

However, the researchers also studied forthcoming ultra-low-emission models announced by manufacturers, and concluded that cleaner diesel and petrol cars would soon overtake hybrids on a like-to-like comparison.

"We're not saying that any car that is the same size as the Prius is better, but the gap is closing very rapidly, and conventional technologies will pass the Prius," says Clifford Thames'

'There's a big focus on exhaust emissions, but they're only part of the story'

Richard Barber.

Toyota has made no announcements of immediate plans to improve the current Prius, although it is also expected to reduce the car's emissions.

The findings will add fuel to already-heated deliberations in industry circles, where most manufacturers – includ-

ing Toyota – are looking beyond hybrids to other long-term low-emission technologies, including plug-in electric and hydrogen fuel-cell cars. They also highlight the fact – widely accepted in the car industry, but less so elsewhere – that many of the most dramatic improvements in cars' cleanliness over the nearer term will come from prosaic tweaks to conventional cars rather than breakthrough vehicle technologies.

These range from tyres with reduced rolling resistance to radically improved diesel particulate filters and "stop-start" devices that turn off cars' ignitions when they halt at junctions.

Carmakers, prodded by European and US legislation aimed at cutting cars' emissions and improving their fuel economy, are quickly introducing such features across their fleets.

"Hybrids are great marketing, but a breach solution," says Stefano Aversa, co-president of AlixPartners, the restructuring and financial consultancy.

Industry specialists say

hybrid vehicles, whose batteries are backed by a petrol or diesel engine, are an environmentally sound solution for purely urban drivers. In Europe and the US, the technology is spreading rapidly among public transport and delivery van fleets.

However, hybrids' edge on emissions and fuel economy erode over longer distances.

Some analysts have also questioned the environmental costs of producing, shipping, and disposing of the

cars. Apart from limited production in China, Toyota makes its hybrids only in Japan, although most are sold in the US and Europe.

"The more complexity there is in a vehicle, the more energy usage," says Art Spinella, president of Oregon-based CNW Research and author of a controversial study claiming that a Prius used more overall energy than one of General Motors' hulking H2 Hummers.

Toyota establishes domination in hybrid sales

The Prius first went on sale in Japan in 1997, reports

John Reed.

Rival carmakers have watched as Toyota moved on to dominate world hybrid production. Toyota's total hybrid sales – mostly the Prius – passed 1m last June.

The car emits 104 grams of CO2 per kilometre, well below the 120 g/km that the European Union wants carmakers to meet by 2012.

The company also makes hybrid versions of its luxury Lexus vehicles and, in Japan,

hybrid multipurpose vehicles.

Critics of the technology – including rival carmakers who were slower to develop hybrids – claim the technology is an interim one.

However, Toyota says it has no plans to abandon hybrids, which can be coupled to petrol, diesel or experimental drive systems such as hydrogen fuel cells.

"It's not stepping-stone technology, it's for now and the future," the company says. Given Toyota's hold on the market, such words cannot be taken lightly.