yes</td>
<td>Operable pedals required. Power (electric or IC) must be auxiliary, not the main source of power</td>
</tr>
<tr>
<td>E.U.</td>
<td>250 W</td>
<td>16 mph</td>
<td>No</td>
<td>Yes</td>
<td>Power assistance only when pedaling</td>
</tr>
<tr>
<td>China</td>
<td>No limit</td>
<td>12 mph</td>
<td>Yes</td>
<td>Yes</td>
<td>Inconsistent enforcement by region and/or city</td>
</tr>
<tr>
<td>Japan</td>
<td>250 W</td>
<td>15 mph</td>
<td>No</td>
<td>Yes</td>
<td>Max assistance at 9 mph declining to zero above 15 mph</td>
</tr>
</tbody>
</table>

^a In Australia, PABs and PBs have different power outputs. PBs (*power-assisted pedal cycle*) are limited to 200W, while PABs (*pedalec*) are set at 250W.

*Source:* Rose, 2011, modified by authors.
EU Directive 2002/24/EC

Pedal-assisted cycles are excluded from directive making them bicycles
“cycles with pedal assistance which are equipped with an auxiliary electric motor having a maximum continuous rated power of 0.25 kW, of which the output is progressively reduced and finally cut off as the vehicle reaches a speed of 25 km/h, or sooner, if the cyclist stops pedalling”.

Low-performance mopeds – throttle motor, power greater 0.25 kW, speed less than 25 km/h
Conventional mopeds/S-pedelecs – pedal assisted with speeds up to 45 km/h

Requirements: compulsory wear of a helmet, insurance, age limit, number plate and a driving license.
U.S. REGULATIONS REVIEW
Definition of an E-bike (Federal)

• Consumer Product Safety Commission (CPSC)

• The Consumer Product Safety Act regulates the use of low-speed electric bicycles to “two-or three-wheeled vehicle with fully operable pedals and an electric motor of less than 750 watts (1 horse power), 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” Sec. 38 [15 U.S.C. § 2085]

• Regulation only pertains to manufacturing and first sell

• Now for the confusing part:
  • d) This section shall supersede any State law or requirement with respect to low-speed electric bicycles to the extent that such State law or requirement is more stringent than the Federal law or requirements referred to in subsection (a).
State & local regulations

- States define the device & determine where it can used

- Many state use regulations in place governing "moped", "motorcycle", "motorized bicycle", "motorcycles", "scooter", and/or "motor-driven cycle."

- Oregon - ORS 801.258 “Has a power output of not more than 1,000 watts” but ORS 807.020(15) “A person may operate an electric assisted bicycle without a driver license or driver permit if the person is 16 years of age or older.”

- Many cities defer to the state regulation and classification

- Some cities are addressing e-bikes: Boulder, Eugene, Bloomfield (CO), Toronto, Chicago, Tucson, New York City
Unique case of New York/New York State

• Motorized devices that cannot be registered in New York – including “motor-assisted bicycle”

• A business using a bicycle for commercial purposes shall not possess any motorized scooter and shall not permit any employee of such business to operate such a motorized scooter on behalf of such business. (Local Laws 2013/40 & 41)
  • Motorized scooter - …capable of propelling the device without human power and is not capable of being registered with the New York State Department of Motor Vehicles

• Proposed bills in New York State Assembly and Senate (A1618A-2013 and S390A-2013)

• Helmet reg., age & passenger restriction
REVIEW OF STATE REGULATIONS
Minimum age of operation

N = 51
Minimum age

- Data unavailable
- 12
- 14
- 15
- 16
- 18
- No minimum age
Classified as bicycle

No

Yes
Rider/Vehicle Requirements

Rider licensing required
- Yes: 24
- No: 27

Vehicle registration required
- Yes: 37
- No: 14

N = 51
Driver’s license and vehicle registration

- **No**
- **Yes**
- **Vehicle registration required**

The map shows the states and provinces in the United States and Canada where driver’s licenses and vehicle registration are required.
Maximum power output

- 750 W (1 HP): 9
- 1000 W (1.3 HP): 8
- Over 1000 W (>1.3 HP): 15
- None specified: 2

$N = 33$

Maximum piston displacement

- 48 - 50 cc: 11
- 100 cc: 2
- 150 cc: 1
- None specified: 3

$N = 17$
Maximum power output specified

- Data unavailable
- 500 W / 0.67 HP
- 750 W / 1 H.P.
- 1000 W / 1.34 H.P.
- > 1000 W / 1.34 H.P.
- Piston displacement (cc)
- Unspecified limit
## States whose permitted speed or power exceeds the CPSC definition

<table>
<thead>
<tr>
<th>State</th>
<th>Identity</th>
<th>Power</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>Motorized Bicycle</td>
<td>1,000 watts</td>
<td>20 mph</td>
</tr>
<tr>
<td>Georgia</td>
<td>Electric-assisted Bicycle</td>
<td>1,000 watts</td>
<td>20 mph</td>
</tr>
<tr>
<td>Indiana</td>
<td>Motorized Bicycle</td>
<td>50 cc</td>
<td>25 mph</td>
</tr>
<tr>
<td>Kansas</td>
<td>Electric-assisted Bicycle</td>
<td>1,000 watts</td>
<td>20 mph</td>
</tr>
<tr>
<td>Minnesota</td>
<td>Electric-assisted Bicycle</td>
<td>1,000 watts</td>
<td>20 mph</td>
</tr>
<tr>
<td>Mississippi</td>
<td>Bicycle with a Motor Attached</td>
<td>no limit</td>
<td>no limit</td>
</tr>
<tr>
<td>Montana</td>
<td>Bicycle</td>
<td>2 HP</td>
<td>30 mph</td>
</tr>
<tr>
<td>Nebraska</td>
<td>Moped</td>
<td>2 HP</td>
<td>30 mph</td>
</tr>
<tr>
<td>North Carolina</td>
<td>Moped</td>
<td>50 cc</td>
<td>30 mph</td>
</tr>
<tr>
<td>Oregon</td>
<td>Electric-assisted Bicycle</td>
<td>1,000 watts</td>
<td>20 mph</td>
</tr>
<tr>
<td>Texas</td>
<td>Electric Bicycle</td>
<td>no limit</td>
<td>20 mph</td>
</tr>
<tr>
<td>Virginia</td>
<td>Electric Power-assisted Bicycle</td>
<td>1,000 watts</td>
<td>25 mph</td>
</tr>
<tr>
<td>Washington</td>
<td>Electric-assisted Bicycle</td>
<td>1,000 watts</td>
<td>20 mph</td>
</tr>
</tbody>
</table>

*a Only states that have a definition recognizing e-bikes as unique vehicles were considered*
POLICY QUESTIONS
What are the next steps?
What are the important factors for defining an e-bike?

• Speed (average/top/acceleration)
• Motor power
• Method to engage motor
• Functional pedals
• Physical characteristics
  • Weight
  • Size/Shape
  • Number of wheels/Size of wheels/Wheel orientation
• Rider position
• Frame type
• VIN (Vehicle Identification Number)
Policy Questions & Implications

- **Technology**
  - Motor size; Speed; Weight; Dimensions; Pedals (Functional?)

- **Rider/Passenger**
  - Age; Helmet; License; Registration

- **Use**
  - Separated/protected bike path; Bike lane; Shared use path; Sidewalk & Trails
Some questions moving forward

• Is an e-bike a bicycle? When is it not?
• Create new classifications of electric bicycles?
• Differentiate between electric bicycles, mopeds, motorized bicycles, scooters?
  • Classes of electric bicycles
    • Throttle
    • Pedelec
    • Dual modes
    • S-pedelec
• Is there a difference in the definition for CPSC (manufacturing and sale) vs. use?
• Should there be flexibility for future technologies and devices?
• Too many terms and names?
• Design vs. Performance?
How Much Faster Are E-bikes?

- AASHTO 2012 design criteria – bike facilities
  - 8-15 mph pave level terrain; 20-30 mph downhill; 5-12 uphill; 15 mph avg. operational speed

<table>
<thead>
<tr>
<th>Facility</th>
<th>Mean (mph)</th>
<th>Max (mph)</th>
<th>Min (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bike path</td>
<td>12.6</td>
<td>24.4</td>
<td>2.7</td>
</tr>
<tr>
<td>Bicycle lane</td>
<td>15.5</td>
<td>25.4</td>
<td>2.5</td>
</tr>
<tr>
<td>Sidewalk</td>
<td>11.5</td>
<td>18.7</td>
<td>2.1</td>
</tr>
<tr>
<td>No facility</td>
<td>11.8</td>
<td>22.9</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Opiela et al., 1980

- Landis et al. 2004, conventional bikes travel 11 mph (avg.), 14 mph (85% percentile), 1% > 20 mph
- Cherry & He 2009, avg. conventional bike 6.9 mph (std. 3.3) / avg. e-bike 9.0 mph (std. 5.5) or 31-35% faster
- Langford & Cherry 2013, UT study of e-bikes (avg. 8.3 mph; 85th percentile 12.4 mph); conventional bikes( avg. 6.5 mph; 85th percentile speed 10.6 mph)
A Naturalistic Cycling Study in Sweden

Dozza, et al. 2013

![Graphs showing speed distribution of traditional and electrical bicycles.](image)

- **Traditional Bicycles**: Average 14 km/h
- **Electrical Bicycles**: Average 23 km/h

- **8.7 mph**
- **14 mph**

Dozza, et al. 2013
Questions