

Dave Roper's Nissan LEAF (LEAF Roper)

<http://www.roperld.com/science/ElectricCarsMusings.pdf>



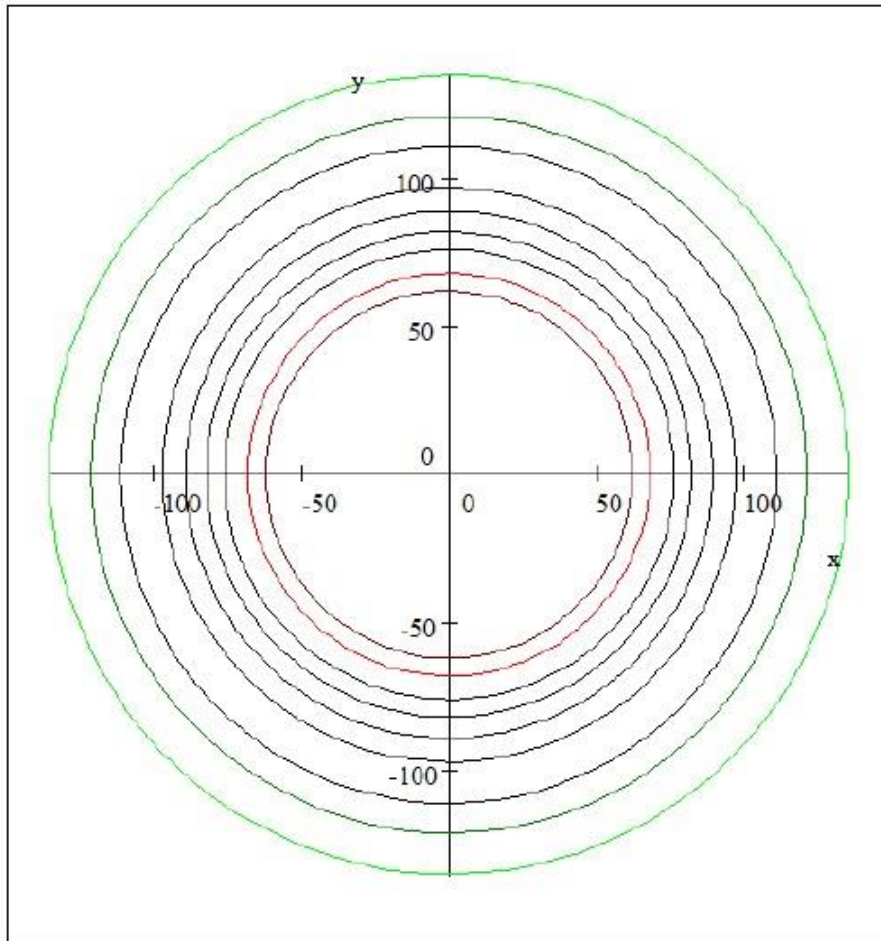
<http://www.roperld.com/Science/NissanLeaf.htm>

2013 LEAF Roper: <http://www.roperld.com/Science/LEAFRoper2013.htm>

Introduction

The Nissan LEAF is a **regional car**. That is, it is designed for travel within a radius of ~100 miles depending on the terrain, the driver's driving style, the time spent at a destination and the existence of a charging station at or on the way to a destination.

Here is a diagram showing the LEAF driving range on flat ground for constant speeds, moderate atmospheric temperatures (no climate control) and daytime driving (headlights off):



Nissan LEAF Range Circles (35-75 mph in units of 5 mph)

The graph shows that, at a constant speed 75 mph, the flat-ground range is ~ 60 miles and, at a constant speed of 35 mph, the flat-ground range is ~135 miles.

Of course, if one drives to the limit of the range, a full [charge](#) would have to be done in order to get back home.

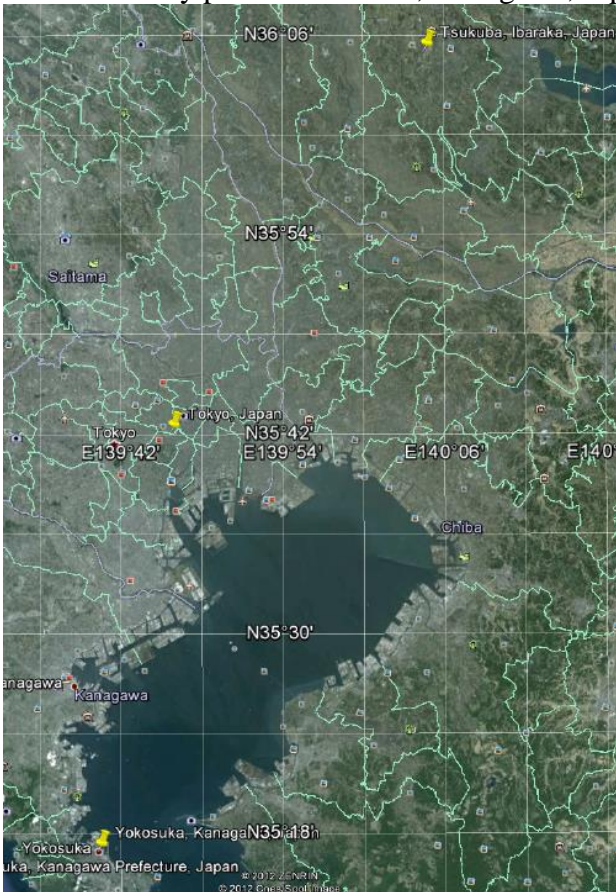
In Blacksburg Virginia, where LEAF Roper lives, for trips outside the region one can join the U-Haul Carshare group (<https://www.ucarshare.com>) and thereby have access to several gasoline or hybrid cars parked at various places in Blacksburg. Also, an electric car could be parked at the Corporate Research Center where the occupants could take the Smartway bus (<http://www.smartwaybus.com>) to Roanoke or parked at the Falling Branch parking lot in Christiansburg and where the occupants could take the Megabus to Washington DC or Knoxville TN (<http://us.megabus.com>).

Some web pages about the Nissan LEAF and LEAF Roper:

<http://www.roperld.com/science/NissanLEAF.htm>
<http://www.roperld.com/science/LEAFRoperDrive.pdf>
<http://www.roperld.com/science/NissanLEAFRangeCalculation.pdf>
<http://www.roperld.com/science/LEAFRoperTrips.pdf>

LEAF Roper

- According to <https://www.nissanusa.com/owners/vehicles#13167> LEAF Roper is #13167 in the USA. The VIN number shows 19,536, which must be LEAF Roper's world number.
- Final assembly point: Yokosuka, Kanagawa, Japan:



I also show Tokyo and Tsukuba, Ibaraki, Japan northeast of Tokyo where I lived and did research at the KEK High Energy Physics Laboratory for 10 months in 1980.

We use LEAF Roper as our major car. My wife drives our 2006 Highlander Hybrid (<http://www.roperld.com/science/hihyplugin.htm>) and we drive it on long trips.

Previous Roper Electric and Plug-in Hybrid Cars

The author purchased a Toyota Prius in 2005 and converted it to a Hymotion plug-in in 2008 (<http://www.roperld.com/Science/Prius/priushymotionconversion.htm>). It was sold to my granddaughter, Tassia Araujo-Roper, in May 2012 when I leased LEAF Roper.

In 2007 the author purchased a ZAP PK electric pickup and drove it for 3 years (<http://www.roperld.com/science/ZAPXebraPKRoper.htm>). It was transferred to an owner in Pensacola FL in June 2010.

Ordering Nissan LEAF

On 3 February 2012 I ordered the cayenne-red SL model Nissan LEAF (<http://www.roperld.com/science/NissanLEAF.htm>) to lease for 36 months, to be delivered in about 90 days. This is the first time I have leased a car; I am leasing it because I expect electric-car technology to be much advanced in 3 years. I chose 36 months instead of 39 months because the free Carwings subscription is for only 36 months. As of 1 April the delivery date is 2 May +/- 7 days.





More red-cayenne LEAF pictures: <http://www.getaround.com/Forrest>

[Cayenne-red LEAF walkaround](#)

<http://www.nissanusa.com/ev/media/pdf/specs/FeaturesAndSpecs.pdf>



Battery

The battery holds 24 kWh of useable energy and delivers up to 90 kW of power to the 80-kW synchronous motor. It is warranted for 8 years and 100,000 miles. (Since I am leasing the car, I do not need to worry about the battery warranty.) I will have a level-2 240-volts 30-amps-maximum charger in our garage, which will charge a fully-depleted battery in 7 hours (overnight easily; however, I will have it plugged into the charger whenever it is in the garage).

Cutout showing the battery under the two seats and the back floorboard:



Cutout showing the 48 battery modules of 4 cells each inside the case:



The modules are stacked vertically in the rear and horizontally in the middle and the front.

Nissan has a battery test for the LEAF. New River Nissan did a battery test on LEAF Roper on 14 June 2012 to have a baseline for future comparisons with the following results:

Item	Cause of gradual loss of capacity	Recommendations	Your Score
Charging	Frequent use of Quick charging	Your score is very high and good for your battery.	5 stars
Charging	Frequent charging when battery state of charge is already high	Your score is very high and good for your battery.	5 stars
Driving	Too much electric consumption while driving	Your score is very high and good for your battery.	5 stars
Storage	Long term parking with high state of charge	Your score is very high and good for your battery.	5 stars

Charging the Battery

List of Charging Stations Available for Installation:

<http://www.roperld.com/science/ChargingStationsElectricVehicles.pdf>

Charging Options

The on-board charger is 3.3 kW for the 2011 and 2012 LEAF models.



1. Level-1: 120-V 12-A maximum: 20 hours (right port)
2. Level-2: 240-V 30-A maximum: 8 hours (right port)
3. Level-3: 480-V DC 125-A maximum: 30 min. @ 80% charge (left port)

The 2013 model will probably have a 6.6-kW charger, which can halve the charging times for level-1 and level-2 charging, if sufficient current is allowed by the charging station. (The 2012 Ford Focus EV, <http://www.roperld.com/Science/FordFocusElectric.htm> , has a 6.6-kW charger.)

Most of the time I set the timer to charge the battery to 80% (17 kWh) early in the morning when power plants are not busy. If the charge level is >70% at the end of a day I do not charge that night for normal days. When the charge level at midday is <50% I charge for a few hours during

the day in case I need to make some trips in the afternoon. When I know that a long trip is planned for the next day I set the timer to charge to 100% (21 kWh) early in the morning. I plan to have ~20% left at the end of a long trip in case of travel changes during the trip.

A level-1/120-volts charge adds ~1.15 kWh/hour (~5.5%) and a level-2/240-volts charge adds ~3.5 kWh/hour (16.7%).

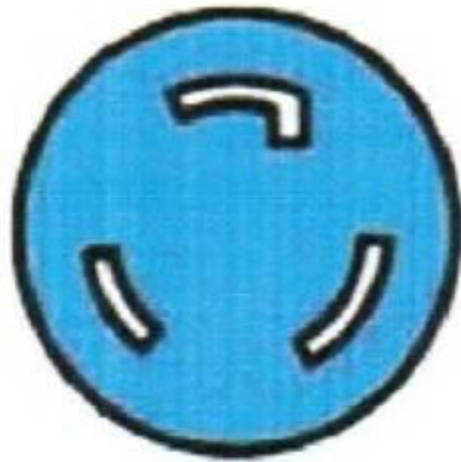
Level-1 charging cord that comes with the LEAF



This is the level-1 "trickle charging" cable that comes with the LEAF. It is called the Electric-Vehicle-Supply-Equipment (EVSE) cable. There is a hole in the release handle in which a small pad lock with 3/16" shank can be inserted to prevent the release button from being pushed in to unplug it from the car. There is a way to secure it under the hood by using another extension cord: <http://www.mynissanleaf.com/viewtopic.php?f=38&t=7587>

There is an aftermarket modification to it that allows it to plug into a normal U.S. 240-volts plug to use as a level-2 charger (<http://evseupgrade.com/styled/>).

Here is what the 240-volts outlet looks like:



NEMA L6-20R Outlet

Level-2 240-volts Charging

I informed Nissan that I wanted to get my own level-2 charger, as I want one that shows kWh put into the battery. The one Nissan sells (http://evsolutions.avinc.com/products/at_home/charging_at_home_a) does not have a kWh meter nor a charging-time meter. However, one can look at the SOC bars shown in the car dash before and after charging to tell how many kWh have been put into the battery; each of the 12 bars represents ~2 kWh.

Here on the left is the one Nissan sells (http://evsolutions.avinc.com/products/at_home/charging_at_home_a):



The one on the right is the one I bought from Home Depot (http://www.homedepot.com/h_d1/N-5yc1v/R-202963679/h_d2/ProductDisplay?catalogId=10053&langId=-1&keyword=charging%20station&storeId=10051)

SOC Meter

There is an aftermarket display that, when attached to the OBD2 plug under the dash, reads out the State-Of-Charge (SOC) (<http://www.wwwsite.com/puzzles/socmeter/>):



Red button changes modes. Black button changes values for a mode.

1. Mode 1: Value 1: SOC as % of 281 raw. Value 2: Raw CAN-bus data.
2. Mode 2: Value 1: Output amperes (-99 to +200). Value 2: Volts (~350 to 400). Value 3: Output kW (~C99.9 for charging, P99.9 for output)

Toggle switches: Top one is for the device to be **always on when up and only on when the car is running when down**. Bottom one is to switch between data buses; currently **only switch down bus is being used**.

I mount it on the ledge just behind the top of the center console.

I find this device to be a great help when taking long trips on which the battery is near depletion at the end; it is a more reliable indicator than the “miles to go” LEAF indicator of what speed should be driven to get to the destination. Combining its reading with the navigation’s “distance to go” and the LEAF’s “miles to go” help get there without running out of charge. Every LEAF driver should have it!

Another similar device, LEAFSCAN, that gives 2 more decimal places for the battery percentage is being developed

(<http://www.mynissanleaf.com/viewtopic.php?f=37&t=8251>):



Another similar device, WattsLeft

(<http://www.mynissanleaf.com/viewtopic.php?f=44&t=8527&start=70>), has 15 different screens
(<http://www.mynissanleaf.com/viewtopic.php?f=44&t=8527&start=80>):



I bought it to replace the older SOC meter.

Driving Range

Driving Range (<http://www.mynissanleaf.com/viewtopic.php?f=31&t=4295>)

Nissan LEAF Range Chart for 24kWh Battery

English

Level Road, No Heating or Air Conditioning, Battery Temp 70F/20C, Windows Closed



35 exactly	40 exactly	45 exactly	50 exactly	55 exactly	60 exactly	65 exactly	70 exactly	75 exactly	Speed MPH
- or -	- or -	- or -	- or -	- or -	- or -	- or -	- or -	- or -	Miles/kWh
6.3	5.9	5.2	4.6	4.3	3.9	3.6	3.3	3.0	kWh
5.56	6.78	8.65	10.87	12.79	15.38	18.06	21.21	25.00	

Battery Gids	Fuel Bar	9/bar	8.5/bar	8/bar	7/bar	6.5/bar	6/bar	5.5/bar	5/bar	4.5/bar	Fuel Bar
282	100.0%	132	121	111	97	89	82	75	68	62	12
257	91.5%	125	114	105	92	85	78	71	65	59	11
232	84.0%	116	105	97	85	78	72	65	60	54	10
219	77.9%	107	97	89	78	72	66	60	55	50	9
199	70.8%	98	88	81	71	65	60	54	50	45	8
186	66.2%	89	80	73	64	59	54	49	45	41	7
173	58.0%	80	71	65	57	52	48	43	40	36	6
147	50.9%	71	63	57	50	46	42	38	35	32	5
122	43.4%	62	54	49	43	39	36	32	30	27	4
102	36.3%	53	46	41	36	33	30	27	25	23	3
88	31.3%	44	37	33	29	26	24	21	20	18	2
73	26.0%	32	27	23	19	17	15	13	12	11	1
49	17.4%	*1*	24	20	17	14	13	12	11	10	Low Battery
25	8.9%	8	7	6	5	5	4	4	3	3	Very Low
4	1.4%	8	7	6	5	5	4	4	3	3	Very Low

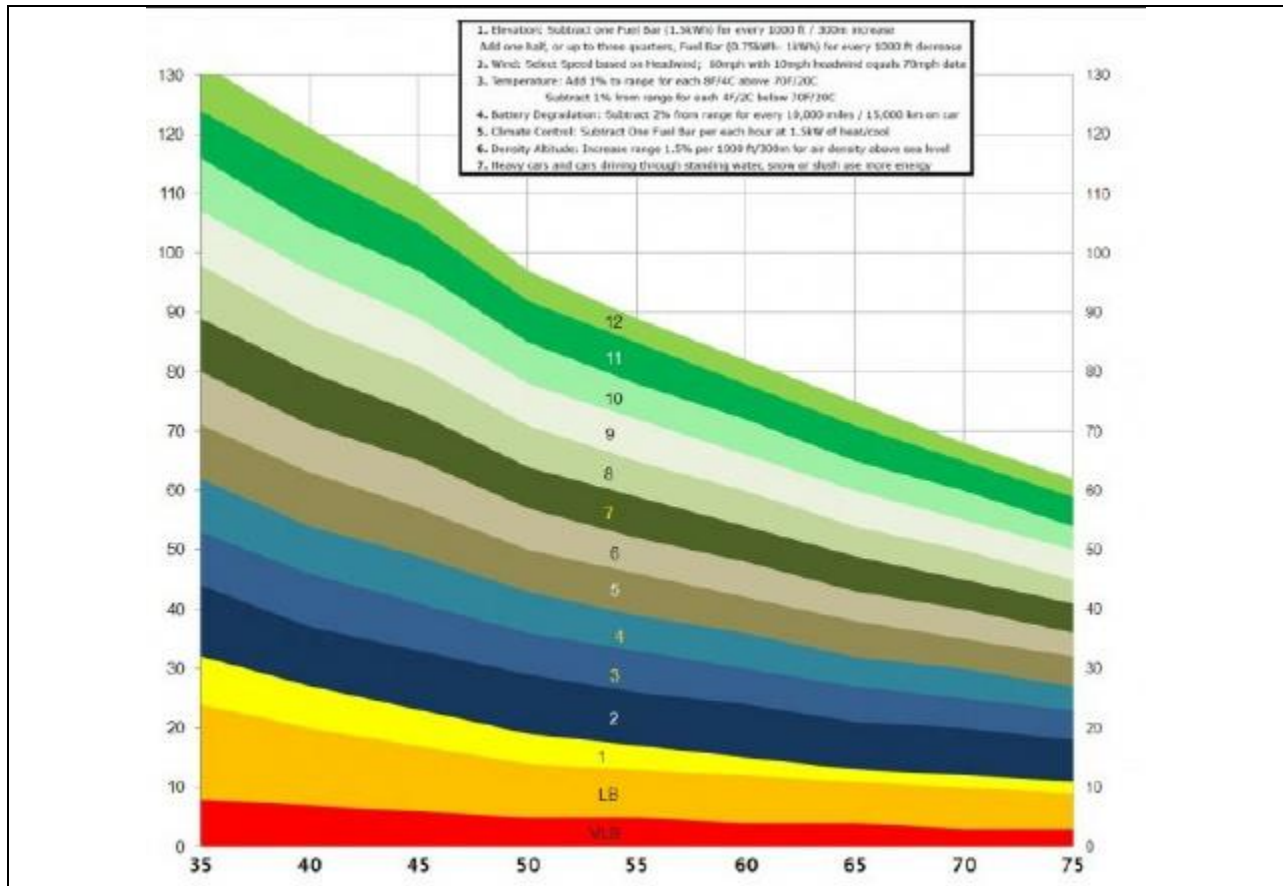
Turtle **Get Safely Off Road Now! Less than One Half Mile at 25 mph Max** **Turtle**

mph	35	40	45	50	55	60	65	70	75
Miles/kWh	6.3	5.9	5.2	4.6	4.3	3.9	3.6	3.3	3.0

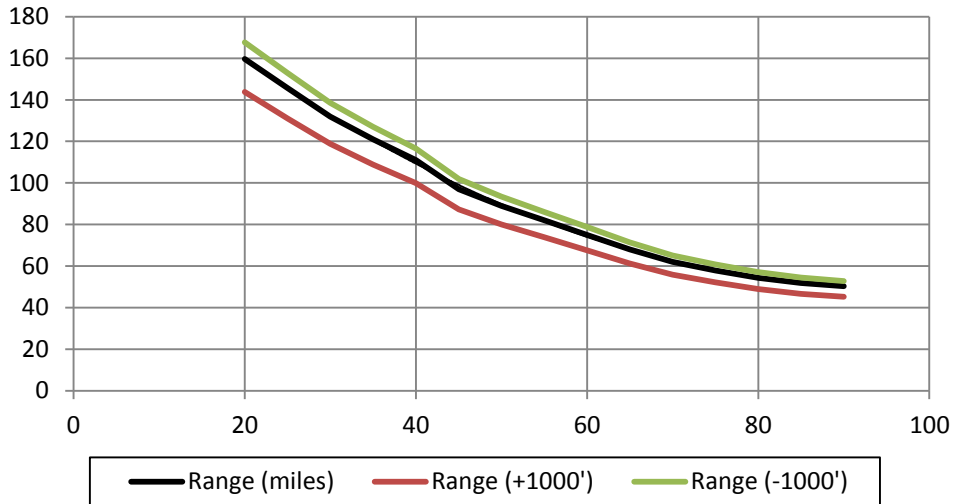
Fuel Bar 1 will remain illuminated with Low Battery Warning; switch to Low Battery range data
 Range below Fuel Bar 1 can be significantly reduced with any battery cell imbalances
 This chart's range data is not associated with the LEAF's dash or center console range data
 Data based on 21kWh usable battery capacity factor. **MAXIMUM RANGE at 12mph exactly** (not average speed)
 Add **One mile** of range @ 60mph (or 3.9m/kWh) for every **12 minute** charge at **120 volt** charge w/3.3kW charger
 Add **One mile** of range @ 60mph (or 3.9m/kWh) for every **5 minutes** of charge at **240 volt/16amp** w/3.3kW charger
 For Urban Stop-Go driving, select data from column that matches estimated miles/kWh column, NOT speed

1. Elevation Increase: Subtract One Fuel Bar for every 1000 ft/300m
2. Elevation decrease: Add One Fuel Bar for every 2000 ft/600m
3. Wind: Select Speed based on Headwind; 60mph with 10mph headwind equals 70mph data
4. Temperature Increase: Add 1% to range for each 4F/2C above 70F/20C
5. Temperature Decrease: Subtract 1% from range for each 2F/1C below 70F/20C
6. Battery Degradation: Subtract 2% from range for every 10,000 miles / 15,000 km on car
7. Climate Control: Subtract One (Two) Fuel Bar(s) per each hour at 1.5kW (3.0kW) of heat/cool
8. Density Altitude: Increase range 1.5% per 1000 ft/300m for air density above sea level
9. Loading: Heavy cars use more energy than light ones; plan accordingly

DISCLAIMER:
 YOUR RANGE MAY VARY
 USE AT YOUR OWN RISK
 English
 Ver 7d



Nissan Leaf Range (miles) vs Speed (mph)



Answer to a query about what it costs to fill a LEAF with electricity:

Our last electric bill calculated out at \$0.0943/kWh, but will increase soon. The battery holds ~24 kWh; the cost to fill it now is ~\$2.26! The average distance the LEAF travels on a fill is ~73 miles, which depends on the terrain and how one drives. So, the cost per mile is \$0.0310. My plug-in Prius gets about

52 miles/gallon in winter. Current gasoline price is ~\$3.50/gallon. So, my Prius cost ~\$0.0673/mile. Double that for the typical car @ 25 miles/gallon. Typically electric cars cost about 1/4th as much for fuel as do gasoline cars. The reason is that electric motors are ~95% efficient and gasoline engines are ~25% efficient, because they are creating much heat and emissions. If gasoline cost included the eventual cost of its pollution and global warming, it would be much higher per gallon. Even if the electricity all came from burning coal (here in SW Virginia it is ~85% from coal), electric cars would be responsible for less carbon emission than gasoline cars. If electricity were obtained from renewable sources, there would be much smaller eventual costs for pollution and global warming.

Battery Capacity Bars

http://www.electricvehiclewiki.com/Battery#Battery_Capacity_Behavior :

The twelve smaller segments at far right of the battery gauge represents the battery's current maximum capacity. As the battery's capacity degrades, these bars disappear one by one. This table shows the approximate battery capacity represented by each bar ^[6]:

Segments	Retained capacity (%)	—	Note
12	85 or more	T12	—
11	85	T11	Value at which segment 12 turns OFF
10	78.75	T10	Value at which segment 11 turns OFF
9	72.5	T9	Value at which segment 10 turns OFF
8	66.25	T8	Value at which segment 9 turns OFF
7	60	T7	Value at which segment 8 turns OFF
6	53.75	T6	Value at which segment 7 turns OFF
5	47.5	T5	Value at which segment 6 turns OFF
4	41.25	T4	Value at which segment 5 turns OFF
3	35	T3	Value at which segment 4 turns OFF
2	28.75	T2	Value at which segment 3 turns OFF
1	22.5	T1	Value at which segment 2 turns OFF
0	16.25	T0	Value at which segment 1 turns OFF

Trunk Items

Folding electric-assisted bicycle

Folding electric-assisted IZIP EzGo bicycle to carry in the LEAF for use when it is charging, so that I can do things while there:



I will carry it when I drive to far places that have charging stations only at Nissan Dealers, which are often at the edge of the town.

The current version of this bicycle is called the IZIP Via Mezza (<http://www.currietechnologies.com/currie-technologies-izip-via-mezza-electric-bike.php>).

Bosch Lithium-Ion-Battery lawn mower



http://www.amazon.co.uk/Bosch-Ergoflex-Cordless-Rotary-Lawnmower/dp/B004GTMNZQ/ref=dp_ob_title_hi

Timeline

1. 1 February 2012: Ordered cayenne-red Nissan LEAF to lease.
2. Bought the Schneider level-2 charger from Home Depot (http://www.homedepot.com/h_d1/N-5yc1v/R-202963679/h_d2/ProductDisplay?catalogId=10053&langId=-1&keyword=charging%20station&storeId=10051).
3. Bought the SOC meter from Gary Giddings (<http://www.wwwsite.com/puzzles/socmeter/>).
4. Bought the HeatShield windshield screen made for the LEAF (https://www.heatshieldstore.com/catalog/product_info.php?cPath=76&products_id=2038).
5. Bought a combination padlock with 3/16” shank for locking the EVSE to the car when charging with it.
6. Bought a motion-sensing LED light to magnetically attach to the inside of the charger cover to provide light at night (<http://www.sylvaniaonlinestore.com/p-122-led-motion-sensor-light.aspx>). (Be careful not to place it above the charging plug as it may accidentally cancel a charge.)
7. 9 March 2012: Bell Electric installed a Schneider level-2/240-volts charger (model EV2430WS) in our garage.
8. 2 April 2012: ordered a red Tomy Tomica model of the Nissan LEAF on eBay.
9. 15 April 2012: Ordered Lloyd Mats rubber floor mats from Amazon.com
10. 24 April 2012: Ordered car mount for Samsung Droid Charge smart phone from Amazon.com
11. 1 May 2012: Cayenne Red Nissan LEAF delivered to New River Nissan while I was on vacation.
12. 7 May 2012: LEAF Roper was delivered to me. Virginia license plate LECTRIC on drivesmartva.org background for the front and back.
13. 8 May 2012: Ordered 2 chrome ELECTRIC emblems to put on the sides of LEAF Roper (https://salsa.democracyinaction.org/o/2711/shop/item.jsp?storefront_KEY=553&t=&store_item_KEY=3660).
14. 19 May 2012: Showed LEAF Roper at the Car Fest in the K-Mart parking lot in Christiansburg VA.
15. 14 June 2012: New River Nissan did a battery test on LEAF Roper; it had the highest score in every category.
16. 6 July 2012: LEAF Roper issued its first “Low Battery Charge” warning at about 17% of charge.
17. 10 July 2012: Received EVSE Upgrade to 240-volts with 120-volts pigtail (<http://evseupgrade.com/styled/>).
18. 13 July 2012: Installed an NEMA L6-20R 240-volts outlet at 870 Catawba Rd so I can charge there when needed to climb the hill into Blacksburg.
19. 18 July 2012: Ordered sun-visor extender: http://www.amazon.com/Gray-Side-window-Visor-Extenders/dp/B002JR949K/ref=wl_it_dp_o_pC_nS_nC?ie=UTF8&coliid=I1JH47XJRZ8KNC&colid=11EEH6VRV6PRL). The LEAF visor is too short.
20. 11 October 2012: Got first damage; a car backed into the back bumper in the Christ-Church parking lot. Cost to remove and paint bumper was \$540.28 .

21. 8 February 2013: Installed an NEMA L6-20R 240-volts outlet at 1843 Oxford Avenue in Roanoke so I can charge there will visiting my daughter and grandson.
22. 28 February 2013: Had to top up air in a tire four times in the last month. Finally got it fixed; there was a nail in the tire.
23. 18 March 2013: Ordered WattsLeft (<http://www.mynissanleaf.com/viewtopic.php?f=44&t=8527&start=70>) to replace the GidMeter, since it shows more parameters.
24. 24 May 2013: Ordered Vgate ELM327 Bluetooth Scan Tool (https://www.amazon.com/gp/css/order-history/ref=ohs_order_orderid?ie=UTF8&hasWorkingJavascript=1&opt=ab&qid=&search=002-9799951-5632257&sr=)
25. 3 July 2013: Had software update (Reprogram lithium ion battery controller and on-board charge module) done at New River Nissan.
26. Jul 2014: Bought OBDII cable with side plug.
27. 4 August 2014: Battery died in key (#2025).
28. 13 August 2014: The resistance heater quit working. It took my dealer a while to find out the problem. They managed to get the needed part, the last one in the parts depot. They had to remove everything above the motor and gearbox to get to the heater. It was a new experience for them. It is covered by the warranty.
29. 15 August 2014: Three parts were replaced: PTC Heater Lin Communication, PTC Heater Connector and HVAC Lin Communication.
30. 5 September 2014: Top capacity bar started disappearing occasionally at slightly over 21,000 miles.
31. 30 September 2014: On the way to a hospital to get an MRI this morning some guy ran a red light in front of me as I was starting out on a green light and we collided. The steering-wheel air bag saved me from injury. The other driver was given a summons for not yielding. Here is what my LEAF looks like after the collision:



The repair cost was ~\$10,600 by Collision Plus.

32. 13 November 2014: I drove my Nissan LEAF to Roanoke to be the first electric car to charge at the new CHAdeMO fast charging station near Market Square. It costs \$3 by credit card to fully

charge an EV. It stops at 80% charge, but can be restarted to slowly finish charging by pressing the Start button again.

- 33. 3 March 2015: Turned in the 2012 LEAF SL two months early and leased a pearl-white 2015 LEAF SV for 2 years.
- 34. 4 March 2015: Ordered portable EVSE upgrade to 240-volts from EVSEUpgrade.com.
- 35. 8 March 2015: Ordered Weathertech CargoLiner and FloorLiners.
- 36. 9 March 2015: Used CHAdeMO charger on Market Street in Roanoke for ~20 minutes. Had ~30% charge left when back home.

Regional trips made in LEAF Roper: ([LEAFRoperTrips.pdf](#))



First day for LEAF Roper



Publicity

A charge for electric cars (Roanoke Times, 14 June 2012):

<http://www.roanoke.com/editorials/commentary/wb/310145>

Power backup for electric

car http://www.roperld.com/science/powerbackup_Electriccars.pdf

Charging Stations Available for Public Use

PlugShare

<http://www.plugshare.com/> This list is user updated.

Charging stations in southwest Virginia and southern West Virginia

<http://www.roperld.com/science/ChargingStationsSWVaSWv.pdf>

ChargePoint Network (<http://chargepoint.net/find-stations.php>)

- The nearest level-2/240-volts charger in the network in Virginia is at Charlottesville VA (Blue Moon, 222 W South St., guest use only) ~150 miles from Blacksburg VA. If there were a charging station in Lexington, one could make the trip using it and the one at the VMT in Roanoke.
- The nearest level-2/240-volts charger in the network in North Carolina is at Statesville NC (Energy United, 567 Mocksville Hwy, unrestricted access) ~128 miles from Blacksburg VA. I don't see the possibility of there being a charging station halfway between Blacksburg and Statesville.

Nissan LEAF trips in southwest Virginia and southern West Virginia

http://www.roperld.com/science/nissanleaftrips_CburgBburg.pdf

I call the LEAF a "regional" car, not a "local" car. "Local" means that one does not have to pay attention to range in ECO mode. "Regional" means one can go to a location and back with about 15% charge left or one needs to level-2 charge there for one or two hours or level-1 charge there for about 5 hours or overnight. For the LEAF in my area of southwest Virginia, "local" means Blacksburg, Christiansburg, Radford, Pulaski, Pearisburg, Floyd, Mountain Lake, Cascades State Park and Salem; whereas, "regional" means Blue Ridge Parkway, Fincastle, Daleville, Cloverdale, Wytheville, Roanoke and several state parks in VA & WV (e.g., Pipestem State Park in WV). "Local" covers about 80% of my driving and "regional" covers about 95% of my driving. We use my wife's 2006 Highlander Hybrid for the remainder; in a few years I hope to replace it with a (bio-)diesel hybrid.

2012 meeting of LEAF owners in southwest Virginia:

http://www.roperld.com/Science/NissanLEAF_SWVa.pdf

<http://www.roperld.com/Science/NissanLeaf.htm>

<http://www.roperld.com/science/LEAFRoper.pdf>

2015 Pearl-White LEAF SV (leased for 2 years on 3 March 2015)



I got the SV instead of the SL because the SL only has a black interior and I wanted a light interior (partially recycled light gray cloth). Unfortunately, the SV does not allow having both the "LED Headlights and Quick Charge Port Package: LED low-beam headlights, automatic on/off headlights, quick charge port and fog lights" and the "Premium Package: Around View Monitor and Bose Premium Audio System". I picked the first package because I wanted the LED lights and the quick charge port. I would have liked to have the Around View Monitor, but had to sacrifice it. The SV does not have the HomeLink garage door openers, which was not a big deal for me.

Here are features added for the 2015 LEAF compared to the 2012 LEAF (<http://sfbayleafs.org/commentary/2013/09/2013-vs-2011-nissan-leaf-whats-new-whats-gone-whats-changed/>):

- Range changed from 73 miles to 84 miles.
- Level-2 charger changed from 3.3-kW to 6.6-kW.
- Chargers moved from the trunk to under the hood, increasing trunk space.
- Motor slightly less torque; reduced dysprosium in magnets (<http://www.nissan-global.com/EN/NEWS/2012/STORY/121120-02-e.html>)
- Charger door can be opened by the smart key.
- Charger door can be locked by a button inside the car.
- Light inside charger door.
- B mode replaces ECO mode on shift knob; ECO button on right of steering wheel.

- Remembers last selection of D or ECO, but not B.
- Battery made more resistant to heat ("Lizard" battery).
- SOC meter on dash.
- Start-up screen does not require driver response.
- Sun visors larger and sturdier with extenders and cards holder on driver's side.
- LED low-beam headlights option.
- Brighter high beam headlights.
- Around View Monitor 4-camera option.
- Two clocks are synchronized.
- Separate heat button and heater is heat pump instead of resistance heater.
- Electric emergency brake replaced by foot mechanical brake.
- Aluminum doors replaced by steel doors.
- LED interior lights.
- Hill hold feature.

Timetable:

1. 3 March 2014: Leased for 2 years.
2. 8 March 2014: Put Electric letters on trunk.
3. ? March 2014: Got Weathertech.com FloorLiners and Cargo Liner (<http://www.weathertech.com/nissan/2015/leaf/>)

L. David Roper, <http://arts.bev.net/roperldavid/>, roperld@vt.edu , April 2012