PRESS RELEASE

December 3, 2009

COP 15: RENAULT TO MAKE PROTOTYPE ELECTRIC VEHICLES AVAILABLE FOR TEST DRIVES DURING COPENHAGEN CLIMATE CHANGE CONFERENCE (DECEMBER 7-18, 2009)

- **Conscious of the stakes associated with global warming, Renault has been working for many years to bring down the CO_2 emissions of its models over their complete lifecycle as part of its ongoing bid to reduce the ecological footprint of the automobile. As demonstrated by its Renault eco² programme in favour of the environment, Renault believes it is essential to ensure that the most effective technologies are available to as many motorists as possible at an affordable price. The efforts that Renault has long made in this area has seen the brand emerge among the three most efficient carmakers in Europe today.**

- **To become the number one European carmaker with regard to CO_2 emissions, Renault is working on two main fronts:**

➔ **the introduction of new technologies for internal combustion engines and transmissions.**

➔ **an unprecedented commitment to all-electric vehicles.**

- **Renault estimates that electric vehicles will account for 10 per cent of the world market by 2020. The Alliance is investing €4 billion in its zero emissions programme and a 2,000-strong team (1,000 at Renault, and 1,000 at Nissan) is already working on electric vehicles.**

- **To the backdrop of the UN Climate Change Conference, Renault has decided to make a number of electric vehicle prototypes available to accredited attendees with for test drive purposes (previous appointment must be made). These prototypes preview the upcoming:**
  - **Renault Fluence Z.E.,**
  - **and Renault Kangoo Express Z.E.**

It will also be possible to test drive Kangoo be bop Z.E., an electric demonstrator vehicle which has just completed a European road show which began in July.

These vehicles feature technology which is very similar to that of the upcoming production cars which are currently being developed.

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- **Electric vehicles mark a clean break solution which will make zero-emission mobility available to all road users.**
- **Production versions of these electric vehicles will be launched in 2011.**

RENAULT FLUENCE Z.E.

Following Fluence Z.E. Concept's unveiling at the 2009 Frankfurt Motor Show, Renault has decided to profit from the Climate Change Conference in Copenhagen to make the initial prototypes of the upcoming Fluence Z.E. available for test drives. These prototypes represent an intermediate step between the original concept car and the production version, and the objective is to demonstrate how much the Fluence Z.E. project has progressed and how easy it is to drive an electric vehicle. Renault Fluence Z.E. will be released for sale in the first half of 2011 in Israel, Denmark and Europe, and will be the C segment's first production three-volume electric vehicle, as well as the world's first car to be compatible with the Quick Drop rapid battery exchange system. It is suitable for both private and fleet use and will appeal to customers looking for a status-enhancing vehicle that is both economical and ecological.

RENAULT KANGOO EXPRESS Z.E.

Based on Renault Kangoo Express, Renault Kangoo Express Z.E. brings zero-emission mobility to business users.

The production version of Renault Kangoo Express Z.E. will also go on sale in the first half of 2011 in a number of European markets where the current Kangoo Express is already well established and acclaimed by fleet operators, tradesmen and traders alike. Renault Kangoo Express Z.E. will be manufactured at Renault's Maubeuge factory in France.

RENAULT KANGOO be bop Z.E.

Renault Kangoo be bop Z.E. does not preview an upcoming production vehicle. However, as a demonstrator vehicle, it has covered some 4,000km in road tests in eight European countries since July 2009. This prototype has enabled the dynamic performance potential of electric vehicles to be showcased to the media, official bodies and fleet operators.

Electric vehicles fit perfectly with the Renault eco² environmental policy which seeks to mass market products that make a minimal impact on the environment over their complete lifecycle.

Electric vehicles represent a clean break solution aimed at bringing sustainable mobility to all road users. In keeping with the philosophy behind the Renault eco² environmental policy, the mass marketing of electric vehicles is set to achieve an extremely significant breakthrough in favour of the environment.

CONTENTS

THE ALLIANCE'S ENVIRONMENTAL STRATEGY

Renault's commitment to the environment

All of Renault employees are committed to protecting the environment. Economics and ecology must come together to reduce environmental impacts on a massive scale. This can only be achieved if the greatest number of people use the greatest number of environmentally-friendly products.

Recycling: New Mégane's virtuous circle

Renault anticipated the need for authorization under Directive 2005/64, which sets a deadline in 2015 for carmakers to demonstrate that the vehicles they sell are designed to be 85% recyclable.
In May 2008, Mégane Hatchback became the first vehicle to obtain global authorization. This was made possible through year-long work on recovering fluids and materials at the vehicles' end of life. The choice of materials is a vital aspect in environmental design when it comes to recycling. Thanks to the plastics provided to Mégane III suppliers, Mégane Hatchback contains 23kg of recycled material, compared with 16kg for Mégane II. The results are even more striking for New Scénic, which contains 34kg of recycled plastic, compared with 18kg for Scénic II.

All sites ISO 14001-certified

All Renault manufacturing facilities are ISO 14001-certified. The last plants to receive certification were the Somaca (Morocco) and AvtoFramos (Russian Federation) facilities.
The Somaca facility, which entered Renault's reporting scope in 2006, received ISO 14001 certification in early 2008. Renault has invested heavily in personnel and equipment to reduce the plant's environmental impact. Also, a total waste management system that meets European standards was put in place in 2007. In terms of energy consumption, action plans on the manufacturing side have yielded important savings. Between 2002 and 2008, the saving per vehicle produced reached 15%.
The AvtoFramos facility, which became part of the Renault Group's reporting scope in 2005, obtained ISO 14001 certification in April 2008, the last of the Group's industrial facilities to do so. Great attention was paid to raising the environmental awareness of all employees in the facility.
Over the last 10 years, environmental management policies at industrial facilities have cut:
. energy consumption by 25% (kW/vehicle);
. water consumption by 61% (cubic metres/vehicle), or 10 million cubic metres;
. waste by 64% (kg/vehicle);
. volatile organic compounds (VOCs) by 34% (kg/vehicle);
. toxic waste discharged into waterways by 47%.

The Alliance's commitment to electric vehicles

In the 2009 edition of its World Energy Outlook, the International Energy Agency (IEA) explains that, without the implementation of new policies, the global demand for energy is expected to rise by 40 per cent by 2030. Three-quarters of new demand will be catered for by fossil fuels which, in this benchmark scenario, will lead to a one-third increase in greenhouse gas emissions. This would double the concentration of greenhouse gases by the end of the century (equivalent to 1,000ppm) and lead to an increase in average temperature of 6°C.

The report also analyses the different political options that might be used to tackle climate change after 2012, the date at which a new worldwide agreement is scheduled to come into force. This will be debated during the UN conference in Copenhagen which starts on December 7, 2009. As far as the automobile is concerned, switching to electric vehicles stands out as a clean break solution likely to bring down CO_2 emissions, both at source, by removing the carbon factor involved in the production of electricity, and during road use. This represents a major shift and is notably highlighted in the EV/PHEV roadmap, another document published by the International Energy Agency in November.

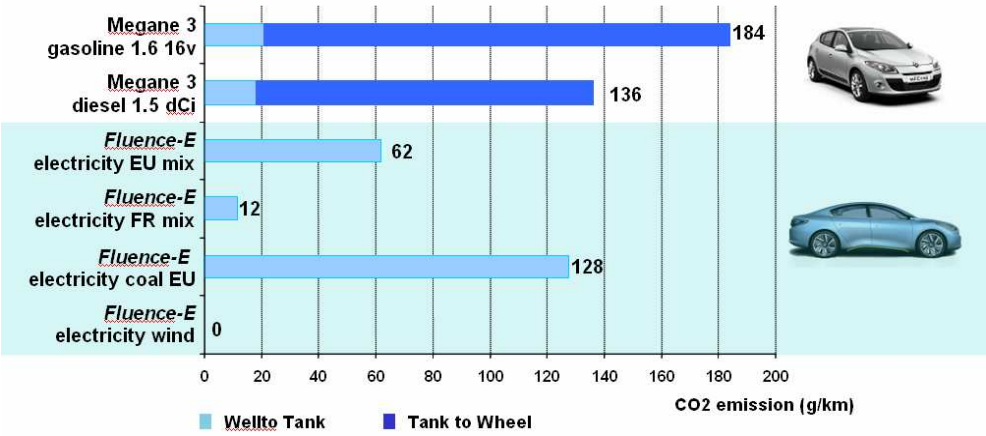
The Renault-Nissan Alliance is to market a comprehensive range of high-quality, reliable and innovative electrical vehicles at affordable prices. Renault Z.E. electric vehicles will be particularly quiet-running and generate zero emissions during road use. As such, they will mark an environmental clean-break which is within the budget of the majority of motorists.

This commitment to the electric vehicle is founded on a single, underlying principle: unlike all other technologies (internal combustion engines, hybrids), electric vehicles are genuine zero-emission vehicles regarding their use on the road. They also permit a reduction in oil-dependency.

Although the well-to-wheel emissions of greenhouse gases (expressed as equivalent CO_2) can vary significantly depending on how the electricity they use is produced in the different countries where they are driven, electric vehicles still account for a smaller quantity of greenhouse gases than equivalent internal combustion vehicles.

When the electricity is produced by nuclear or renewable sources (hydro-electric, wind-generated, photovoltaic), the well-to-wheel performance of electric vehicles is indisputably superior. With the electricity generation methods currently employed in Europe, the results are still compelling, since CO_2 emissions are halved compared to those produced by an internal combustion engine.

Comparison of vehicle CO_2 emissions as a function of electricity production methods



Source : Efficiency of fuel and electricity production calculated according to the methodology of the JRC-EUCAR-CONCAWE study « Well-to-Wheels Analysis of Future Automotive Fuels and Powertrains In the European Context »,, v3 Nov. 2008 : http://ies.jrc.ec.europa.eu/WTW

The well-to-wheel figure is further improved when the car is charged at night, which promises to be the most frequently used method. This allows customers to:

- profit from electricity when demand for energy is low at night time; such electricity often goes to waste because it is difficult to store,
- benefit from appreciable savings by profiting from the off-peak tariffs offered by energy companies; in France, for example, off-peak electricity costs 40 per cent less than at peak times during the day.
- use the cleanest forms of electricity (nuclear, hydro-electric, wind power), since thermal power plants are usually on standby at night.

Electric vehicles represent a **clean-break solution** that can put sustainable mobility within everybody's reach. In line with Renault's environmental stance as promoted by its Renault eco² hallmark, Renault Z.E. electric vehicles will be mass-produced to achieve substantial environmental savings.

Synergies within the Alliance

A decade after the establishment of the Alliance, Renault and Nissan stepped up their cooperation in May 2009. This included the creation of a team dedicated to speeding up and broadening the synergies that will enable both companies to improve their performance, and more particularly in the field of electric vehicles.

The electric vehicles produced by Renault and Nissan, for example, will be equipped with batteries developed by AESC, a NISSAN-NEC joint venture. The Alliance has pooled the expertise of Renault

and Nissan to strengthen synergies at every level and encourage the sharing of major electrical assemblies, such as the drive train and batteries. Renault and Nissan also share purchasing requirements and have standardized components to generate economies of scale with a view to making it possible to develop mass-market electric vehicles.

Renault and Nissan are working on shared components but, as is the case with their conventional product line-up, will offer distinct ranges of electric vehicles. Each range will be sold separately, through separate dealer networks.

Furthermore, the Alliance is entering into partnerships with governments, local authorities and energy companies to drive forward the mass-distribution of electric vehicles worldwide. Up to the beginning of December 2009, the Alliance had already signed more than 35 thirty such agreements (see list below).

Announced partnerships		
	Partner	**Memorandum of understanding**
1	Israel	21/01/2008
2	Denmark	27/03/2008
3	Kanagawa Prefecture (Japan)	19/05/2008
4	Portugal	09/07/2008
5	Tennessee (USA)	22/07/2008
6	EDF (France)	09/10/2008
7	Yokohama (Japan)	05/11/2008
8	Oregon (USA)	19/11/2008
9	Monaco	20/11/2008
10	Sonoma County (California, USA)	21/11/2008
11	EOS (Switzerland)	16/12/2008
12	Greentomatocars (United Kingdom)	27/02/2009
13	Elektromotive (United Kingdom)	27/02/2009
14	EWZ (Switzerland)	17/03/2009
15	One North East (United Kingdom)	20/03/2009
16	San Diego Gas & Electric (California, USA)	23/03/2009
17	Electricity Supply Board (Ireland)	03/04/2009

18	Ministry of Industry and Information Technology (China)	10/04/2009
19	LeasePlan	16/04/2009
20	Phoenix (Arizona, USA)	16/04/2009
21	Oak Ridge National Laboratory (Tennessee, USA)	22/04/2009
22	Hong Kong	24/04/2009
23	Seattle (Washington, USA)	28/04/2008
24	Raleigh (North Carolina, USA)	01/05/2009
25	Singapore	06/05/2009
26	Washington D.C. (USA)	07/05/2009
27	A2A (Lombardy, Italy)	02/07/2009
28	Netherlands	03/07/2009
29	State of Victoria (Australia)	03/08/2009
30	RWE (Germany)	15/09/2009
31	Vancouver (Canada)	06/10/2009
32	Barcelona (Spain)	28/10/2009
33	Mexico City (Mexico)	28/10/2009
34	Guangdong Province (China)	05/11/2009
35	Saitama Prefecture (Japan)	05/11/2009
36	Miyazaki Prefecture (Japan)	13/11/2009
37	Houston (Texas, USA)	13/11/2009
38	Guangzhou & Dongfeng Motor (China)	24/11/2009

Renault's product plan

From 2011, Renault will progressively roll out four electric vehicles.

These include two **derivatives of internal-combustion vehicles:**

- Renault Fluence Z.E., an electric version of Fluence which will initially be available in Israel and Europe. This vehicle will be manufactured at the Bursa factory in Turkey.
- Renault Kangoo Express Z.E. will be an electric version of Renault Kangoo Express, intended primarily for fleet and business use. This vehicle will be manufactured at Renault Maubeuge factory in France.

Plus two vehicles which will be available in **EV form only**. The range of electric vehicles will later be extended to cover other segments, including two new cars whose architecture will be designed to run exclusively with electrical power:

- A car derived from the Twizy Z.E. Concept concept car for motoring in built-up areas. This vehicle will be manufactured at the Valladolid factory in Spain.
- The fourth vehicle will take its inspiration from Zoe Z.E. Concept and is scheduled to be released at the beginning of 2012. It will be a particularly versatile vehicle intended for everyday motoring in and around cities. It will be manufactured at the Flins factory in France.

Renault's electric vehicle production strategy

The production of Renault's first four Zero-Emission vehicles will begin in 2011 and will involve four different factories.
The vehicle previewed by Zoe Z.E. will be manufactured in France at Renault's Flins facilities, near Paris, while the electric versions of Kangoo Express will be made in Maubeuge, in northern France.
Renault will produce the vehicle previewed by Twizy Z.E. Concept in Valladolid, Spain.
Last but not least, the electric versions of Fluence will be made in Bursa, Turkey.
Not only will this arrangement enable Renault to mass market Zero-Emission vehicles across Western Europe thanks to the factories' location close to the marketplace, but it will also allow it to benefit from the expertise of these production sites with regard to their output and build quality.

The Renault-Nissan Alliance's battery production strategy

Battery production is poised to become a core activity for the Renault-Nissan Alliance. Renault and Nissan will manufacture lithium-ion batteries on three continents – America, Asia and Europe – with a view to supplying the body assembly factories where the forthcoming EVs will be produced from a local source.

The Alliance has already announced its intention to make batteries in the United States, Japan, France and the United Kingdom.

This multi-locality arrangement will permit a secure supply flow and ensure logistics-related cost-savings, while at the same time enabling significant production volumes to be turned over. In the longer term, this set-up will allow the Alliance to produce 500,000 batteries annually.

ELECTRIC VEHICLE PROTOTYPES AVAILABLE FOR TEST DRIVES

RENAULT FLUENCE Z.E.

Following Fluence Z.E. Concept's unveiling at the 2009 Frankfurt Motor Show, Renault has decided to profit from the Climate Change Conference in Copenhagen to make the initial prototypes of the upcoming Fluence Z.E. available for test drives. These prototypes represent an intermediate step between the original concept car and the production version, and the objective is to demonstrate how much the Fluence Z.E. project has progressed and how easy it is to drive an electric vehicle. These prototypes will go on to be employed for test drives during a Europe-wide road show scheduled for the first half of 2010.

Renault Fluence Z.E. will be released for sale in the first half of 2011 in Israel, Denmark and Europe, and will be the C segment's first production three-volume electric vehicle, as well as the world's first car to be compatible with the Quick Drop rapid battery exchange system. It is suitable for both private and fleet use and will appeal to customers looking for a status-enhancing vehicle that is both economical and ecological.

Renault Fluence Z.E. will be manufactured at the OYAK-Renault factory in Bursa, Turkey, using the same production line as internal combustion engine-powered versions of Fluence. Production is due to begin in the first half of 2011.

The introduction of the Fluence Z.E. concept car at the 2009 Frankfurt Motor Show generated so much interest that Renault immediately sought to demonstrate the feasibility of the project, as well as the extent of the progress that has been achieved. The vehicles present at the Climate Change Conference in Copenhagen are prototypes which preview the technical specification of the model that Renault and Better Place will market in Israel from mid-2011.

A spacious, status-enhancing vehicle

Renault Fluence Z.E. is a large, three-volume saloon car. Although the prototypes are of the same length as the heat-engined Fluence (4.62 metres), the production electric version will be longer in order to house the batteries behind the rear seats and consequently retain the boot. Cabin space is worthy of that of a saloon car from the next segment up and boasts best-in-class front and rear kneeroom. Fluence stands out from rival three-volume saloons thanks to its sweeping, fluid lines which express sportiness and strength. The comfortable interior features a raft of useful technologies, including smart navigation, Bluetooth telephony, automatic dual-zone climate control, and automatic headlamp and windscreen-wiper activation. Renault Fluence Z.E. also innovates with the incorporation of the exclusive Quick Drop rapid

battery exchange system which will enable this large saloon to overcome the range-related constraints inherent in conventional electric vehicles and thereby permit longer than average journey distances.
Renault Fluence Z.E. targets families looking for a spacious, comfortable vehicle and who seek social status through their car.
This vehicle will also figure on the shopping list of fleet operators because of its lower running costs.

Technology

Renault Fluence Z.E. is an all-electric zero-emission vehicle which emits neither CO_2, smoke nor particulates.

- **Motor**

Fluence Z.E. is powered by a synchronous electric motor with peak power of 70kW at 12,000rpm and maximum torque of 226Nm. The motor's weight, excluding peripherals, is 160kg. Acceleration performance is responsive and linear, with maximum torque available very early on.

- **Battery**

The energy capacity of Fluence Z.E.'s lithium-ion battery is 20kW/h. On the prototype versions, it is located vertically in the boot. In the case of the production version, it will be mounted behind the rear seatbacks in order to free up minimum boot space of 300dm^3. It tips the scales at 250kg.
An energy recovery system will be used to charge the battery when decelerating.

- **Battery charging methods**

It will be possible to charge the battery of the upcoming production version of Fluence Z.E. in one of three ways:
- via a household mains supply (10A or 16A 220V) which will fully charge the battery in between six and eight hours. This method is particularly suited to vehicles which are charged at night since it will permit owners to benefit from the off-peak rates available in certain countries.
- at quick charge stations using a 32A 400V supply which enables the battery to be charged in approximately 30 minutes.
- The Quick Drop battery exchange system will enable the Fluence Z.E.'s battery to be swapped in approximately three minutes at bespoke battery exchange stations.

- **Chassis**

In order to adapt it to Fluence Z.E.'s specific specification (dimensions, weight distribution), the suspension of these prototypes has been modified compared with that of the heat-engined Fluence. The front suspension is softer since electric motors are lighter than all the internal combustion engines available for Fluence. The rear suspension has also been revised to cope with the heavier weight due to the presence of the battery.

- **Tyres**

Renault Fluence Z.E. runs on low rolling resistance tyres. The Goodyear-developed EfficientGrip enables lower energy consumption thanks to extensive work on the tyre's casing and sidewalls. The tread is identical to that of a conventional tyre for high performance road holding and braking.

- **Dialled-in safety**

The ABS and ESC electronic driving aids have been recalibrated. On the passive safety front, the body of Renault Fluence Z.E. will be reinforced in order to deliver the same high standard of safety performance as the shorter and consequently lighter heat-engined version.

- **Production**

Fluence Z.E. will be manufactured at the OYAK-Renault factory in Bursa, Turkey, on the same production line as the heat-engined versions of Fluence. Production will begin in the first half of 2011. This solution will enable Renault to minimize capital outlay and get production under way quickly, while at the same time guaranteeing a very high standard of quality.

FLUENCE Z.E. TECHNICAL DATA (prototype of production version)

DIMENSIONS	
Length (mm)	4 620
Width (mm)	1 809
Height (mm)	1 461
Wheelbase (mm)	2 702
Front/rear track (mm)	1 541 / 1 563
Front/rear overhang (mm)	908 / 1 010
Unladen weight (kg)	1453
Standard tyres	Goodyear EfficientGrip 205/55R16
MOTOR	
Type	Electric
Transmission type	Direct drive with reducer and forward/reverse inverter
Maximum power EEC (kW)	70
Maximum torque EEC (Nm)	226
BATTERY	
Type de battery	Lithium-ion
Range (km)	160
STEERING	
Power steering	Electric variable rate power steering

RENAULT KANGOO EXPRESS Z.E. and RENAULT KANGOO BE BOP Z.E.

The production version of Kangoo Express Z.E. will be released in the first half of 2011 and will feature technology that is very similar to that which features today on the Renault Kangoo Express Z.E and Renault Kangoo be bop Z.E. prototypes. The production version of Renault Kangoo Express Z.E. will have a range of 160km from launch.

Prototype Renault Kangoo Express Z.E.

Renault Kangoo Express Z.E. previews the upcoming electric Kangoo, a light utility vehicle aimed at business users. It will be used chiefly for city and suburban use.

The length of Renault Kangoo Express Z.E. is 4.21 metres and its carrying capacity stands at three cubic metres. Its asymmetric hinged rear doors and sliding side door provide easy access to the cargo area. The batteries are located in a central position beneath the floor, enabling the electric version of Kangoo to boast the same carrying volume as the heat-engined version.

The upcoming production version of Renault Kangoo Express Z.E. is aimed at extremely exacting business users looking to minimize running costs and has been engineered to guarantee a very high standard of reliability and durability. Its outstanding TCO rating (Total Cost of Ownership) makes it a first class solution for small businesses and fleet operators alike. It will also benefit from Renault's extensive experience of utility vehicle production. Indeed, Renault has chosen to manufacture the electric version of the Kangoo Express utility vehicle at its M.C.A. facilities (Maubeuge Carrosserie Automobile) in northern France. Production is due to begin in the first half of 2011.

Renault will manufacture this vehicle on the same line as the heat-engined versions. It will consequently benefit from the same expertise, supplier network and logistical framework as the current Kangoo. The Maubeuge plant has specialized in utility vehicle production for the past 20 years and currently manufactures Kangoo, Kangoo Express and Kangoo be bop. This factory has the capacity to adapt both to the variety of specifications associated with this type of vehicle (short and long versions, with or without windows, etc.) and to demand. The choice of Maubeuge will enable production to get under way quickly, while at the same time guaranteeing a very high standard of quality.

Renault Kangoo be bop Z.E. demonstrator vehicle

Kangoo be bop Z.E. is derived from the production Kangoo be bop, but is instantly recognizable thanks to its Energy Blue body colour. The Renault logos on the grille and wheels are picked out in satin-finish blue-hued chrome. Inside, satin-finish chrome and metallic fluorescent green details provide a unique ambience which is compounded by specific upholstery including embroidered 'printed circuit' motifs.

Like the Z.E. Concept concept car which was unveiled at the 2008 Paris Motor Show, Kangoo be bop Z.E. is equipped with low-energy LED (light-emitting diodes) front and rear lights with a view to optimizing energy use. Again in a bid to reduce energy consumption, its aerodynamics have been significantly reworked, too. Kangoo be bop Z.E. sits on full disc wheels, and its ground clearance has been lowered by 20mm compared with that of the production Kangoo be bop.

An illuminated gauge on Kangoo be bop Z.E.'s body side displays how much charge is left in the battery by simply activating the remote central locking control. Inside, another gauge to the left of the instruments provides the driver with a permanent indication of how much battery charge remains.

An all-electric motor

Renault Kangoo Express Z.E. and Renault Kangoo be bop Z.E. are all-electric zero-emission vehicles regarding their use on the road. They do not generate CO_2 emissions, smoke or particulates.
Renault Kangoo Express Z.E. is powered by a 44kW (60hp) electric motor which boasts energy efficiency of 90 per cent, a figure which is far superior to the 25 per cent of heat engines which suffer from energy losses. This motor revs to 12,000rpm and instantly delivers peak torque, which is a constant 226Nm. Acceleration and pull-away from low speeds are particularly responsive. The electric motor is very quiet, too. The battery of the production version of the electrically powered Kangoo Express will be located beneath the boot floor and will not affect its carrying capacity.

Battery charging methods

Renault Kangoo Express Z.E. and Renault Kangoo be bop Z.E. are charged via a socket located behind a flap at the front of the vehicle alongside the right-hand headlamp. **Renault is developing two different battery-charging methods:**

- A **conventional charge** via a household mains supply (10A or 16A 220V) which can charge the vehicle in between six and eight hours. This method is perfectly suited to vehicles which are parked up overnight or during the day at the workplace.
- A **faster charge** using a 32A 400V three-phase socket enables 80 per cent of Renault Kangoo be bop Z.E.'s battery to be charged in approximately 30 minutes.

The production Renault Kangoo Express Z.E. will not be equipped for rapid Quick Drop battery exchange. However, this facility will be available for the other vehicles of the future range.

RENAULT KANGOO EXPRESS Z.E. (prototype of production version)

DIMENSIONS	
Length (mm)	4,213
Width / with exterior mirror (mm)	1,829 / 2,133
Unladen height (mm)	1,805
Wheelbase (mm)	2,697
Front track (mm)	1,521
Rear track (mm)	1,533
Ground clearance, unladen (mm)	190
Weight (kg)	1,425
TECHNICAL DATA	
Motor	Electric
Power (kW)	44
Maximum revs (rpm)	12,000
Torque (Nm)	226
Transmission	Direct drive with reducer
Batteries	Lithium-ion
Battery energy	20kWh
PERFORMANCE	
Top speed (kph) (capped electronically)	130

RENAULT KANGOO BE BOP Z.E. (demonstrator vehicle)

DIMENSIONS	
Length (mm)	3,871
Width / with exterior mirror (mm)	1,829 / 2,133
Unladen height (mm)	1,812
Wheelbase (mm)	2,313
Front track (mm)	1,522
Rear track (mm)	1,536
Ground clearance, unladen (mm)	185
Weight (kg)	1,591
TECHNICAL DATA	
Motor	Electric
Power (kW)	44
Maximum revs (rpm)	12,000
Torque (Nm)	190
Transmission	Direct drive with reducer
Batteries	Lithium-ion
Battery energy	15kWh
PERFORMANCE	
Top speed (kph) (capped electronically)	130

RENAULT ELECTRIC VEHICLES

Latest-generation lithium-ion batteries

All Renault's electric vehicles are powered by a latest-generation lithium-ion battery.
The battery comprises 48 power modules, each of which incorporates four elementary cells. It is inside these cells that the electrochemical reactions take place, enabling electrical current to be produced or energy to be stored. Modules are similar in size to a laptop computer and are positioned in two rows, side by side. The four cells of each module store 8.4V each, making a combined total of 400V for the 48 modules that make up the battery.

These compact, innovative lithium-ion batteries are produced by AESC (Automotive Electric Supply Corporation), a Nissan-NEC joint venture founded in April 2007. Their performance compared with former-generation nickel metal hydride batteries is superior in every domain, including range, performance, reliability and safety. Lithium-ion batteries do not suffer from the so-called memory effect resulting from incomplete charge cycles which can ultimately lead to a fall-off in capacity in the case of conventional batteries. AESC batteries are maintenance-free and are expected to deliver between 80 and 100 per cent of their original capacity for an average duration of six years. It will also be possible to charge them for short cycles with no adverse effect on capacity.

Batteries are cooled by ambient airflow thanks to the heat-dissipation properties of their aluminium casing.

Finally, lithium-ion batteries are recyclable and the Renault-Nissan Alliance is actively working on establishing recycling processes and infrastructures suited to automotive batteries. It is important to remember that lithium-ion batteries – which are made up of non-toxic materials (lithium, manganese oxide or iron phosphate, and graphite) – do not present any danger for the environment, unlike former nickel-cadmium batteries. Also, to put the demand for lithium supplies into perspective, our 250kg batteries contain just 3kg of lithium. According to the mining companies Chemetall and SQM, worldwide lithium reserves are currently estimated to be between 14 and 17 million tonnes.

Range optimization

Range management is a key consideration when it comes to electric vehicles, and this is why Renault has made a point of making optimization as straightforward and efficient as possible.

In addition to the information provided by the exterior gauges, a specific MMI (Man Machine Interface) has been developed to keep the driver informed about the vehicle's current state of charge and remaining range:

- a gauge alongside the speedometer displays the battery's level of charge,

- an 'econo-meter' uses a new a new colour-coded system to tell the driver how economical his or her driving is in terms of energy consumption (light blue for 'normal' vehicle use, dark blue for 'optimal' driving and red for excessive energy consumption likely to reduce the vehicle's range).

The trip computer is adapted to the needs of electric vehicles and indicates the number of kWh remaining, average and instantaneous energy consumption and remaining range (in kilometres).

Driving an electric car can even be fun, trying to accelerate as gently as possible with a view to minimizing energy consumption.

Driving an electric vehicle: new habits

Driving an electric vehicle is a new experience. The silent-running motor, the immediate availability of peak torque and the linear acceleration characteristics call for new habits.

High torque at low speeds and the immediate delivery of power are inherent features of electric motors. Renault Kangoo be bop Z.E. consequently pulls away briskly, while mid-range acceleration is sprightly from low speeds. The reducer ensures that this acceleration is particularly progressive (from standstill to 50kph in six seconds) and this in turns contributes to a sensation of driving comfort.

When the driver presses on the accelerator pedal, the lithium-ion battery provides energy to the electric motor which converts this electricity into the mechanical energy necessary to drive the wheels. The battery charges during deceleration: when the driver lifts, kinetic energy is recovered by the motor which converts it into electrical energy. The current generated in this way is used to charge the battery.

Meanwhile, ride performance (body-roll control, steering, etc.) is identical to that of the heat-engined Renault Kangoo be bop.
The noise generated by the electric motor when running also requires a different mindset. At idle, the motor is totally silent and the driver only knows that it is running thanks to an audible signal and a green warning light. When the vehicle is moving, the faint whining sound which is specific to electric motors provides the driver with audible, if muted feedback. Last but not least, the electric motor produces very few vibrations to deliver an appreciable level of ride comfort compared with that of a heat engine.

Safety: an absolute priority

As a leading volume manufacturer, Renault has profited from its significant knowhow in the realm of safety to produce electric vehicles which meet the same exacting standards expected of a current heat-engined vehicle.

Renault's safety experts have added their own particular line of expertise to that of all those involved in the project. The advanced tools at Renault's disposal include a range of structural dimensioning calculation software, failure and crash simulators, and physical prototype evaluation.

The incorporation of a 250kg battery in the vehicle has naturally not been without effect and has called for specific bracing of the body structure in order to protect against impact. Given that the battery is as sensitive a component as a conventional fuel tank, it, too, has undergone bespoke strengthening with a view to ensuring that its modules are effectively protected. The layout of the electrical wiring has also been optimized with a view to preventing chafing, while the power supply is immediately switched off in the case of a big impact.

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High-resolution photos of Renault Fluence Z.E., Renault Kangoo Express Z.E. and Renault Kangoo be bop Z.E. can be downloaded from www.media.renault.com

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