

ELECTRIC VEHICLES



- Reducing emissions
- Decreasing oil dependence
- Improving competitiveness

....The future of transport in Europe

ELECTRICITY DRIVES CLEANER!



ELECTRIC VEHICLES HELP IN REACHING EUROPEAN ENERGY POLICY GOALS

Carbon dioxide emissions

Replacing conventional internal combustion engines with electric vehicles (EVs) would result in major reductions in CO₂ emissions. With the current carbon intensity of the European electricity sector¹, **a typical electric car results in CO₂ emissions of around 80g/km**. As shown in the graph 1, this compares favourably to the current EU market average of CO₂ emissions from passenger cars – about 160g/km. However, the European electricity sector will reduce in carbon intensity over coming years, particularly with increased use of renewables and carbon capture and storage. EURELECTRIC estimates that the carbon intensity of EU electricity in 2030² implies emissions from electric cars of less than 30g of CO₂ per km (see Graph 1).

Security of supply

Unlike the electricity sector, the transport sector depends almost entirely on one particular fuel: oil. Indeed, the vast majority of the energy consumed (almost 97%) in transportation in the EU-27 derives from crude oil.

The EU is more than 80% dependent on oil imports, much of it from regions of political instability. In 2007, the EU-27's net imports reached 571 Mtoe³.

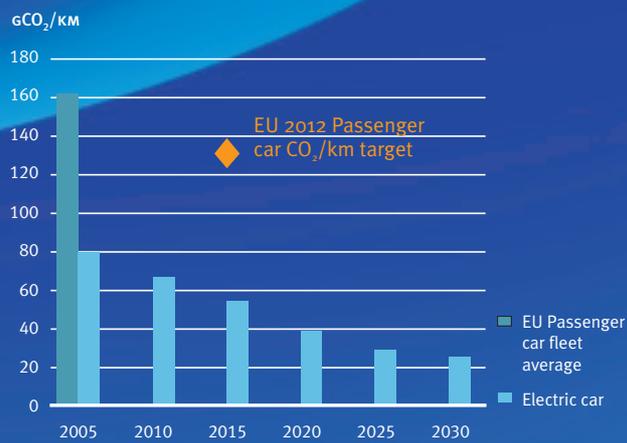
Generating part of the energy necessary for road transportation from electricity (of which less than 4% is currently generated from oil in the EU-27) would help to reduce these imports and ensure a diversified supply of energy for the road transportation sector.

¹ around 410 g CO₂ per kWh Source: Role of Electricity, EURELECTRIC 2007 (PRIMES model)

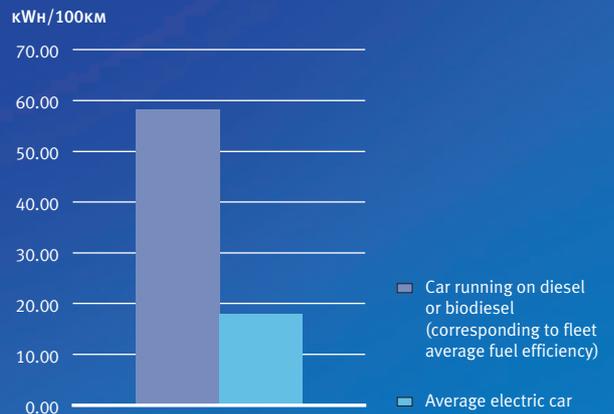
² around 130g CO₂ /kWh, Source: Role of Electricity, EURELECTRIC 2007 (PRIMES model)

³ Source: Eurostat, Energy – monthly statistics, Issue number 4/2008, 23 April 2008, http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-BX-08-004/EN/KS-BX-08-004-EN.PDF

GRAPH 1 - CO₂G/KM OF PASSENGER CARS



GRAPH 2 - ENERGY EFFICIENCY OF ELECTRIC CAR VS CONVENTIONAL (BIO)DIESEL CAR



Assumptions: Typical mid-size electric vehicle using 0.18kWh/km, 7% electricity network losses, CO₂ intensity of electricity declines in line with EURELECTRIC Role of Electricity scenario (410g CO₂/kWh in 2005, 130g CO₂/kWh in 2030)

Competitiveness

Assuming an oil price of \$80/barrel, oil imports into the EU in 2007 represented a net transfer of around 250 billion euros⁴. If used to buy electricity, these huge amounts of money would be re-injected in the European economies to the benefit of both consumers and producers. This would generate investment and create jobs.

Reducing energy imports would result in economic savings and help to maintain the competitiveness of the European economy, particularly in the recent climate of volatile oil prices. Europe will be less exposed to the uncertainty of the oil price thus reducing risks for domestic industries and consumers.

Furthermore, European carmakers have the opportunity to take pole position in EV development. This would improve the global competitiveness of the European car industry in an increasingly carbon constrained world, and give European economies a further lead in green technologies.

Energy efficiency

An electric powertrain can be up to four times more energy efficient than a standard internal combustion engine. In other words, electric vehicles can lead to a decrease in overall energy consumption, as less energy per km is needed – as shown in graph 2.

⁴ Estimate based on oil price of 80\$/barrel and exchange rate of 1.3 dollars to 1 euro.



Prototype plug-in hybrid Toyota Prius currently being tested in the UK and France. A revised version is foreseen for series production in 2010



Charging of electric cars can be synchronised with availability of wind power (Source: Project Betterplace)



ELECTRIC VEHICLES OFFER MANY OTHER BENEFITS

EVs enjoy synergies with wind energy and other renewables

Wind power generation is intermittent in nature, as are some other forms of renewable power, and therefore presents challenges to balancing supply and demand on the grid. With the increased penetration of renewables needed to fulfil the EU's 2020 renewables target, significant use of energy storage and demand regulation will be needed. Electric vehicles provide a solution here. The charging of the vehicles can be regulated in accordance with the supply of intermittent renewable electricity. In the longer term, the batteries of the cars may be used to supply back to the grid in periods of low renewable generation but high demand. The ability of electric vehicles to assist in balancing networks could reduce the use of less efficient "peaking" plants, thus increasing efficiency and reducing the costs of the whole power system.

EVs are easy to use

The existing European electricity infrastructure can be used for charging vehicles. If cars are charged at night a standard household socket is quite sufficient. The grid is robust enough to allow millions of electric plug-in (hybrid) vehicles to charge simultaneously without any severe impact on the network. Therefore, integrating the charging of EVs in electricity networks does not require any new technology to be developed. As the market in electric vehicles develops, smart chargers could be introduced to allow greater use of electric vehicles in network balancing.



The THINK CITY car currently already on sale in Norway, to be released to several EU countries in 2009. Charging of electric cars can be done with a standard household electricity supply.

EVs are on their way to the mass market

Cost and performance of advanced batteries have improved enormously in recent years, leading to dramatic increases in range. Full battery electric vehicles such as the “Think City” can already provide ranges of up to 200km – perfectly sufficient for all commuting needs. For longer distances, Plug-in hybrid electric vehicles (PHEVs), i.e. electric vehicles with an onboard generator, overcome any range limitations. Major manufacturers are poised to release vehicles onto the market in 2010, with a major trial programme envisaged in 2009. However, manufacturers have been concentrating their efforts on North America and Japan – Europe needs to take the lead.

Electric vehicles improve the urban environment

Electric vehicles result in zero local emissions of particulates, nitrogen oxides and volatile organic compounds emitted by internal combustion engine vehicles. In addition, electric vehicles would greatly reduce noise emissions from traffic. Electric vehicles would offer European citizens cleaner, quieter cities.

EUROPEAN POLICYMAKERS NEED TO HELP KICKSTART THE MARKET FOR ELECTRIC VEHICLES

Policymakers, whether on national or EU level, should encourage consumers and industry to choose the cleanest and most efficient solution for road transport. This can be achieved by providing accurate information and implementing policies that internalise externalities in the market place. They should take the lead in fostering a market demand for grid-connected vehicles.

IMMEDIATE POLICY ISSUES

Electric vehicles are part of the EU climate package

Article 3 (3) of the proposed EU Renewables Directive sets a target share of at least **10% energy from renewable sources in 2020 in the transport sector**. Many policymakers have associated this target only with biofuels, but the target also encompasses electric cars using renewable electricity. EURELECTRIC has made proposals in order to amend the directive with a view to strengthening the inclusion of electric vehicles within this target in two ways:

- **Putting renewable electricity on a par with bio-fuels** – an electric car uses less than a third of the energy to drive 100km required by a biofuel car (see graph 2), so an equalisation factor must be applied to ensure that use of electric vehicles is counted fairly towards the target.
- **Splitting the target for renewables in transport** – we support an initial separately split target for electric vehicles under the RES Transport target, in order to kickstart the market for EVs. However, splitting of the target should be kept under review.

More details on EURELECTRIC's proposal on the inclusion of electric vehicles in the 10% RES Transport target are available in a separate paper available from the EURELECTRIC Secretariat.

Targets for car CO₂ emissions

EURELECTRIC supports the proposals for limiting the fleet average CO₂ emissions for cars. We support a strong CO₂ target for 2015. However, we also believe in setting a very strong target for 2020 or 2025 to give long term security of investment to manufacturers developing low carbon vehicle technologies such as electric drivetrains.

EVs in the Fuel Quality directive

The proposed Fuel Quality directive requires fuel suppliers to reduce the greenhouse gas (GHG) intensity of fuels by 6% by 2020, with an additional 4% reduction from other measures. From that, 2% GHG reductions can come from electric vehicles, but this is not mandatory and subject to review in 2012. We recommend that that this 2% allowance for EVs becomes mandatory, at the very least following the review in 2012. Furthermore, we request that the current proposal to link the 2% GHG reduction from EVs to the development of carbon capture and storage (CCS) be removed, as CCS will not be commercial until around 2020 (or after). The carbon intensity of electricity will anyway be much reduced by mandatory measures such as the 20% renewables and carbon reduction targets for 2020.

LONGER TERM ISSUES: DEVELOPING THE MARKET FOR ELECTRIC VEHICLES

The following measures are indicative policy ideas which EURELECTRIC will develop further over the next months, and will propose more concrete measures in Spring 2009.

- **The European Union should develop a common assessment system for the efficiency and CO₂ emissions attributable to electric vehicles.** CO₂ emissions of electric vehicles in CO₂g/km can be evaluated based on their energy consumption in kWh/km and the carbon intensity of the electricity system in gCO₂/kWh. One question is whether measurements should be made on a national or on an EU basis?
- **The European Union should use available powers to encourage Member States to use CO₂ emissions as the standard tax base for car purchase and circulation taxes.** Inconsistent taxes based on archaic power and engine capacity ratings are creating an uneven market which runs counter to EU principles.
- **The European Union should prioritise R&D funds for electric vehicle research, including batteries.** A positive approach to EV demonstration projects could be given under the Intelligent Energy Europe framework. Europe needs to seize the opportunity to become a technology leader in electric vehicles.
- **The European Union should help in initiating standardisation of infrastructure for charging electric vehicles.**
- **The European Union or Member States should consider putting in place an EV mandate** for a minimum percentage of new vehicles sold to be electric vehicles.
- **Member States, National Regulatory Agencies and municipalities should remove administrative and planning barriers** to the installation of charging poles for plug-in vehicles and launch schemes for establishing networks of charging poles in partnership with the private sector.
- **Member States should facilitate the use of electric vehicles in cities.** Initial measures could include:
 - exempting EVs from road tolls or congestion charges
 - allowing EVs to use bus and taxi lanes
 - reducing parking fees or reserving city parking places with plugs for charging EVs
- **Member states should put in place reduced purchase and circulation taxes** for electric vehicles.



EURELECTRIC IN BRIEF

The Union of the Electricity Industry-EURELECTRIC is the association which represents the common interests of the electricity industry at pan-European level, plus its affiliates and associates on several other continents.

EURELECTRIC's mission is to contribute to the development and competitiveness of the electricity industry and to promote the role of electricity in the advancement of society.

As a centre of strategic expertise, EURELECTRIC identifies the common interests of its Members. EURELECTRIC is then able - through in-depth and specialized research into the market place, technologies, legislation, etc. - to assist its Members in formulating common solutions to be imple-

mented and in coordinating and carrying out the necessary actions.

To that end it also acts in liaison with other international associations and organisations, recognising the specific missions and responsibilities of these organisations.

Within the European Union, EURELECTRIC represents the electricity industry in public affairs, in particular in relation to the EU legislative institutions in order to promote the interests of its Members at a political level.

For further information please contact:

Union of the Electricity Industry-EURELECTRIC
Boulevard de l'Imperatrice, 66
B - 1000 Brussels
Belgium
Tel.: +32 2 515 1000
Fax: +32 2 515 1010

Sam Cross: scross@eurelectric.org
Pierre Schlosser: pschlosser@eurelectric.org
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For full details of the work of the association visit: www.eurelectric.org

FRONT COVER IMAGES:

Tesla Roadster: currently on sale in several US states and constructed by Lotus in the UK.

BWM Mini EV: BMW announced in October 2008 that it will build 500 trial versions of an electric Mini with lithium ion batteries. This pure electric car will have a range of around 240 kilometres.

Smart EV: Several hundred Smart EVs are foreseen for test programmes in the UK and Germany.