

## Nissan LEAF

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Amidst much debate about the best way forward for electrically-powered cars, Kim Henson test drives a Nissan LEAF.



[Nissan LEAF - Charging Ahead?](#)

### HISTORY

In recent times, increasingly high fuel prices, plus escalating concern over vehicle emissions, have helped to persuade motor manufacturers to revisit electric propulsion as a viable alternative to using the internal combustion engine.

It may come as a surprise to some, to discover that in fact the development of electrically



powered vehicles dates back to the 1820s. However, limitations in contemporary battery technology, resulting in very restricted available mileage ranges, meant that as the motor car developed in the later years of the 19th Century, vehicles driven by steam or petrol generally found greater favour.

All the same, electric propulsion still had its devotees, and notably in 1899 Camille Jénatzy made history in an electrically powered lightweight racing car, called “La Jamais Contente”, in which he took the World Land Speed Record at 66 mph.

During the early years of the last century, electric cars briefly continued to make the headlines. Car drivers of the time appreciated the smooth-running nature of electric models, compared with petrol-fuelled vehicles (in which noise and vibration were inherent features!). They also liked the ‘instant start-up’ aspects of driving electric cars, compared with the necessarily protracted processes associated with persuading steam vehicles of the era to run, when starting from cold.

Nevertheless the limitations of battery technology still proved to be a stumbling block for anything other than fairly short journeys, and this was a real handicap in an age when motorists were becoming increasingly adventurous in travelling longer distances.

So petrol powered cars became dominant, although development work on electric vehicles continued on a low key basis. As one example, during the late 1970s I test drove a BMC Mini that had been converted to electric propulsion. Its performance was impressive, but the big snag with it was the huge bank of very heavy batteries that it required (significantly reducing passenger and luggage accommodation), plus - once more - its limited mileage range between recharges.

## BACKGROUND - 21ST CENTURY

Today electricity is increasingly important in vehicle propulsion systems being developed by a range of mainstream manufacturers. Driving forces for this trend include significant reductions in overall running costs, and lowering/eliminating the emissions from the



vehicles when actually being driven. (Note: Of course the electricity used still has to be produced, and some emissions/environmental costs inevitably result from this production...).

Some makers (including Honda and Toyota) prefer to combine the power produced by an electric motor with that delivered by an internal combustion engine ('hybrid' technology).

A contrasting approach is to employ an electric motor to drive the wheels 100 per cent of the time, with a petrol engine used to drive an on-board generator when required; the petrol motor functions as a 'range-extender'. In addition the car's on-board battery can be regularly recharged from the mains electricity supply, thereby providing the power for relatively short-distance running (typically up to about 50 miles). The Chevrolet Volt and Vauxhall Ampera are two examples of modern cars incorporating this technology.

Taking things a stage further is Honda, with their FCX Clarity. This company is looking to the future and progressing hydrogen fuel cell stack technology. The fuel (hydrogen) combines with oxygen from the atmosphere to generate electricity, which powers the car.

Further new innovative technologies are being developed by other manufacturers too.



From the rear, the LEAF displays a futuristic appearance.



The badging gives a clue to the car's electric propulsion system...



The electric motor sits 'comfortably' in the underbonnet compartment where an internal combustion engine is usually found. Interestingly, the LEAF does feature a cooling system.



This shot shows the LEAF being recharged via a domestic electricity supply (the additional socket alongside is for recharging via public charge points).



Smart, spacious and comfortable, the driving compartment is a pleasant place to be.



To the left side of the dash display is a battery temperature gauge, towards the top is the 'instant' indicator of power consumption or regeneration, and on the right hand side is the vital gauge showing battery state and remaining mileage range.



Rear seat occupants benefit from wide-opening doors, good leg and head room, and comfortable seats.



The luggage compartment is spacious, even though there is some intrusion by a large 'beam' running across the car, behind the rear seats. The bag on the right of the boot in this shot houses the charging cable.



The roof incorporates a small solar panel assembly, to help power ancillary functions.



Standard equipment includes these smart, easy to clean five spoke sports wheels.



From the outside the LEAF has modern styling, but at a quick glance there's no hint



of the fascinating technology  
built into the car.

## THE NISSAN LEAF

It's already won the World, European and Japan 'Car of The Year' Awards, when launched in 2011, and since then approximately 50,000 examples of the Nissan LEAF have found homes, worldwide. From the spring of 2013 the LEAF will be produced in Sunderland (alongside the Qashqai, Note and Juke), as will the lithium-ion batteries required by this model.

So what's it all about? Well, boldy taking a different route compared with other models, the LEAF is a five door, five seater family hatchback which doesn't have an internal combustion motor for 'assistance' or for power generation, relying instead solely on an electric propulsion motor.

This innovative car is powered at all times by the synchronous AC electric motor, driving the front wheels via a single speed reduction gear. The on-board battery stores the power required, and regular recharging from a mains electricity supply is required. The LEAF can be recharged from a suitable domestic supply (a mains charging lead is supplied with the vehicle, and special recharging packs are available for owners who need to frequently recharge the car at home). Alternatively the LEAF can be charged at public charging points, such as those found today at supermarkets and motorway service areas. It is estimated that by the end of 2013, there will be approximately 10,000 public charging points in Britain.

In addition to the main propulsion system's battery set-up, the LEAF incorporates a roof-mounted solar panel, which harnesses the power of the sun to help provide electrical power for ancillary functions.

## DRIVING

I have driven a number of modern electrically powered vehicles, so was especially interested in trying a LEAF over several days, in 'real life' conditions - driving the car for



local commuting, as well as taking in some longer journeys.

Throughout my time with the Nissan, I enjoyed the totally different driving experience. Notably, I found that at all times the electric propulsion motor runs almost silently, providing a unique experience in terms of on-board smoothness and refinement, compared with any petrol or diesel powered car I've driven.

It's an easy drive; there is no need for any misgivings about 'driving electric', and anyone who has ever driven an automatic should feel especially at home in the LEAF.

Reassuringly too, the instrumentation provides clear, unmistakable information about the vitally important estimated mileage range remaining before a mains recharge is required, the state of charge of the battery, and, at any given instant, an indication of the amount of power being consumed or automatically 'regenerated' - which occurs under deceleration/braking. I should add that it is essential to check the instrumentation on a frequent basis, so that you are not caught out miles from home, beyond the range limits of the remaining battery power!

The transmission controller (situated where the gear lever would be in a traditional car) enables 'normal' drive or reverse gear modes to be engaged (like a simplified automatic transmission gear selector).

Importantly, the controller can also be set to change the drive parameters to 'ECO' mode. For most of my time with the car I found that this was the most suitable setting, in particular providing optimum mileage between recharges. However, when required, such as for fast overtaking or tackling steep hills with a full load aboard, switching to 'normal' drive mode gave an immediate and useful power boost. Indeed it was akin to bringing a turbocharger into play, in a car with a conventional engine.

I found that in all situations the LEAF accelerated rapidly when required, but power delivery was always smooth, easily-controlled and pleasantly proportional to input levels from the right foot. The test car picked up speed very quickly from low road speeds, and equally well



when travelling faster.

In heavy urban traffic, I found the car particularly relaxing to drive. When stopped at traffic lights (etc.) there's no need for 'stop-start' power shutdown systems with this car. It's near-silent anyway, even when under way, and when the vehicle comes to a halt there's no noise at all. Bliss!

I was especially impressed by the way in which the LEAF performed on the open road, away from the strangling traffic of built-up areas. Indeed it was very happy to cruise along in a hushed manner at the U.K.'s motorway limit of 70 mph.

Even at relatively high road speeds the eagerness of the electric motor was evident. I am not saying that performance levels are sports-car like, but nonetheless the LEAF is a willing machine and I felt it was fun to drive.

Passenger comfort and practicality aspects have not been overlooked. The LEAF has a roomy cabin accessed via wide-opening doors. It also features accommodating seats, a smooth ride quality and positive handling characteristics.

In Euro NCP crash tests, the LEAF has been given a top '5 Star' rating.

The car comes with comprehensive levels of standard equipment, including a satellite navigation system which incorporates 'Carwings'. This is Nissan's fascinating telematics system which enables the car's owner, by means of a mobile 'smartphone', to control the heating and air conditioning settings, and to monitor the electricity charging process.

Further standard fittings include an 'Intelligent' key, a rear-view parking camera, Bluetooth connectivity and LED headlamps (which work well).

Last but not least, the luggage compartment is wide, deep and long. The only visible reminder that the battery and associated equipment have to be fitted in somewhere is a cross-vehicle 'beam' assembly, taking up space between the rear wheel arches.



## RANGE? THEORY AND PRACTICE...

Theoretically, having taken on board a full charge of electricity, the LEAF should provide over 100 miles of driving (in 'ECO' mode). In my use of the car I found that after recharging the vehicle from a domestic supply, initially the range indicator would show around 95 miles, increasing to around 105 miles after a mile or two, then dropping gradually thereafter.

If I am honest, even if driving gently, I found that the remaining mileage indication was quite optimistic. As just one example, I set out on one 'open road' round trip of 70 miles (virtually all of it undertaken in power-saving 'ECO' mode) with the mileage range indicator showing 105 miles. I was therefore expecting that on my return, the 'gauge' would indicate perhaps 30 to 35 miles. In fact the remaining range indicated by the instrumentation had dropped to just 14 miles...

Of course, such situations can be quite worrying, but once you become used to the vehicle, so that you are aware of how many miles can actually be covered on a full charge, you can arrange outings accordingly. I found that careful planning of journeys was the key to avoiding the possibility of being stranded (and any associated stress!).

I discovered that full recharging of the LEAF's battery from a domestic electricity supply outlet typically took 13 hours, starting with the range indicator showing just 12 miles remaining. However, importantly, a charge of a couple of hours would pump back in enough power for a further 21 miles. Usefully, the instrumentation includes an indicator showing the estimated time required for full recharging.

One thoughtful refinement that I found very helpful was the built-in row of three blue lamps incorporated into the dash top. These are visible from both inside and outside the vehicle. As the battery is being recharged, the lamps gradually illuminate one at a time, to indicate charge levels of approximately 33 per cent, 67 per cent and 'full', respectively.

Should you ever need to recharge the battery during a journey, rapid recharging via public



charging points is available. Although I didn't need to try this facility, it is said that half an hour's rapid charging in this way will provide approximately 80 per cent of a full charge.

## VERDICT

I found the LEAF enjoyable to drive, and performance levels were especially impressive. The car appeared to be well-built too. In addition the test car was well-equipped, spacious, comfortable, and practical in everyday use.

As has been the case throughout the history of electrically.

## STOP PRESS: Good news for buyers

As I write (February 2013), it has just been announced that, as part of a global effort to make the LEAF more affordable in the car's main three markets of Japan, Europe and the United States, the UK price of the LEAF has been reduced by £2,500.

So, the 'starting' price of the LEAF is now £28,490, from which can be deducted £5,000 in terms of the U.K. government's 'incentive grant'. So a LEAF can be yours for £23,490 (or £239 per month).

For those wishing to buy a LEAF on finance, an interest rate of 6.9 per cent is available for PCP and HP purchases.

### WHEELS-ALIVE TECH. SPEC. IN BRIEF

Powertrain: Front engine (electric motor), single speed reduction gear, front wheel drive

Motor: Synchronous AC type

Power: 80kW (approx. 107 bhp)

Torque: 280Nm (approx. 206 lb.ft.)

Battery: Capacity, 24 kWh; Power, Over 90kW



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0-62 mph: 11.9 seconds

Top speed: 90 mph

Equivalent miles per gallon (general use, approx.): 300 to 350

'On the Road' Price: £28,490, less UK government incentive grant of £5,000, equals £23,490.

Warranty: As well as Nissan's standard three year/60,000 mile warranty, the LEAF has a five year/60,000 mile 'EV component warranty'. This extra 'high voltage component warranty' covers the lithium-ion propulsion battery, the electric motor, the inverter, the vehicle control module, the reduction gear, the converter, the onboard charger and the charge connector/cable.