

# Borismaster or

The New Bus for London (NBfL) hybrid double-decker bus is one of those marmite developments – you either love it or hate it. Steve Banner examines the issues

**R**oute 24 has an unusual distinction. It was the first to run the New Bus for London (NBfL), with 32 of the £354,000 diesel-electric hybrid double-deckers plying between Hampstead Heath and Pimlico. Transport for London (TfL) has since ordered 600 for delivery by 2016 at a total cost of £213m.

What TfL describes as the New Routemaster, but is usually referred to as the Borismaster (because of London mayor Boris Johnson's influence), received a mixed reception. Some applauded its looks – though stopping short of Johnson's claim of "sinuous beauty and graceful motion" – but others voiced criticisms.

For example, NBfL has three sets of doors. Although the rear door, which opens to reveal an open platform, is not always fully in use, when it is the vehicle requires two crew – the driver and a 'customer assistant', who appears to be there to stop passengers tumbling off the platform. That drives up costs. Green Party members of the London Assembly claim that this requirement alone will push annual operating expenditure up by £37m.

Complaints have also been voiced that the passenger air cooling system is inadequate. The top

deck is unbearably hot on summer days because the windows cannot be opened, they say. Indeed, one wag dubbed NBfL the Saunamaster. Caroline Pidgeon, leader of the London Assembly's Liberal Democrats and deputy chair of its transport committee, describes it as a cauldron on wheels.

However, David Barnett, product director at Wrightbus – which developed and builds the Heatherwick Studio-designed vehicle – defends NBfL as a remarkable engineering achievement, particularly given that it was created in such a short space of time. "We won the contract to produce the first batch of vehicles on 23 December 2009 and that gave us just 25 months," he points out.

Barnett believes that using hybrid technology – key components are provided by Siemens – was the right way to go. "NBfL had to be 40% more fuel efficient than a conventional diesel bus. It also had to emit 40% less NOx and 33% fewer particulates," he explains. "A hybrid could achieve those figures, and we felt, too, that a series hybrid made the most sense because of the nature of the operation."

## Sweet spot

He adds: "In stop/start situations you can run the engine at a steady-state sweet spot speed for maximum fuel efficiency, then shut it off when not required and run the vehicle on its batteries." The engine (in this case, a Cummins 185bhp ISBe 4.5-litre) can then cut back in whenever required. "The bus also benefits from regenerative braking, which contributes to fuel economy, too – as does the cap placed on acceleration," he explains.

On test at Millbrook, NBfL achieved 10–11mpg, reports Barnett. That compares with 8.6mpg for a standard hybrid bus and 5.8mpg for a diesel. But has that been matched in service, given claims by London Assembly members that the new bus is achieving barely half that figure? Barnett demurs: "Remember that the Millbrook test doesn't entirely replicate real-world conditions," he says. "You don't have to keep opening and closing the doors, for example, and there is no suspension movement, both of which increase fuel usage."

NBfL's six-bag air suspension enables the bus to kneel, lowering its passenger loading height by around 70mm and thus improving access for people

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# Saunamaster?

in wheelchairs when the ramp is deployed. “Remember, too, that there is a significant difference in fuel usage between one route in London and another,” continues Barnett. “What I can say is that NBfL’s in-service fuel consumption is better than that of a standard hybrid. Furthermore, the bus is proving reliable, aside from the odd niggle.”

Additionally, TfL says that the New Routemaster emits 25% of the NOx and particulates of a cheaper standard hybrid, and 20% less CO<sub>2</sub>. It argues that, once all 600 are in service, they will cut the capital’s CO<sub>2</sub> emissions by around 20,600 tonnes annually.

That said, a key challenge for Wrightbus was keeping the NBfL’s unladen weight down to a target 11.8 tonnes. While the 4.5-litre engine is lighter than the 6.7- to 9.4-litre diesel on standard double-deckers, the weight of the lithium-phosphate battery pack, generator, permanent magnet electric motor, etc, more than offsets that. Further, NBfL is fitted with two staircases to aid passenger flow.

“At the rear of the vehicle we made extensive use of structural composite material to achieve the look without adding weight, which probably saved around 250–300kg,” comments Barnett. “As for the body, we relied on our Aluminique structure, which employs aluminium extrusions and cladding.” Nevertheless, NBfL has ended up weighing in at just shy of 12.2 tonnes – meaning that passenger

capacity has been reduced to 85 from a planned 87. “We have, however, been reducing the unladen weight during production,” he adds. Such efforts should compensate for any burden imposed by Euro 6. All current NBfLs use Euro 5 engines.

And the occasionally hot and sweaty top deck? “The air-chill system installed meets TfL’s specifications, but it is something we are looking at,” replies Barnett. Installing a full air conditioning system might be an option, but would increase the cost of the vehicle and its fuel consumption. It would also push up weight.

Heatherwick Studio says that NBfL’s appearance evolved out of a series of decisions. For example, its corners and edges are rounded to minimise the perceived size. Also, the front window is angled down towards the pavement so that the driver can see children standing next to the vehicle.

Londoners will have plenty of time to get used to the NBfL. It has a design life of more than 16 years and TfL says it intends to keep it in service for 14, a reflection perhaps of both its high initial cost and its limited scope for use outside the capital.

That said, Wrightbus is attempting to market the NBfL concept in the hope that overseas customers may be interested in ordering modified versions (two sets of doors rather than three, and air conditioning, perhaps). **TE**

