

Low Energy Vehicles

for Sustainable Future Transport



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Example EVs The S.A.M. from Poland, left, offers compact dimensions and frugal energy consumption⁸, yet full weather protection and stability. The innovative Libner BIL delivery system from France, right, provides new solutions for urban freight distribution (800kg load capacity).



Transport is the UK's biggest energy consumer¹, with road vehicles accounting for a large proportion of the country's total carbon dioxide emissions². Meanwhile, 91% of car commuting is single-occupancy³.

“We don’t have an energy crisis. We have a consumption crisis.”⁴ Using a 1000kg vehicle (typical hatchback car) to move a 75kg human means that only 7% of the energy is propelling the person, with 93% just moving the car itself. Larger, heavier cars are even worse. This is absurdly wasteful, yet as a society we have become inured to it.

Bicycles are supremely energy efficient, but have limitations. Scooters and motorbikes also lack weather protection and can be dangerous, especially in slippery conditions.

There is considerable potential for vehicles which bridge the gap between conventional two-wheelers and cars.

Such **lightweight vehicles** have low embodied energy from manufacture. Above all, they require significantly **less energy for propulsion** than do cars – regardless of whether the powertrain is ICE, electric, or hybrid.

As the automotive industry moves towards electrification, **displaced emissions** and **grid demand**⁵ are becoming increasingly important issues.

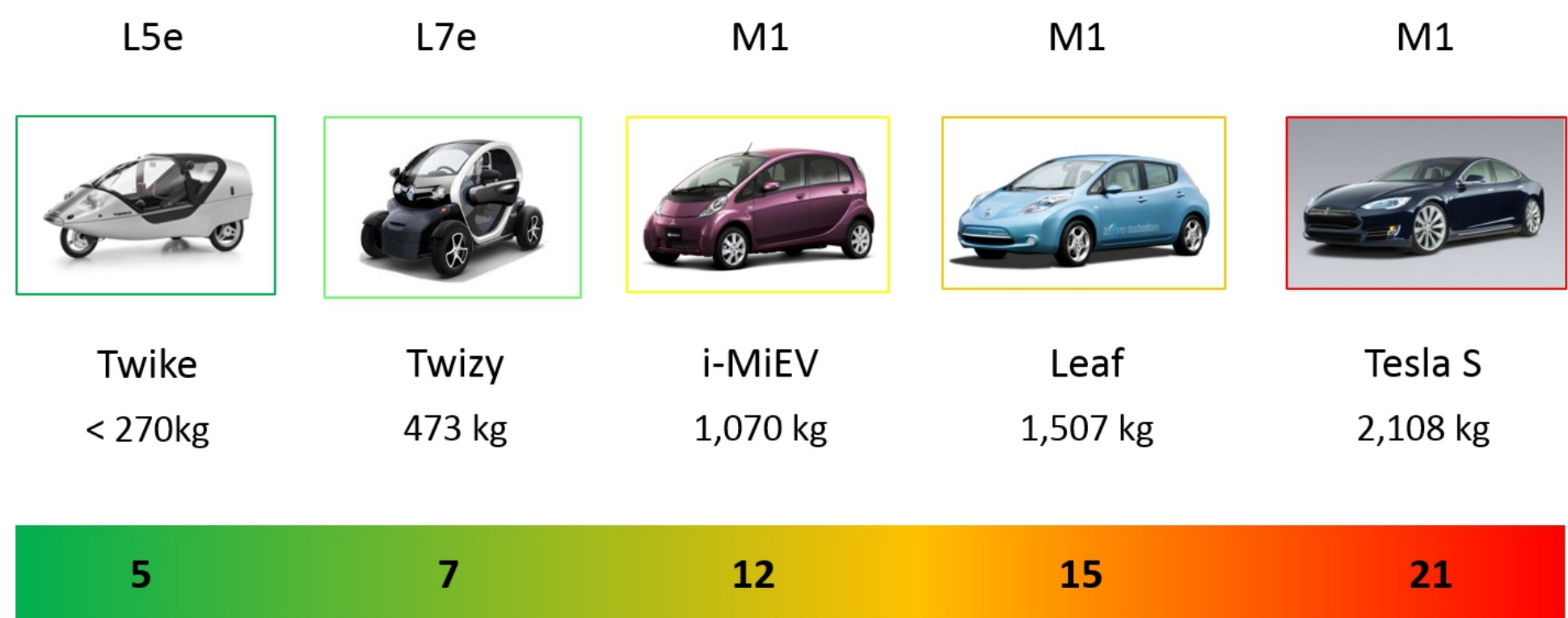
The charts below compare energy consumption and engine (or motor) power of different vehicles, showing the urgent need to rethink our mobility choices if we are to achieve sustainable future transport.

Additional benefits of compact lightweight vehicles include low running costs; also less traffic congestion, road wear and tyre noise. There are opportunities for freight transport too, particularly ‘last-mile logistics’.

Low energy vehicles can already play a **valuable role** in the local transport mix. Looking ahead: dynamic charging (while driving), distributed energy resource systems (localised micro generation) and tailored infrastructure (e.g. dedicated lanes, hire at railway stations) would enable other uses.

Further R&D (technical, commercial, sociological, design)⁶ and support from government (currently lacking in the UK)⁷ is required to capitalise on the significant benefits of these vehicles.

Energy Efficiency and Displaced Emissions

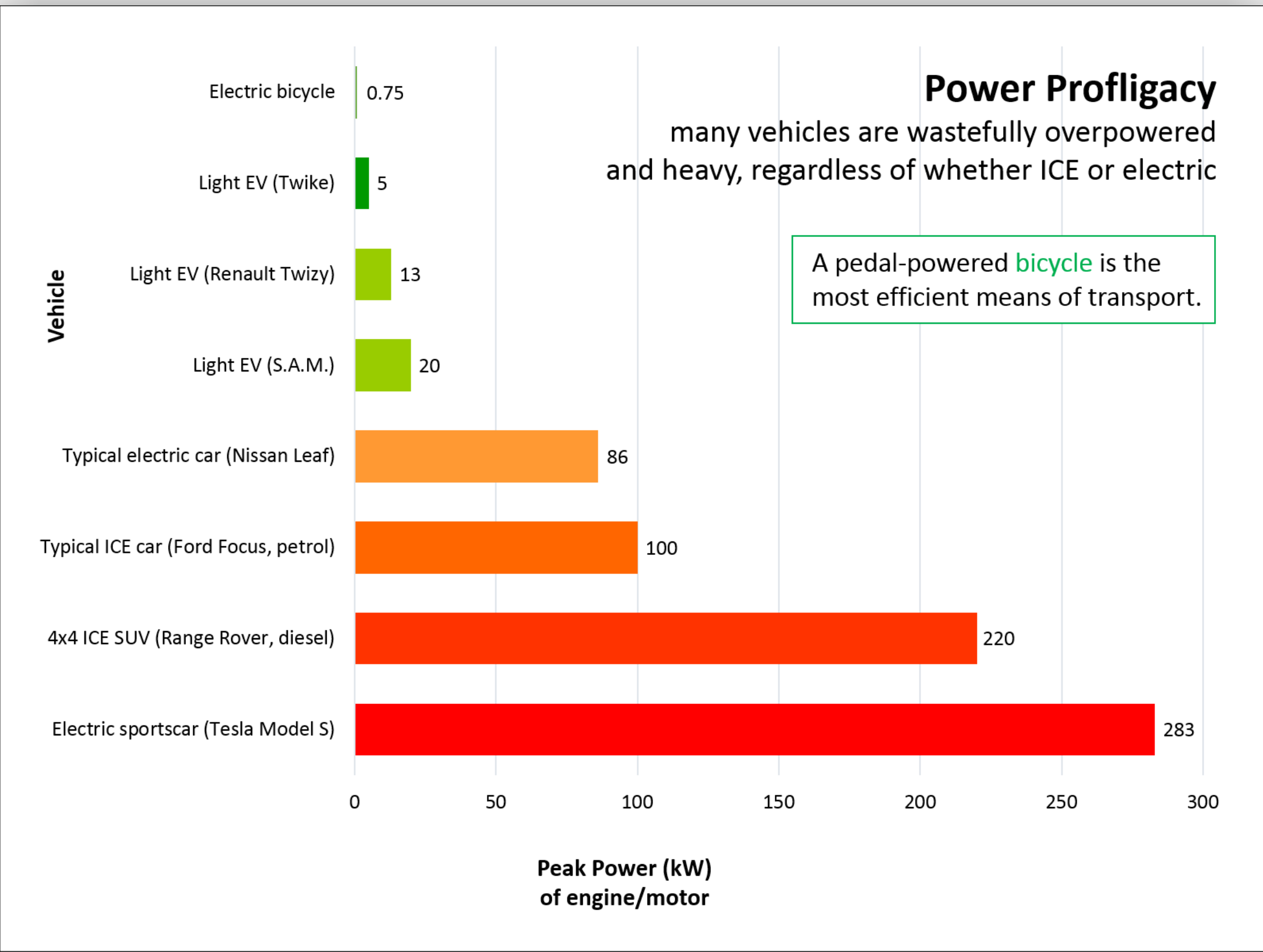


Energy consumption in kWh/100km

Aggregated figures (exact comparison requires harmonised test cycle procedures)

Displaced emissions: generating 1 kWh electricity causes 428g CO₂
based on UK generation mix in 2014

L5e, L7e and M1 are European Union type-approval categories.
M1 is a car. L-category includes powered two-wheelers, three-wheelers and lightweight four-wheelers (quadricycles).



References, sources, further information: ¹ 38% in 2013. Source: ONS (<http://visual.ons.gov.uk/uk-perspectives-energy-and-emissions/>) | ² 22% in 2014. Source: Environmental Protection UK (www.earthchampions.org/#!transport/c7ir and www.environmental-protection.org.uk/committees/air-quality/air-pollution-and-transport/car-pollution/ - see 'Impacts of Car Pollution', 'Climate Change' section) | ³ Source: *Carbon Pathways Analysis: Informing Development of a Carbon Reduction Strategy for the Transport Sector*, (DfT: 2008) p.8 | ⁴ Zehner, O. *Green Illusions: The Dirty Secrets of Clean Energy and the Future of Environmentalism (Our Sustainable Future)*, (University of Nebraska Press: 2012) back cover | ⁵ The National Grid is already struggling with only a few EVs on the road, even requesting heavy industry to cut demand due to power shortage on 4th November 2015 (multiple sources) | ⁶ Example: crash safety, which touches on all four areas | ⁷ Office for Low Emission Vehicles excludes electric three-wheelers and quadricycles from their consumer plug-in grant, thus stifling uptake of existing vehicles; L-category was discouraged from InnovateUK's call *Developing Advanced Lightweight Vehicles*, thus restricting R&D in this area. | ⁸ 8kWh/100km for standard model (manufacturer's figure), but capable of 6.2kWh/100km when customised (RAC Future Car Challenge 2012, official results sheet).