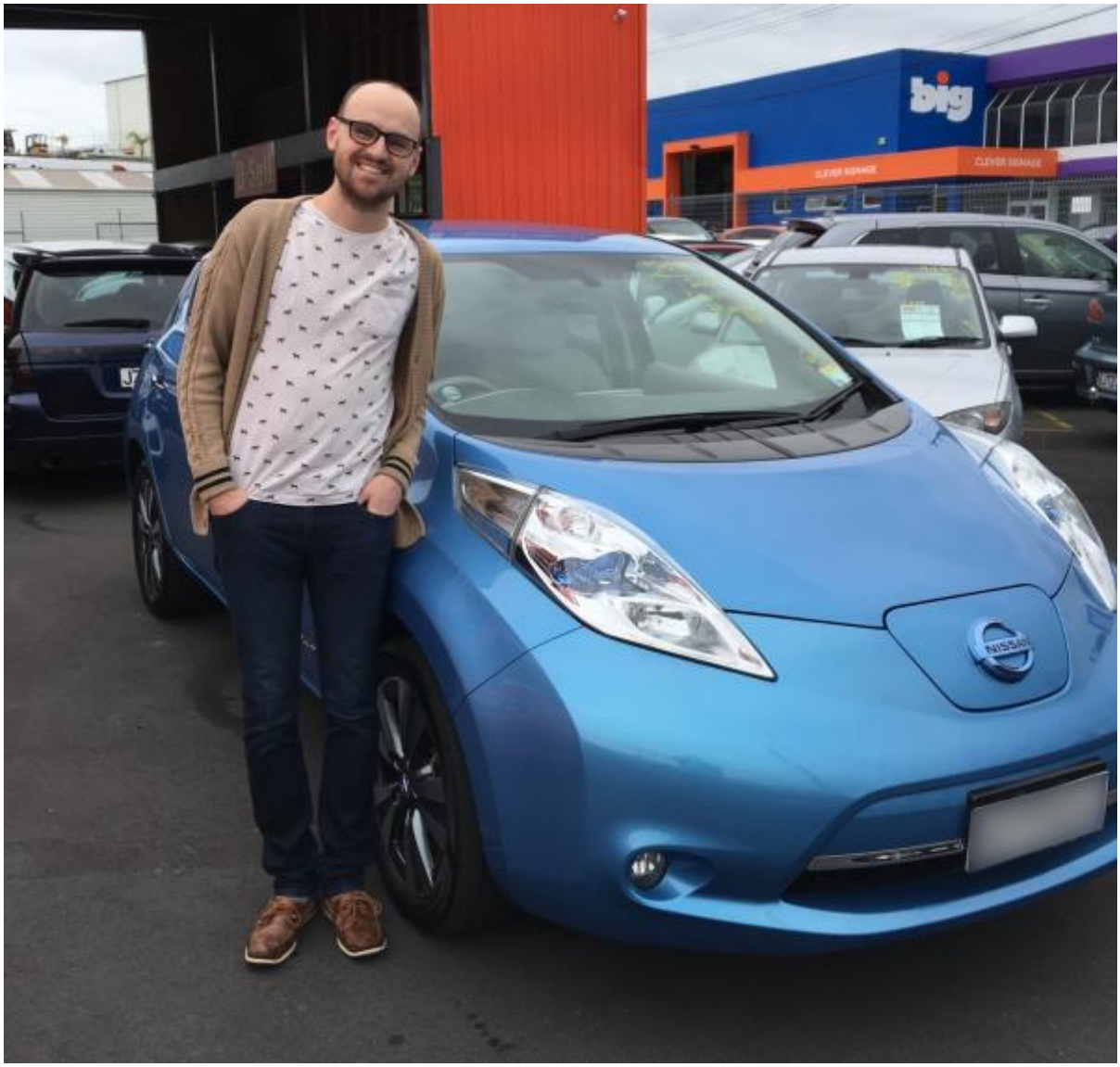
Sam’s Leaf buyers guide New Zealand

This guide is targeted to those pondering the purchase of a Nissan Leaf in New Zealand, though it will be applicable to anyone looking for a right hand drive Leaf.



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New Zealand Electric Car Guide

An excellent New Zealand guide to electric vehicles can be found at http://www.electricheaven.nz which covers other EV options, charging, costs, and other essential EV facts. It also links to NZ EV group websites.

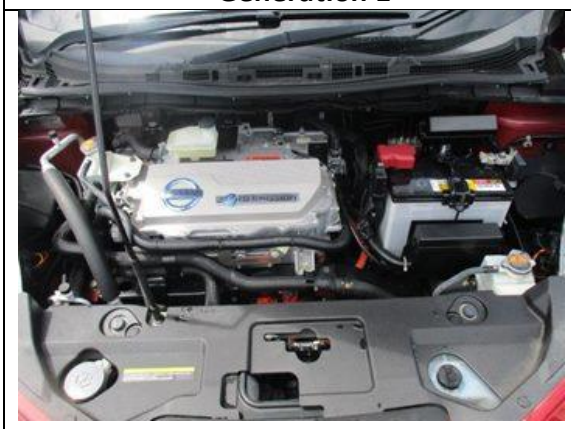
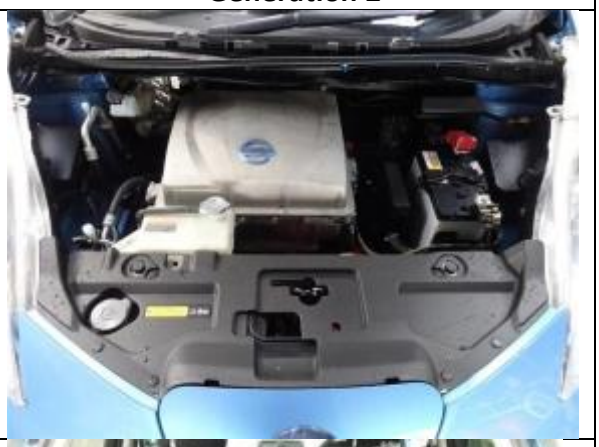
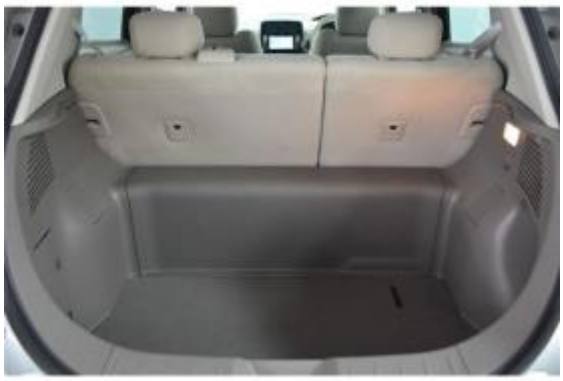
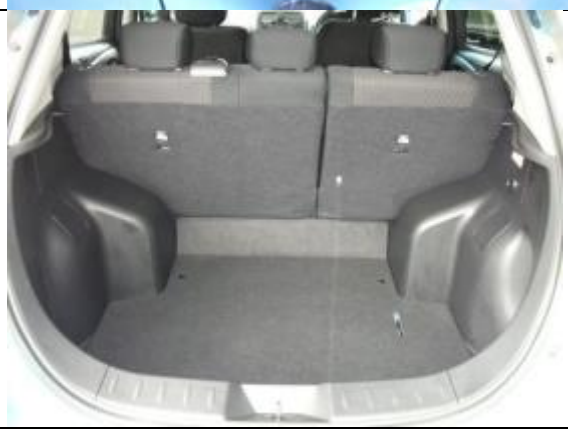
American Leaf

For Leafs in the Americas, check out http://insideevs.com/used-nissan-leaf-buying-guide/

Leaf generations (1 & 2)

There are currently 2 generations of Nissan Leaf. The Generation 1 Leaf came out in 2011. All 2011 Leafs are Generation 1 and many 2012 Leafs are Generation 1. Late 2012 Leafs first (approx. Nov 2012 onwards) are Generation 2 and would be sold as 2013 models, but if they were first registered in Japan in late 2012, they will be labeled as 2012 in NZ. All New Zealand new Leafs are Generation 1 (even the 2014 ones).

You can tell generations apart from photos of the engine bay and boot. The engine bay in the Generation 1 has a smaller charger cover and the boot has a higher wall beneath the rear seats.

Generation 1	Generation 2
	
	

Ex-Japanese models

Unsurprisingly, most used Leaf imports in NZ are from Japan.

The following applies to ALL ex-Japanese Leafs:

- Navigation unit and instrument cluster are in Japanese and cannot be changed, flashed, or hacked into English. However, the stereo in the Generation 2 S model can be removed and replaced with an English double din aftermarket unit. The only exception is that the navigation unit in the X and G models can be replaced from a wrecked Leaf (from the US, UK or Australia), but this is expensive. The instrument cluster menu remains in Japanese. Autolink cars performs this 'upgrade' and that's why their prices are approx. $3000 more than others.
- The important controls including climate control, radio, and physical buttons are in English. There are only 3 physical buttons with Japanese characters (Map, Settings and Info), so you can learn them easily. After you have set your initial settings (e.g. charge timer, Bluetooth connection), you will not be hindered by the Japanese menus for day to day driving.
- Most have 3.6 kW on-board chargers (6.6 kW is common on UK models and I've heard of one ex-Japanese Leaf with 6.6 kW).

Ex-UK models

These are rare and command a higher price. They are generally imported privately.

Ex-UK Leafs:

- Everything is in English.
- Some have a 6.6 kW on-board charger option that allows faster AC charging.
- The trims and features are similar to the ex-Japanese Leafs, but with different names. S = Visia, X = Acenta, G = Tekna.

New Zealand new models

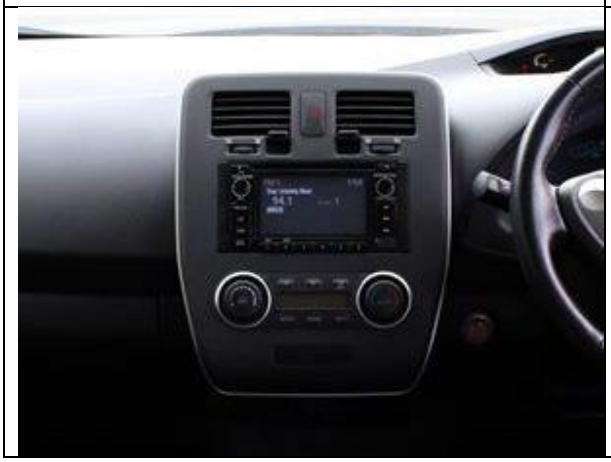
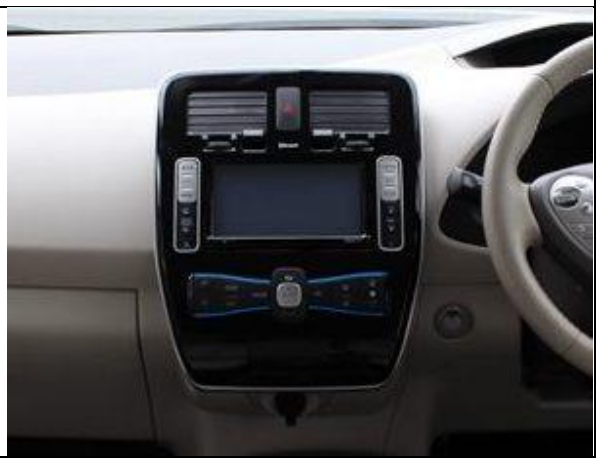
All are Generation 1 (even the 2014 models). They are mostly unsold stock from Australia, and none of them have NZ navigation, so their only advantage over a Japanese Generation 1 Leaf is the English instrument cluster and stereo.

Trim levels

Generation 1 Leafs have two trim levels: The X (lower end) and G (higher end). Both have a charge timer (to set start and stop times for charging off peak) and climate timer (to pre-heat or pre-cool the cabin while plugged in), Bluetooth connectivity, push button start, stability control, and 6 airbags. The G adds fog lights, auto headlights, reverse camera, and a solar panel spoiler to trickle charge the accessory battery (not the main traction battery).

Generation 2 introduced a third lower end trim level S, making X the mid-range. The main improvements of the Generation 2 Leaf are improved battery chemistry (much slower degradation), 80 kg weight reduction, more boot space, hill start assist, charge plug lock + light, insulated ceiling, dark trim option, and on X and G models: enhanced brake regeneration (B mode) and a more power-efficient heating system (heat pump instead of resistive).

You can easily tell the S trim by the large round manual climate control knobs instead of the digital climate controls of the X and G.

S trim	X and G trim
	

The only downgrade from Generation 1 is from an electronic parking brake to a foot-operated one. A good run down of changes are available at:

- http://www.nissan-global.com/EN/NEWS/2012/_STORY/121120-01-e.html
- http://www.evsrilanka.com/viewtopic.php?t=69

All have the same 24 kWh battery (except 2016+ models that have a larger 30 kWh option), performance, and vital features such as the charge and climate timers. Note the absence of a parcel tray in all but the G trim before 2016.

Table 1. Trim comparison for the 2012 - 2015 Generation 2 Leaf

	Trim		
	S / Visia	**X / Acenta**	**G / Tekna**
Charge timer	Y	Y	Y
Climate timer	Y	Y	Y
Heat pump	N	Y	Y
Heated seats/steering wheel	Y	Y	Y
Reverse camera	Option	Option	Y
B mode	N	Y	Y
Bluetooth audio & phone handsfree	Phone only	Y	Y
Cruise control	N	Option	Y
CHAdeMO fast charger	Option	Option	Y
LED low beam headlights	N	Option	Y
Fog lights	Option	Option	Y
16” Alloys	N	Option	N
17” Alloys	N	N	Y
Electric folding mirrors	Y (I think)	Y (I think)	Y
Auto headlight on/off	N	Option	Y
Parcel tray	N	N	Y
Spoiler solar panel	N	N	Y
Bose 7 speaker audio	N	N	Option
360 surround camera system	N	N	Option
Leather	N	Option	Option

Note: There is a paucity of information readily available in English about the 2016 and 2017 Japanese Leaf. I assume the trim levels are the same as UK models except for the 6.6 kW onboard charger option. You may find the occasional Leaf with a different combination of trim options.

Table 2. 2016 - 2017 Leaf trims (where different from pre-2016 models in Table 1)

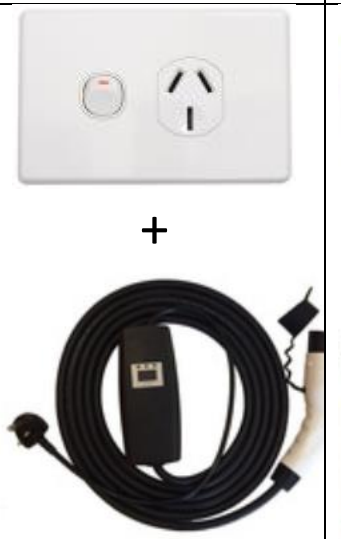
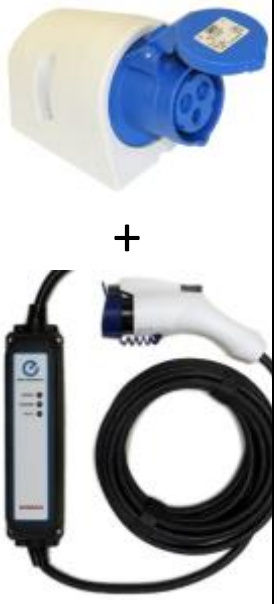
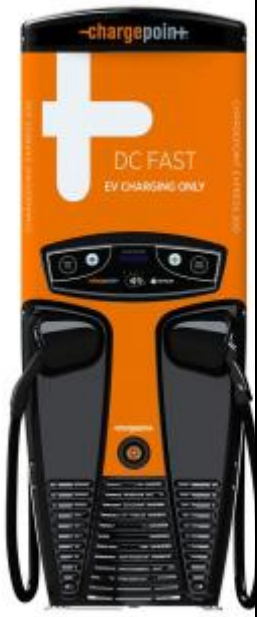
	S / Visia	X / Acenta	G / Tekna
CHAdeMO fast charger	Y	Y	Y
Parcel tray	Y	Y	Y
Fog lights	Y	Y	Y
Auto wipers	N	Y	Y
Reverse camera	N	Y	Y
Cruise control	N	Y	Y
Electric folding mirrors	N	Y	Y
Auto headlight on/off	N	Y	Y
Heated seats/steering wheel	N	N	Y
Leather interior	N	N	Y
Bose 7 speaker audio	N	N	Y
360 surround camera system	N	N	Y
30 kWh battery (24 kWh is standard)	Option	Option	Option
Tinted rear windows	N	Y	Y
Spoiler solar panel	N	Option	Option
6.6 kW onboard charger	Option	Option	Option

Charging

Charging terminology can be overwhelming, so don't get lost in the detail. Your Leaf will come with a Level 2 charger (Level 1 is USA only where they have very low voltage and therefore slow home charging) that either plugs into a standard wall outlet (6 to 10 amps) or a larger caravan plug outlet (15 amps). Using a standard wall outlet, you will be able to fully recharge overnight. A caravan plug outlet can be installed in your home by an electrician for <$500 and will allow a near doubling in charge speed. Charging slows down once the battery is 80% charged, so while it may take 10 hours to charge from empty to 100%, you'll probably never do this, and will usually be good to go again in 2-4 hours.

Note that technically the 'charger' is actually an EVSE (electric vehicle supply equipment) as the actual charger is built into the car. A portable EVSE is plugged either into a standard wall socket or caravan plug. An original Nissan EVSE (15A) from Japan needs modification for use in NZ, either by replacing the Japanese plug with a caravan plug, or by faulting it into a lower amperage (both should be done by an electrician). Replacing the Japanese plug directly with a standard NZ plug will cause overheating and melting of your socket.

Table 3. Charging options

Standard socket + variable amperage portable EVSE	Caravan plug + modified Nissan portable EVSE (15A)	Hardwired EVSE (32A)	DC fast charger
			
Allows charging at 1.4 to 2.4 kW. Max charge time approx. 14 hours.	Allows charging at 3.6 kW. **This is the fastest home charger available for an ex-Japan Leaf**. ~6-8 hours charge time.	Allows charging at > 3.7 kW, only useful for ex-UK Leafs with a 6.6 kW onboard charger. ~4 hours charge time.	Public chargers. Find on PlugShare. ~30 minutes charge time.

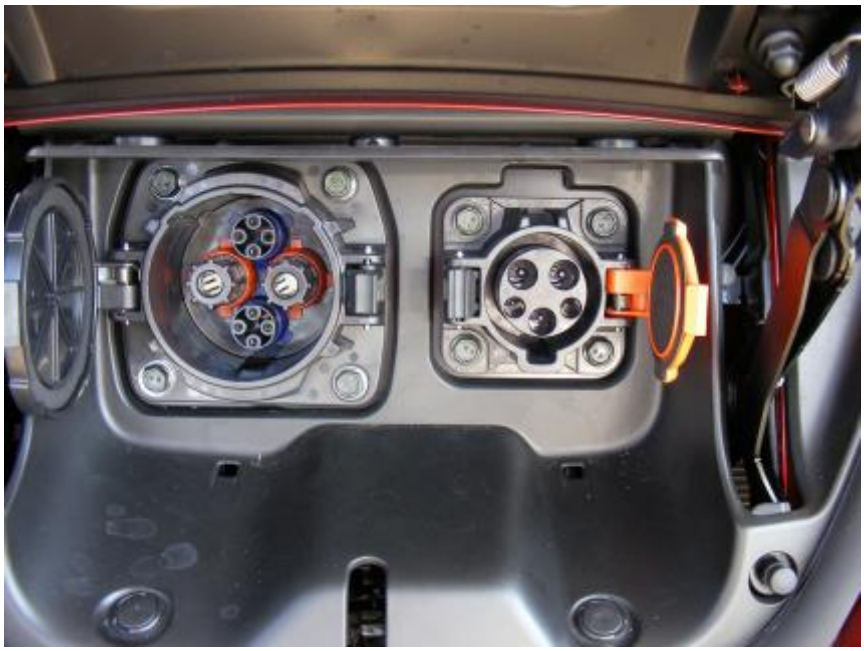


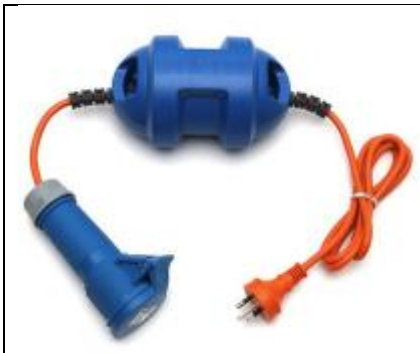
Figure 1. CHAdeMO port on left, standard J1772 port on right

If you get a Leaf with a CHAdeMO (Figure 1) DC fast charging option (most have it, but check before you buy), you can take advantage of DC fast charging. You won't be able to do this from home (the unit and plug cost $40,000 and require a serious power supply), but at public locations (see PlugShare) you will be able to charge from empty to 80% in approx. 30 minutes. Practically, you can usually stop for 5 minutes and get enough juice to get home!

Table 4. Charge time by amperage (from 0 to 100%)

Socket	Amps	kW	Max charge time
Standard NZ	5	1.2	12 h
Standard NZ	6	1.44	11 h
Standard NZ	10	2.4	6 h
Caravan	15	3.6	4 h
Hardwired EVSE	30	6.6	2 h
DC Fast Charger	50	Up to 62.5	30 min

But what is this?



The Mini-Blu allows you to plug your portable EVSE, with a caravan plug, into a standard socket. <u>But only if your EVSE allows you reduce the amperage</u> to 10A or lower. Simply plugging in a standard 15A Nissan EVSE into this will trip the built in over-current protection to stop a fire. This is most useful for allowing you to travel with a portable EVSE, so you can plug into caravan sockets where available, and standard sockets everywhere else.

Special features

Charging timer

All Leafs allow you to set a charge timer to take advantage of off peak power rates. If you set an end time only, your Leaf will automatically start charging in time to be good to go by the specified time. If you set a start time, it will start charging at that time and stop (if not already charged) by the end time. 2012 and 2013 Generation 2 Leafs (and UK Leafs until 2016) allow you charge either to 80% or 100%, but this feature was discontinued in later models so they will always charge to 100%. If you don't set a timer at all, the Leaf will start charging as soon as it is plugged in. If a timer is set, you can bypass the timer at anytime by pressing a dedicated button on the dash.

Climate timer

X and G trims can be configured to warm the cabin while plugged in before you get in. This saves you trading range for heat on cold mornings.

Both charging and climate timers can be set to only operate on certain days of the week an you can set two different configurations for each timer (e.g. a later timer could be set for weekends).

Bluetooth

All models have Bluetooth, so you can divert phone calls through the car audio system. The X and G trim can also connect audio from your phone, so your music or podcast will automatically pause when you turn off the car or stereo, and automatically resume when you turn the car/stereo back on.

Ownership costs

From July 2017, the ACC component of annual registration will be reduced from $86.50 to just $18!

Depending on your electricity price, a Leaf is roughly 3 to 5 times cheaper to run per kilometre than a comparable petrol or diesel car. You should expect approx. 7.5 km/kWh, so you can calculate your expected cost/km compared to your existing car.

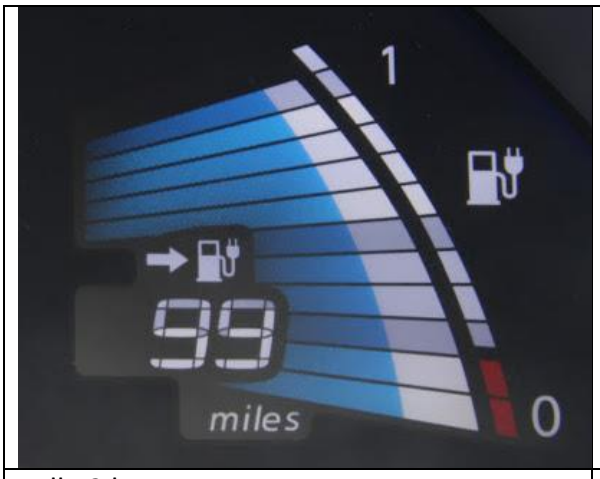
There is no annual maintenance required, no oil changes, spark plugs, or cam belts. You will need to change tires occasionally, and brakes ever so often. But the brake pads will generally last much longer because the regenerative braking reducing the use of the brake pads.

Personally, I went from a Subaru Forester costing $11/day for a 68 km commute + $1600 annually in maintenance for a $1.50/day commute with no annual maintenance. My Leaf could pay for itself in 10 years!

Battery health

All batteries degrade, but the odd one degrades faster than the rest. Generally EV batteries have been lasting a lot longer than the manufacturers lead us to believe. Less than 0.1% of Leaf batteries have needed replacing and none have needed replacing in NZ to date.

At a minimum, you should check battery bars on the dashboard display. On the far right of the battery state of charge meter is a row of 12 bars with the numeral 1 at the top and the numeral 0 at the bottom. The lowest two bars will be red.

	
Full 12 bars	Only 11 bars

Generation 2 Leafs should have 12 bars. Generation 1 Leafs may only have 10 or 11. It would perhaps be wise to avoid a Leaf with fewer bars, unless you can get a great discount and don't require as much range.

LeafSpy

LeafSpy is an app available on iOS, Android and Kindle that can be used in conjunction with a wireless OBD2 adapter. It can be used to check the battery health, set the auto door locking behavior, log battery use, and reset some warnings.

LeafSpy exposes a bunch of battery metrics, but does not provide interpretation. The more you read online, the more confusing it can become. There is a lot of debate on what certain metrics mean, so you have to decide for yourself. What also makes things difficult is that the numbers such as State of Health and voltage difference can change drastically depending on how discharged the battery is.

I personally believe it is fine to purchase a Leaf without using LeafSpy, but others swear by it. To be thorough, you need to fully charge the Leaf, then drive it down to empty with LeafSpy running. This usually isn't practical for a car you don't own yet!

The most official definitions of the LeafSpy metrics are available at
http://www.electricvehiclewiki.com/Leaf_Spy_Pro

 	You can purchase an Android and iOS compatible OBD2 adaptor on Amazon or eBay. Search for “LELink Bluetooth OBD2” or “WIFI Wireless ELM327 OBD2” and make sure it is V1.5 (not a higher number). Check in the question and answers section on Amazon to be sure that it works with LeafSpy.

LeafSpy Metrics

- GID: Non-percentage metric of battery capacity remaining. The higher this number when fully charged, the larger the usable capacity of the battery.
- State of Charge (SOC): Charge percentage of full (not important for gauging battery health).
- State of Health (SOH): A magical number reported by the Leaf onboard computer. Some people say this number should be higher than 90%, though it changes when different states of charge. A Leaf with 12 bars, will have a SOH of at least 85%. The bottom line, is that you don’t need LeafSpy to know the SOH is acceptable.
- Hx: Another magical number that is inversely related to the battery internal resistance. It is sometimes higher than 100%. The lower it goes, the more internal resistance (a marker of battery degradation). Like the other numbers, don’t put too much weight on this, but feel free to use it to try to bargain down the price.
- Voltage difference (shown at the bottom of the battery cells histogram): As the charge is depleted, the cells voltages become more unbalanced and the voltage difference goes up. A massive voltage difference >100 to 1000 mV might suggest a bad cell. However, the Leaf can balance the cells when left plugged in, so this difference may improve if the Leaf has been sitting unused for a long time, or is usually only fast charged. Again, I wouldn’t worry too much about this number. I’d be very happy if it is <100 mV, and would maybe keep looking if a single cell’s voltage was very low. It’s hard to say if this would have a real world impact on your range though.

Range

The main determinant of range applicable to NZ are:

- Battery state of charge (charge percentage)
- Battery capacity
- Wind and road resistance
- Hills
- Driving style

Obviously the larger the battery (30 kWh vs 24 kWh), the more potential range. If you start with 100% charge, you will have more range than if you start with 80%. If you accelerate smoothly and decelerate over a long distance to maximise regenerative braking, you will achieve more range than accelerating aggressively and braking a lot.

Driving up hills uses the most power, so you go up and down a lot of hills, expect your range to be less than that of a flat highway commuter. Also rough/grippy rural roads have provide more rolling resistance than smooth roads, reducing range. Wind resistance increases with speed, so the Leaf's efficiency peaks between roughly 30 kph and 80 kph. Heavy traffic is a Leaf's best friend – I use about 30% less capacity crawling at 30 kph in rush hour compared to the same distance at 100 kph. Heavy oncoming wind will reduce range, while a tailwind, or drafting behind a leading vehicle will increase range.

A Gen 1 Leaf should easily get at least 90 km on a full charge and any Gen 2 should get at least 100 km. You should expect more, but these minimums should be kept in mind for your usual use if you are unable to test out your commute before buying.

Pre-purchase checks

The Leaf has a simple trim line up, is mechanically simple (few parts), and usually owned by meticulous EV enthusiasts. This means you are unlikely to encounter a lemon. The few specific checks for a Leaf before purchasing are:

- 12 bars of battery life available (see Battery health).
- Professionally modified EVSE (charging cable) for NZ use.
- Navigation unit does not say "SD card missing" – this are notoriously difficult to replace and the stereo and Bluetooth are unusable without it. Apparently this only applies to ex-Japan models.
- You have enough charge to get home or to the nearest charger.

That's it! No cam belt, no oil, no spark plugs.

Please send any feedback/corrections on this guide to samholford@gmail.com