NGC Fuel Cost Calculator 1.0 Methodology (United Kingdom)

Version 1.0 – August 2015

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1 Methodology overview

Fuel cost is calculated by multiplying a vehicle's fuel economy by fuel price and the distance driven. The calculator, which can be used for all vehicle types, provides two results – one based on official fuel economy data and the other representing real-world driving.

For light-duty vehicles that are powered by petrol, diesel or electricity, official performance data is sourced from the UK Vehicle Certification Agency (VCA) or manufacturers' websites. Real-world performance factors are ether estimated using established data sources (such as the ICCT) or modelled using available UK real road test data.

The calculation for vehicles powered solely by petrol, diesel or electricity is relatively straightforward as the official test data is widely published in the public domain, and real-world correction factors are well-known given the availability of large data sets generated by vehicles driven on real roads.

The data sourcing and calculation for plug-in hybrid electric vehicles is more complex, as they can be simultaneously powered by electricity and petrol or diesel. For the real-world estimate of fuel costs for PHEVs, the calculation assumes that the vehicle is driven for half the distance in EV-mode and half using a conventional fuel.

Key data sources: Vehicle Certification Agency [http://www.dft.gov.uk/vca/], International Council on Clean Transportation [http://www.theicct.org/].

2 Fuel cost methodology

A vehicle’s fuel cost is calculated by multiplying its fuel economy (using units of litres or kWh per 100 km) by fuel price (in pence per litre or kWh) and the distance driven (in kilometres). Inputs and results are shown in imperial units (miles-per-gallon, pence per mile and miles) using appropriate conversion factors.

The calculator, which can be used for all vehicle types (petrol, diesel and plug-in vehicles), provides two fuel cost results – one based on official fuel economy data and the other representing real-world driving.

For vehicles solely powered by petrol or diesel, fuel cost is calculated by multiplying the fuel economy (in litres per 100 km) by fuel price (in pence per litre) and the distance driven (in kilometres or miles). The official fuel cost is calculated using test-derived figures (‘official combined’) for fuel economy as published by the VCA and manufacturers. The real-world fuel cost is estimated using factors as published by the ICCT which quantify the increasing discrepancy between test and on-road data for petrol and diesel cars.

For vehicles powered solely by electricity, fuel cost is calculated by multiplying the fuel economy (in kWh per 100 km) by fuel price (in pence per kWh) and the distance driven (in kilometres or miles). The official fuel cost is calculated using test-derived figures for fuel economy as published by the VCA and manufacturers. The real-world fuel cost is estimated using a correction factor derived from comparing the official EV range with independent test

data (from a number of sources including EV Range Test data from Next Green Car). Where no real-world range estimates are available, a factor of 0.8 is used implying the real-world range is 80% of the official figure.

For plug-in hybrid vehicles powered by electricity and petrol or diesel, fuel cost *for both fuels* is calculated multiplying the fuel economy (in litres and kWh per 100 km) by fuel price (in pence per litre and kWh) and the distance driven (in kilometres or miles). The official fuel cost is calculated using test-derived figures ('weighted combined') for fuel economy as published by the VCA and manufacturers. The real-world fuel cost is estimated using the assumption that the vehicle is driven for half the distance in EV-mode ('Condition A') and half using a conventional fuel ('Condition B'); real-world correction factors are then applied for the electric and conventional fuel element of the calculation as already described.

Terminology used for describing fuel economy

'Official combined' – The so-called New European Drive Cycle is the current set of test cycles which are used to generate the official fuel economy figures. The NEDC test is conducted on a rolling-road (chassis dynamometer) and consists of two cycles: an urban cycle to represent driving in towns/cities; and an extra-urban cycle to represent highway/motorway driving. The results of the two cycles are combined to produce the overall official combined figure.

'Weighted combined' – For plug-in hybrid electric vehicles which use two fuels (electricity and petrol or diesel), the vehicle is tested in two fuel modes: first using primarily electric power starting with the battery fully charged (also known as 'Condition A'); and then with the battery fully depleted ('Condition B'). These figures are then weight-averaged using the battery range plus 16 miles to produce the official weighted combined figure.

A fuel cost calculator is also available on pages for specific models within Next Green Car, which uses figures for real-world fuel economy and/or electricity use as the starting values for fuel cost calculations. Users can enter alternative values for real MPG and/or kWh and mileage where these are known and differ from the starting values provided. For PHEVs, users can also select the proportion of the mileage driven on electric or petrol/diesel.

3 Worked examples

3.1 BMW 3 Series 316d SE – Diesel, 1496cc (2.0 litre)

Vehicle fuel economy and fuel price data

Description	Metric	Imperial
Official CO2 tailpipe emissions	109 g/km	
Official combined fuel economy	4.1 litres/100km	68.9 MPG
Real-world fuel economy (estimate)	5.7 litres/100km	49.6 MPG
Diesel price (typical UK average)	117.3 p/litre	
Distance travelled (1 mile=1.61km)	16,100 km	10,000 miles

Official fuel cost = (4.1 x 1.61 x 117.3 x 10,000) ÷ (100 x 100) = £770 or 7.7 p/mile

Real-world fuel cost = (5.7 x 1.61 x 117.3 x 10,000) ÷ (100 x 100) = £1,080 or 10.8 p/mile

Record published: http://www.nextgreencar.com/view-car/35425/bmw-3-series-saloon-316d-se-diesel-manual-6-speed/

3.2 Nissan LEAF Acenta – Battery Electric

Vehicle fuel economy and fuel price data

Description	Metric	Imperial
Official CO2 tailpipe emissions	0 g/km	
Official energy use	15.0 kWh/100km	168.5 MPG equivalent
Real-world energy use (estimate)	18.8 kWh/100km	134.4 MPG equivalent
Electricity price (typical UK average)	15.6 p/kWh	
Distance travelled (1 mile=1.61km)	16,100 km	10,000 miles

Official fuel cost = (15.0 x 1.61 x 15.6 x 10,000) ÷ (100 x 100) = £377 or 3.8 p/mile

Real-world fuel cost = (18.8 x 1.61 x 15.6 x 10,000) ÷ (100 x 100) = £472 or 4.7 p/mile

Record published: http://www.nextgreencar.com/view-car/49677/nissan-leaf-electric-car-acenta-80kw-auto-electric-(av-uk-mix)/

3.3 Mitsubishi Outlander 2.0 GX3h Auto PHEV – Plug-in Hybrid

Vehicle fuel economy and fuel price data

Description	Metric	Imperial
Official CO2 tailpipe emissions	44 g/km	
Official fuel economy (Condition A)	1.9 litres/100km	148.5 MPG
Official electricity use (Condition A)	13.6 kWh/100km	185.8 MPG equivalent
Real-world electricity use (Condition A) (est.)	17.3 kWh/100km	148.7 MPG equivalent
Official fuel economy (Condition B)	5.8 litres/100km	48.7 MPG
Real-world fuel economy (Condition B) (est.)	8.1 litres/100km	35.0 MPG
Petrol price (typical UK average)	116.9 p/litre	
Electricity price (typical UK average)	15.6 p/kWh	
Distance travelled (1 mile=1.61km)	16,100 km	10,000 miles

Official fuel cost = (1.9 x 1.61 x 116.9 x 10,000) + (13.6 x 1.61 x 15.6 x 10,000) ÷ (100 x 100) = £700 or 7.0 p/mile

Real-world fuel cost = 0.5 (8.1 x 1.61 x 116.9 x 10,000) + 0.5 (17.3 x 1.61 x 15.6 x 10,000) ÷ (100 x 100) = £979 or 9.8 p/mile

Fuel cost calculator on model-specific pages (for 80% miles on electric):

Real-world fuel cost = 0.2 (8.1 x 1.61 x 116.9 x 10,000) + 0.8 (17.3 x 1.61 x 15.6 x 10,000) ÷ (100 x 100) = £652 or 6.5 p/mile

Record published: http://www.nextgreencar.com/view-car/51537/mitsubishi-outlander-phev-2.0-gx3h-auto-plug-in-petrol-hybrid-automatic/