

editorial



Claude Fischer
President of
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Clean cars: the great transformation

Who has never dreamed of having his own car? We do not consider the car a "household expense". It is more like a gift, a valuable object, a source of freedom and pride. Yes but... our wonderful car is polluting the atmosphere. So we should give it up? They are used everywhere, all over the world, and more and more. Their global number is expected to double over the next 15 years. Manufacturers are using their ingenuity to vie with competitors in the search for an ever "cleaner", more efficient and more suitable vehicle. They can now run on electricity or carbon-free fuel, and engines are even beginning to be placed in wheels... there is talk of flying cars! The car of the future is already here, and the electric vehicle was not born yesterday. A number of oil producers have shown real genius in developing an efficient and cheap source of fuel, and in succeeding in transferring this discovery to industry... The automobile industry is today thriving, driving innovation, creating millions of jobs, generating wealth in and enhancing the image of developed countries, and China and India are in the process of creating their own model and fleet of vehicles. But with oil depletion and price volatility and their negative impact on the industry on the one hand, and climate change on the other, we cannot be blamed for wondering: should we abandon the car altogether? The economic crisis served to remind us that the destiny of growth is linked with that of the real economy - there can be neither growth nor skilled jobs without industry. So we need to invent another kind of growth built around the development of green industry, clean transport and farming. And we need to make this transition while avoiding social dramas. What a challenge! Europe is capable of providing the impetus; it has adopted the only climate package of its kind in the world, regulated the reduction in automotive emissions, and planned for the inclusion of aviation in the ETS. That is really very ambitious! Because to do so will require more than just standards and regulations, launching the transformation will involve mobilising stakeholders and funding to invest in new industries and agriculture, effectively organising the large internal market and making it competitive, adopting a trade policy doctrine, etc.

After studying the positive role of the climate package in economic recovery, *Confrontations Europe* continued its discussions with its partners and stakeholders in the energy, automotive and agricultural industries, who are working hand in glove to devise a coherent industrial policy capable of fuelling new growth. During the *Les Entretiens européens* talks on both biofuels and clean cars, all spoke of the social and political challenges. Our discussions helped us to see things more clearly, to establish certain truths, to realise that some technologies have now reached maturity, and that some companies are assuming their social and environmental responsibilities... but political will is lacking.

Take biofuels for example. They have all been tarred with the same brush, vilified,

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Transport, Energy and CO₂: moving towards sustainability

THE INTERNATIONAL ENERGY AGENCY HAS DONE ONE'S HOMEWORK. LEW FULTON, ITS EXPERT FOR ENERGY QUESTIONS IN THE FIELD OF TRANSPORT, REMINDS US THAT THE ESSENTIAL DRASTIC CUT IN TRANSPORT CO₂ EMISSIONS NEEDS A WORLDWIDE UNFAILING POLITICAL COMMITMENT.

Worldwide, transportation accounted for about 19% of global energy use and 23% of energy-related CO₂ emissions in 2006 and these shares will likely rise in the future. As described in the IEA Energy Technology Perspectives 2010 (IEA 2010), absent marked changes from current trends, transportation energy use and CO₂ emissions are projected to increase by nearly 50% by 2030 and to double by 2050. This growth is not compatible with energy security goals or controlling the risks of climate change. The UN Intergovernmental Panel on Climate Change (IPCC) advises that to avoid the worst impacts from climate change, global CO₂ emissions must be cut by at least 50% by 2050 when compared with current emissions levels.

To bring about these deep cuts, transportation must play a significant role. Even with deep emissions cuts from all other energy-using sectors, transportation will need to reduce its emissions significantly - probably to well below today's levels - if atmospheric concentrations of greenhouse gases (GHGs) are to be stabilized in the range of 450 ppm to 550 ppm CO₂ equivalent by the middle of the century⁽¹⁾.

This article elaborates on analysis originally published in the IEA *Energy Technology Perspectives 2010: Scenarios and Strategies to 2050* (ETP 2010) and *Transport, Energy and CO₂: Moving Toward Sustainability* (IEA 2009). The analysis shows how the introduction and widespread adoption of new vehicle technologies and fuels, along with some shifting in passenger and freight transportation activity to more energy efficient modes, can yield a 30% reduction in transportation CO₂-eq emissions in 2050 compared to 2005 levels, and 70% when compared to baseline trends in 2050.

But substantially changing transportation trends along the lines needed to achieve this large reduction will not be easy. The changes must involve industry, government, and users of transportation services. They will require a combination of the widespread adoption of current best available technology, longer-term development and deployment of many new technologies, a willingness by consumers to buy these technologies and, very likely, make significant changes to their travel behaviour. Major changes will be needed in every region of the world.

Baseline Emissions Trends

Based on recent and expected economic and demographic trends, in particular growth in population and GDP per capita, it is possible to construct "business as usual" scenarios for global transportation energy use that suggests a possible future consistent with the current path. Key drivers of transport energy

use include expected increases in car ownership, air travel, and freight movement by truck and ship, especially around the developing world. As shown in IEA (2010), the result is more than a doubling in global passenger and freight transport activity and about a doubling in associated energy use by 2050, compared with 2007 levels. Under this Baseline scenario, average transport energy intensity falls over time, but not nearly enough to offset travel growth or to prevent energy use from growing.

BLUE Map Analyses: Revealing a Technology Path to Emissions Reduction

To change the direction of transportation energy use and CO₂ emissions will require a radical departure from transportation trends of the recent past. A principal scenario in ETP 2010, called BLUE Map, is presented here. The Baseline and BLUE Map scenario results for transport energy use are shown in Figure 1.

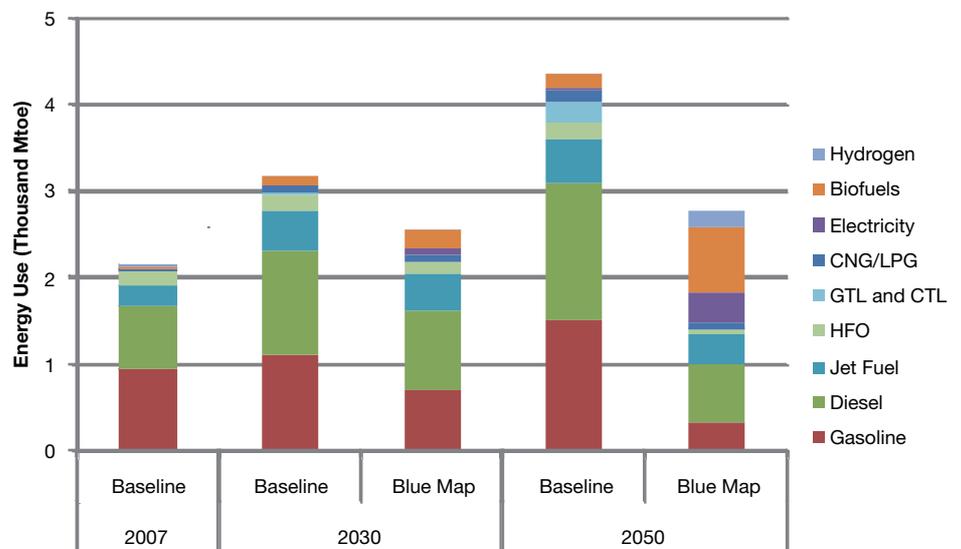
Fuel-efficiency Technologies

In the case of passenger cars and light trucks, a principal implication of BLUE Map is that more aggressive deployment of currently available fuel-saving technologies could be cost-effective in cutting tested vehicle fuel consumption and CO₂ emissions per mile by 30% by 2020 and 50% by 2030. Comparable gains in vehicle fuel economy may be possible for other transportation modes. Built into the Baseline scenario are 20 to 25 percent increases in energy efficiency for these modes by 2050; however, BLUE Map assumes the improvements reach 35% to 50%.

Alternative Fuels

In the Baseline scenario, the mix of fuels remains fairly constant up to 2050, with petroleum fuels remaining dominant. After 2030 an increasing use of non-petroleum resources to derive liquid hydrocarbon fuels, such as gas-to-liquids and coal-to-liquids, could result

Figure 1: Baseline and Blue Map scenarios - Results in terms of energy use



BLUE Map shows that a 70% reduction in CO₂ emissions in 2050 compared to the Baseline (and a 30% reduction compared to 2005 levels) can be achieved through a combination of changes in technologies and fuels. Assuming a real oil price rising to USD 120 by 2050, along with reasonably successful technology development and costs reductions over time, these reductions could be achieved at a cost up to \$175 per metric ton of CO₂ saved, at the margin in 2050. At higher oil prices the marginal costs would be lower. Further, the average costs over the 2010-2040 period could be low or negative, using a low (societal) discount rate. This takes into account the cost of options and the value of fuel savings, which becomes quite large over time.

in an increasing carbon intensity of fuels. In BLUE Map, the share of conventional gasoline and other fossil fuels used by light-duty vehicles falls to below 50% of total supply by 2050 (Figure 2). They are replaced by a combination of advanced, low-CO₂ biofuels, electricity, and hydrogen. If produced from low-CO₂ feedstocks, any one of these fuel options might achieve the overall CO₂ outcome, but each has drawbacks that can limit its full potential and market penetration. Using these alternative fuels in combination, therefore, can maximize the chances of success, even though it would likely result in higher investment costs to develop the more diverse production and distribution infrastructures. For biofuel production, several important issues must be addressed, such as ensuring that the cultivation of land does not adversely affect food supplies or harm

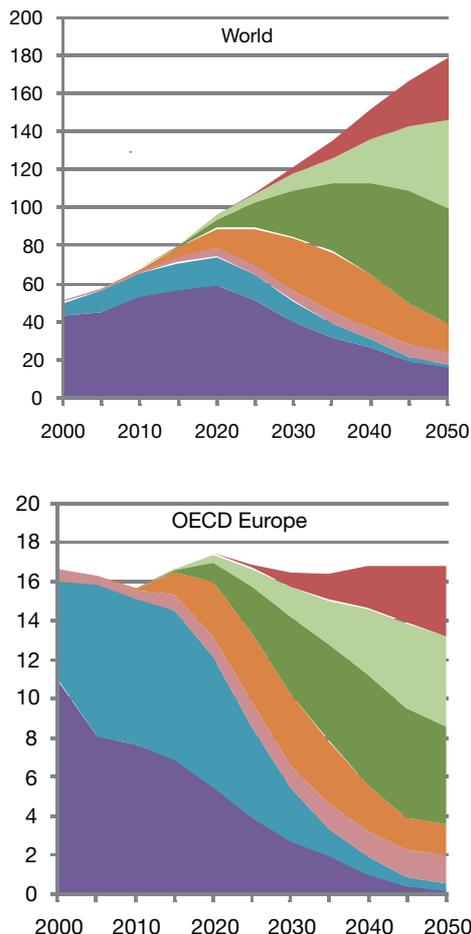
sensitive ecosystems. An increase in biofuel production of about a 20-fold, relative to today's levels, is needed to achieve the energy and CO₂-eq outcomes envisaged in the BLUE Map scenario by 2050. However the total land requirement should be no more than about 5% of global agricultural land, and less to the extent that waste biomass feedstocks are available. This should be possible if land is managed wisely, but if not achievable then biofuels would need to play a smaller role.

Advanced Vehicle Technologies

Electric vehicles (EVs), plug-in hybrid electric vehicles (PHEVs), and fuel cell vehicles (FCVs) all play an important role in BLUE map, especially after 2020. EVs are rapidly emerging as an important option, especially as lithium-ion battery costs decline. Certain policy assistance will be required over at least the next 10 years, such as public planning and support for the development of a suitable recharging infrastructure. The market price of oil, the principal competing fuel, will also be an important factor. The CO₂ emission characteristics of the electric grid are another important consideration. Early deployment of EVs in those regions with already low CO₂ generation, or committed to moving in this direction, might make the most sense. PHEVs represent an important transition strategy and possibly permanently for longer distance drivers. Eventually the internal combustion engine might be swapped out for a fuel cell system, leading to an important role for fuel cells. In BLUE Map this begins to occur after 2025.

In BLUE Map, both EVs and PHEVs are initially deployed in 2010 and increase in sales to over five million per year worldwide and over 1 million in Europe by 2020 (Figure 2). Both vehicle types experience rapid market penetration around the world, each reaching annual sales of around 50 million worldwide by 2050, prima-

Figure 2:
Passenger light duty vehicle sales (millions) evolution by technology in BLUE Map, World and OECD Europe IEA Blue Map Scenario



ry as passenger light-duty vehicles but also a small share of trucks (not shown). Although European LDV sales are not expected to grow much in the future, the market penetration of these new technologies occurs, displacing sales of conventional gasoline and diesel vehicles. This represents much faster growth in market penetration than has occurred for other new vehicle types over the past 40 years. For example, hybrid electric vehicles were first introduced in the mid 1990s and as of 2009 have achieved global sales of only about 1 million per year, less than 2% market share. The market penetration of EVs and plug-ins will need to move at a much faster pace to hit the targets set in BLUE Map. This will require strong policy support. Similar types of changes will be required for trucks, ships and aircraft. And significant changes will also be needed in the manner in which people and goods moved (i.e. mode shares, trip lengths, etc). These issues are discussed in IEA (2009).

Conclusions

Clearly, the changes posited in the BLUE Map scenario will require strong policy actions and a willingness to embrace change. A Carbon price such as via an international carbon market will help, but even a USD 50/tonne price of CO₂ would raise average fuel prices only modestly (i.e. gasoline would increase by about USD 0.40/gallon). Strong sectoral measures such as fuel economy standards across the different transport modes, low carbon fuel standards, and measures to encourage a new paradigm for investing in transport infrastructure will be needed around the world.

Lew Fulton

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(1) CO₂ equivalent includes CO₂, CH₄, and N₂O.

Can Europe 'decarbonise' its transport sector?

THE EUROPEAN ENVIRONMENT AGENCY HAS ALSO PRODUCED ITS 2050 SCENARIO. EXECUTIVE DIRECTOR JACQUELINE MCGLADE'S ASSESSMENT LOOKS CLEAR: IF ALREADY KNOWN STRATEGIES FOR GREENHOUSE GAS EMISSIONS REDUCTION - INVOLVING TECHNOLOGICAL IMPROVEMENTS AS WELL AS 'AVOID' AND 'SHIFT' MEASURES - ARE NEEDED, THEY WILL HAVE TO BE COMPLETED IF EUROPE IS TO MEET ITS PART OF THE WORLDWIDE CLIMATE CHALLENGE.

To keep the global average temperature increase below two degrees, scientists estimate that by 2050 greenhouse gas emissions need to be reduced globally by 50% and 80-95% by developed countries. Accounting for around one-quarter of all EU emissions, Europe cannot meet such ambitious long-term emission targets without reducing emissions from the transport sector.

December's climate summit, COP15 and the Copenhagen Accord, have moved climate mitigation one step closer to the heart of transport policy both globally and in Europe.

Gains offset by growth in demand

Some measures have already been effective in reducing emissions. New passenger cars have been put on a trajectory towards emissions of 95 g CO₂/km by 2020 - almost a 50% cut compared to 1990. Initiatives exist to include vans and, with a longer time perspective, trucks into the emissions targets.

Unfortunately, without complementary measures, most improvements risk to be offset by the growth in traffic. Indeed, more efficient vehicles may lower transport costs in the long run, thereby increasing the demand for transport. This process is already apparent in the airline industry. Half a century ago few could

afford a vacation in Thailand but now it is available to a broad segment of society.

To be achieve the 80-95% cut in CO₂ emissions by 2050 from 1990 levels from the transport sector, policymakers will need to embrace and put into action all measures available rather than opting for a limited selection.

Formulating policy options

Identifying options in a more systematic manner can be done by looking at the main strategies for greenhouse gas emission reduction:

- **avoid** the need for certain types of trips;
- **shift** trips to other transport modes;
- **improve** the individual transport modes.

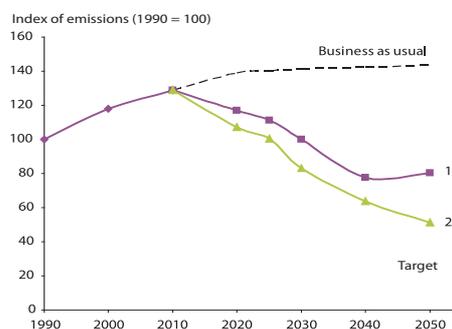
Equally there are five groups of policy instruments that can be employed to achieve the aims of the strategies: planning, regulatory, economic, information and technology instruments. The three strategies can be combined to create a matrix of 15 core categories, as presented in the here above Table.

'Improve' measures, i.e. technological improvements, include improved engine and vehicle design, low carbon fuels and technologies to encourage behavioural change such as speed limit enforcers. Hybrid vehicles can play a role, delivering a significant impact on emissions from cars, light goods vehicles and buses. Electric vehicles are widely predicted to be one of the most effective measures to reduce CO₂ emissions. The scenarios in the European Environment Agency's latest TERM report anticipate an uptake rate of 50-80% in 2050. A 35% reduction in CO₂ for electric cars by 2050 is projected on the basis of a mix of renewable and non-renewable energy sources. These 'improve' measures have the potential to deliver swift benefits, but can only reduce total transport emissions by 44% in 2050.

'Avoid' and 'shift' measures focus on behaviour change. A modal shift is primarily effected through changes in population density, improved town planning and transport networks as well as road pricing. A substantial emission reduction impact can be obtained through

land-use planning by bringing people closer to services. This is particularly important for urban areas, where by 2050 approximately 80% of the EU population are estimated to be living. Another 'avoid' and 'shift' measure is teleworking and virtual conferencing. Teleworking and video conferencing facilities are expected to be far advanced by 2050 and therefore a large majority of commuting trips will no longer be made. The 'avoid' and 'shift' measures have the potential for more far reaching changes. Although such measure won't have immediate effects, we must start planning today. The TERM report foresees a further 20% reduction in transport CO₂ emissions by 2050 as a result of such measures.

Effect of a combination of 'improve' (1), 'avoid' and 'shift' measures (2) on European transport CO₂ emissions by 2050



The combination of 'avoid', 'shift' and 'improve' measures are thus projected to bring about a total reduction in emissions of 64%, which still fall short of the target. Therefore, we need to go beyond what extrapolated from different trails of concepts.

When the unthinkable becomes reality

Implementing the social, economic and technical changes needed to bring about sustainable transport will certainly be very challenging but is not impossible. To address the climate challenge, we must first have a vision of what a truly sustainable transport system should be like, so that all the measures necessary to achieve it by the middle of the century can be formulated with this vision in mind. Creating that vision is the core of establishing a new common transport policy for Europe.

At an EEA transport scenarios workshop in April, we worked with real transport users and planners to get their reactions to a set of sustainable transport scenarios. Participants responded quite negatively to the idea of a 'no aviation' scenario within Europe on the first day of the workshop. But then Eyjafjallajökull erupted in Iceland and its volcanic ash caused mass flight groundings in Europe. So they were suddenly living in a 'no aviation Europe' and we could at least discuss it as an option.

Jacqueline McGlade

Executive Director

European Environment Agency

Policy instruments to 'avoid', 'shift' and 'improve' transport emissions (Following EEA TERM 2009 Report)

Policy instrument	Strategy		
	Avoid	Shift	Improve
Planning	High density mixed land-use development. Restrictive parking standards. Car-free settlements	Integrated public transport. High density mixed use land to be achieved through spatial planning. Investment in passenger transport through land use planning. Infrastructure for NMT. Road freight to rail and sea. Travel planning through planning process.	n/a
Regulatory	Parking restrictions and availability. Vehicle access restrictions.	Traffic management measures including: parking restrictions, access restrictions on the type of vehicles that can be used. Regulation of transport providers.	Vehicle emissions and fuel efficiency standards. Set and enforce speed limits. Restrictions based upon emissions e.g. low-emission zones.
<i>Parking restrictions can be used to "avoid" and "shift"</i>			Use of pricing instruments to encourage investment in more carbon efficient energy and vehicles.
Economic	Fuel taxes, vehicle taxes. Road user charges, parking charges, emission trading.	Subsidise alternative modes. Fuel taxes, vehicle taxes, emissions trading, congestion charging. Low emission zones.	
<i>Fuel pricing discourages travel, encourages modal shift and encourages improved fuel efficiency</i>			
Information	Promotion of alternatives to travel.	Travel awareness campaigns. Personalised travel planning. Public transport information. Increase awareness of alternatives. Mobility management and marketing. Co-operative schemes. Travel planning.	Improve driver behavior (eco-driving schemes)
Technology	Enable virtual interactions: virtual - conferencing, remote working. <i>Travel plans introduced through planning instruments include remote working and teleconferencing.</i>	Improvements in the efficiency and quality of passenger transport.	Vehicle efficiency improvements. Regenerative braking, biofuel. Hybrid electric vehicles, plug-in hybrid electric vehicles, and electric vehicles. Hydrogen vehicles. Rail electrification.
<i>Traffic management is both a "shift" and "improve" policy measure.</i>			

Energy use and sustainability: core aspects of the incoming European transport policy



Energy use and sustainability in transport is really, with a few other issues, at the core of European transport policy. There is a shared view that with a business-as-usual approach, transport greenhouse gas emissions are likely to increase by about 60% by 2050, and that these emissions should be reduced by 80% by 2050, if we are to limit the rise in temperature to 2°C.

Road transport accounts for 72% of all transport greenhouse gas emissions. And it relies heavily on imported oil, an energy source which will become growingly costly and scarce. For all these reasons, reliable alternatives to oil need to be in place by 2050. Most significant **initiatives undertaken** at EU level to achieve this goal are:

- **EU legislation** on clean fuels and green vehicles, which has been put in place step by step during the last two decades. Directives, regulations and communications on fuel quality, emissions from vehicles, internalisation of external costs, information to consumers and public procurement of vehicles contribute to reduce energy consumptions and vehicle pollution, and to promote alternative fuels in Europe.

- **Research and demonstration projects** on alternative fuels, such as hydrogen, fuel cells and biofuels, supported consistently and over a long period of time by the European Commission.

- **The Green Car Initiative with a high priority for electrification of transport**, which was a part of the Union's response to the crisis in the automotive industry. The European Commission activity will comprise funding of research and development, standardisation and facilitation of market introduction of electric vehicles. In particular, the Directorate General for Mobility and Transport will co-fund a large European **electromobility demonstration project** with a €23 million EU contribution. It will provide a platform for technology validation of vehicles, components and infrastructure - as well as a platform for fostering essential development of standards to facilitate the market rollout of electric vehicles.

- **The European Strategy on Clean and Energy**

Efficient Vehicles⁽¹⁾, adopted last 28 April by the European Commission. Besides activities focusing on clean and efficient vehicles including internal combustion technologies, specific actions will be pursued such as standards setting and type approval, in order to promote market take up of electric vehicles in Europe.

Main **future initiatives** of the European Union are as follows:

- In March this year, the Commission adopted the **Europe 2020 strategy**. In this strategy the Commission recognised the particular enabling role of road transport sector for moving out of the current economic crisis and getting back on track towards



development and job creation, based on smart, sustainable and inclusive growth.

- The **new White Paper on the common transport policy for 2010-2020**, which is being drafted and which adoption is foreseen for the end of this year, will present the policy outline for the European transport system and propose concrete actions for its implementation during the next ten years. This will build on the results of a very extensive consultation process which started in June last year with the publication of the Commission's Communication 'A sustainable future of transport'⁽²⁾. One of the few central themes of this White Paper will be to make transport more environment friendly.

- An **Expert Group on Future Transport Fuels** was set up earlier this year, to advise the European Commission on the development of a comprehensive fuel strategy and concrete measures aiming at substituting fossil oil as transport fuel by clean and green energy sources. The very first conclusion seems to be that electric propulsion is the main candidate for alternative fuels to

substitute oil in the long term. However, at the same time, it seems that Europe in the years to come should support a variety of transport fuels - including hydrogen, biofuels, natural gas and electricity - to ensure sustainable mobility for future generations.

- The promotion of new fuel and vehicle technologies, such as electric vehicles, is integrated into the policy framework that the Transport White Paper will outline. To ensure this integrated approach, the Commission will prepare an **Initiative on Clean Transport Systems and a Strategic Transport Technology Plan**, covering all transport modes and all fuels, for end of 2011. The clean transport systems initiatives will focus on the progres-

sive substitution of fossil energy sources by alternative fuels, on the improvement of energy efficiency in all transport modes and on a more efficient transport management. The STT-Plan will provide a framework for research and technological development and deployment based on the policy needs of the transport sector. The Council and the European Parliament have recently adopted the Commission proposal for a directive on the deployment of **Intelligent Transport Systems - ITS** - in the field of road transport⁽³⁾. Its objective is to accelerate and coordinate deployment of interoperable ITS in road transport, including interfaces with other transport modes. Under this directive, the Union would adopt the necessary specifications for ITS applications and services concerned, to be respected by every Member State who would want to deploy an ITS application or service on its territory. European transport policy is slowly but steadily moving towards a policy of sustainable mobility with considerable emphasis, and much more so than in the past, on energy use, energy efficiency, alternative fuels, clean vehicles, optimised transport management and smart infrastructure. The Commission counts on the cooperation of all public and private interested actors to implement this policy.

Zoltan Kazatsay

Deputy Director General of the European Commission's DG Mobility & Transport

(1) COM(2010)186 final.

(2) COM(2009)279 final.

(3) COM(2008)887 final.

NATIONAL RENEWABLE ENERGY ACTION PLANS ARE SOME MEMBER STATES OF CENTRAL AND EASTERN EUROPE ALREADY IN TROUBLE?

21 of the EU's 27 Member States only have delivered their national renewable energy action plan to the European Commission. At the end of the summer, three members of the four of Visegrád (Hungary, Poland, Slovakia), 2 of 3 Baltic States (Estonia, Latvia), and Belgium were still missing.

The submission of such plans is provided for by Directive 2009/28/EC on the promotion of the use of energy from renewable sources. The action plans should include the objectives set by Member States regarding the share of renewable energy produced and consumed in transportation, electricity production and air conditioning in 2020, as well as their chosen path for achieving these objectives. They must include details of national policies aimed at developing biomass resources and biofuel sustainability.

SUSTAINABLE BIOFUELS: KEY ASPECTS OF THE DEBATE

The biofuel sector in Europe: an involved player for sustainable development?

BIOFUELS ARE SET TO PLAY A RAPID AND SIGNIFICANT ROLE IN THE DECARBONATION OF EU TRANSPORT, ALONGSIDE SOLUTIONS REQUIRING TECHNOLOGICAL BREAKTHROUGHS THAT WILL TAKE LONGER TO IMPLEMENT. THEY ARE NOW BEING SEVERELY UNDERMINED, DESPITE THE FACT THAT THIS AGRICULTURAL RESOURCE GIVES REAL OPPORTUNITIES FOR BIO-DEVELOPMENT. LES ENTRETIENS EUROPEENS HAVE ENLIGHTENED THE DEBATE. HERVÉ FISCHER PROPOSES AN INITIAL ANALYSIS OF THE SITUATION.



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Because biofuels are the product of plants that rapidly recycle carbon in the atmosphere, they are included in the portfolio of renewable energy sources deployed by the EU to reduce its GHG emissions and its oil dependence. As they can be assimilated into existing engines, biofuels represent a renewable fuel source quickly available for EU transport.

Controversy and conflicting evidence

After being extolled, biofuels are now being accused of seriously undermining the global food supply, biodiversity and the various environmental compartments by encouraging the expansion of intensive single-crop farming, which eat away at primary forests, wetlands and grasslands.

Yet agricultural land dedicated to biofuels accounts for only 1% of the land cultivated throughout the world. Palm oil is primarily used for consumption, and the European rapeseed and sunflower oils which it replaces are not diverted from their food use. On the other hand, oil cake produced by these oilseed crops covers only 30% of Europe's animal-feed protein needs, which are supplemented by soybean grown in Latin America. Oilseed crops are also rotation crops, and reduce the global impact of crop cycles. Also, the processing co-products are almost fully recovered. Biodiesel is still helping to reduce the production shortfall of European refineries, as well as the carcinogenic pollutant emissions in the automotive sector. So the reality is less prosaic than it might appear and, although there are indeed some disadvantages, biofuels seem capable of emerging from an agricultural and industrial process head held high.

Setting a sustainability threshold

Of course, a biofuel production and cultivation threshold exists beyond which the pressure on ecosystems is not sustainable. Studies per watershed of the impacts of high-volume cultivation and of cropping practices on the different environmental compartments, and compliance with the sustainability criteria set by the European Union are essential. The biofuels industry must also improve its track record by deploying a progressive and multi-sectoral approach aimed at maximising the use of its operating products and the efficiency of its manufacturing processes.

Biofuel sustainability: an unprecedented institutional innovation

The biofuel production sustainability rules issued by the EU - aimed at assessing the environmental, land, climatic and social impact of manufacturing processes, and to only recognize the sustainability of the resulting product, wherever it is produced in the world, if the generated externalities remain acceptable in terms of sustainable development criteria - constitute a paradigm shift. We must be careful to prevent any form of activism from sending this crucial political innovation back to a state of limbo for the sake of a battle of opinion instigated by organizations wishing to see the end of biofuels (much like that of nuclear power) to win political points.

Sustainable biofuels: precursors of sustainable agriculture and green industry

Of course, the certification process is not simple. It is even formidably complex. But we should not smother the crop sustainability debate under the pretext that second then third-generation biofuels are set to arrive, which will supposedly resolve all of the problems caused by first-generation biofuels with a magic wand. Because these issues are scalable to all agricultural and forestry issues, from energy crops in particular to non-food crops in general, and including food crops. It would be extremely hypocritical to want to confine sustainability rules to energy crops only. Can we question energy crops alone, without then questioning the relevance of cotton, flax, hemp, tobacco, bamboo or rubber crops? And beyond that, how can we not wonder about the sustainability of food crops themselves? This false clear conscience would not resist long before a world of almost nine billion people needing to feed themselves, at a time when whole swathes of industrial activity, which are today leaning on petrochemistry, will have to turn to plants as a result of the rising cost of fossil resources. We must aim for controlled bio-development, and, from this point of view, the sustainable biofuels promoted by the European Union represent a first contribution to the emergence of responsible and sustainable green industry and agriculture. Because we need to bridge the gap between agriculture and industry through innovation, capable of expanding our markets and satisfying the demand for public goods such as climate protection and food safety.

On 24 March 2010, Confrontations Europe led Les Entretiens européens in Brussels.

Organized in partnership with Sofiprotéol, with the participation of the European Commission and the French Ministry of Agriculture, the debate was held as part of the EU's Sustainable Energy Week, and was the only one of the week's 86 events in Brussels to address this subject: the biofuels sector is widely reviled, and yet it deserves to be better known.

150 representatives from institutions, associations and businesses came to listen and discuss the issue with fifteen manufacturers, politicians and international experts. You can find the proceedings of Les Entretiens européens debates, and of the 5 thematic preparatory meetings at www.confrontations.org

VERBATIM

Xavier Beulin, SOFIPROTEOL - The sustainable biofuels produced in Europe represent a first contribution to the emergence of responsible and sustainable green industry and agriculture.

Paul Hodson, DG Energy of the Commission - Biofuels are a central element of the Union's energy policy. They also generate more new jobs than any other renewable energy.

Jan-Erik Petersen, European Environment Agency - In the world trade framework, every new land use in Europe will have a worldwide impact on food and extra-European land use.

Maria Benitez, DG Agriculture of the Commission - Europe's agricultural sector is able to produce enough to fill its food mission, and to meet the 20% renewable energy target in 2020.

Bruno Le Maire, French Minister for Agriculture - Biofuels offer a genuine solution for the reduction of carbon emissions into the atmosphere due to transport, because it has the huge merit of already being operational. We would be well advised to continue down this path.

Raffaello Garofalo, European Biodiesel Board - Europe is importing 20 million tons of biofuels from former USSR countries, and such imports will increase. Besides the question of greenhouse gas emissions, the issue of energy independence is therefore also raised.



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Bio-development of tomorrow

Under certain conditions, the cultivation of biofuels can become an engine for agricultural and rural growth in Europe and worldwide. The African cotton experience demonstrates this. On 24 March, we explored the conditions and limitations of such an approach, including the need to territorialise the issue and for sequential, reviewable and consistent - in other words concerted - European energy, climate, agricultural and development policies. Current events today reveal the difficulties faced by European farmers, whose fate seems devoid of prospects, despite the fact that the destinies of sustainable development and bio-development are linked. Chemistry, energy, construction and of course food... not a single sector really has a future without agricultural redeployment. From this point of view, there is no fundamental difference between the fate of Europe and that of the South.

The essential external component

Of course, the least developed countries will not be able to develop their agricultural sector alone. For bio-fuel development to lead to improved living conditions and food safety in poor countries, investment is needed in their backup public goods: agricultural infrastructure, training, research, market institutions, legal system, etc. It is the duty of developed countries to help them via financial and technology transfers, which

could in fact also be the subject of a chapter in this climate agreement so difficult to come by. The rise in the level of agricultural prices (marginally as a result of biofuels) and the deepening of the biofuel market in OECD countries (which will call for massive imports), offers us a good opportunity to strengthen our co-development policies. We will need to help poor countries develop their food crops (by decreasing or doing away with our export subsidies, coupled with financial and technical aid), and provide food aid capable of protecting the weakest urban and rural dwellers, who are net buyers of food (50-90% of Southerners) and will suffer greatly from the rise in food prices. We should not forget, however, that the farmers in the South are in favour of biofuels, as they open the door to cash crops capable of generating income and currency and of supplying energy alongside food crops.

Support for the sector and the global market

The development of biofuels throughout the world will lead to interaction between the demands of different areas, and inevitable regulation problems. There is little research on market interdependence, but it is already high, and we need a holistic approach that is not based on co-development issues alone: battles will be fought in the field of international trade, so the gap will need to be bridged between environmental and agricultural issues. The biofuels sector provides an emblematic example of a sector in which multilateral

environmental and trade regulation agreements need to be linked. We have not managed that as yet, but it is a medium-term policy objective.

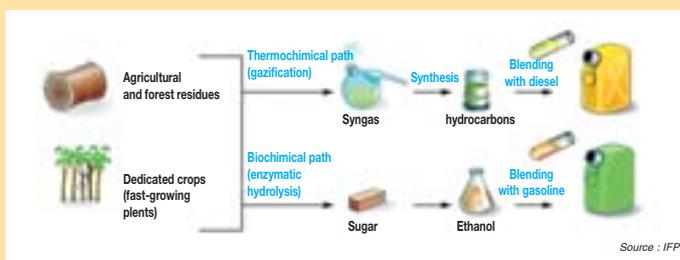
Whether the biofuel industry succeeds in Europe over the long term will depend on support policies, which have remained national in nature until now. Yet, the issue of harmonisation at Community level will be quickly raised, precisely because of the growing opposition between imported products, which are not supported but subjected to inevitable competitive dumping practices that are difficult to control, and EU products having benefited from subsidies in return for irreplaceable environmental guarantees. Therefore, the demand for European certification will need to draw on an EU industrial policy, a harmonised fiscal policy and redirected government aid. On this last point, the common agricultural policy, with its decoupling of environmental service and production, needs to be reconsidered in order to link production for market and research for the common good. Finally, the economic equilibrium of the biofuels sector is largely determined by the oil market. The fight against price volatility, which is fierce and has a negative impact on the sector, calls for another commitment from the European Union: an oil policy forming part of an overall plan outlining the contours of a new European energy policy.

Hervé Fischer

Managing director of Les Entrepreneurs européens

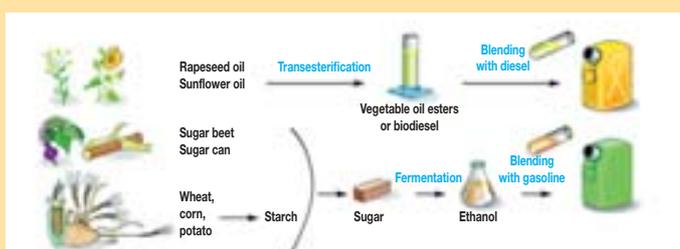
TYPES OF BIOFUEL

• **First generation:** produced from crops' storage organs, i.e. the seeds of cereals or oleaginous plants, sugar beet roots and oil palm fruit, which store sugar, starch or oil. These storage organs are also used for human consumption. They produce ethanol, used in petrol engines, and vegetable oil methyl esters (VOME), used in diesel engines.



• **Second generation:** produced from lignocellulose, which is contained in all plant cells. In other words, the whole plant is used. Straw, stems, leaves, green waste and even dedicated, rapidly growing plants (i.e. Miscanthus) can be used.

Two methods exist, one for producing biodiesel (the Fischer-Tropsch process) and another for ethanol (fermentation).



• **Third generation:** research into the use of algae fuel, produced from algae, is currently underway.

Examples of opened and closed micro-algae production reactors



PRODUCTION KEY FIGURES

The GRFA (Global Renewable Fuels Alliance) estimates the global production of ethanol in 2009 at 73.9 billion litres (54% in the USA, 34% in Brazil and 5% in the European Union), and that of biodiesel at 16.4 billion litres (60% in the EU, 10% in the USA, and 8% in Brazil).

With **12.1 million tonnes of oil equivalent consumed in 2009**, biofuels accounted for 4% of the energy content of fuel used in road transport in the European Union.

The breakdown of European biofuel consumption devoted to transport is still largely to the advantage of biodiesel consumption, which represents 79.5% of the total energy content, compared to 19.3% for bioethanol, 0.9% for pure vegetable oil, and 0.3% for biogas.

With **growth of 18.7% between 2008 and 2009** (following + 45.7% between 2006 and 2007 then + 28.5 % between 2007 and 2008), biofuel consumption increasing in the EU seems to mark time. Between 2008 and 2009, bioethanol consumption growth (+ 31.9%) has been for the first time stronger than the one of biodiesel (+ 19.9%), while the one of pure vegetable oil collapsed (- 72.3%), and the one of biogas for cars increased by 23.2% (source: EurObserv'ER 2010).

Marie-Ange Schilling

Project manager for Les Entrepreneurs européens

Commission unveils its ambitions for the European sustainable biofuel market

THE EUROPEAN COMMISSION ADOPTED ON 10 JULY A LEGISLATIVE PACKAGE CONSISTING OF TWO COMMUNICATIONS AND A DECISION, WHICH SHOULD MAKE IT EASIER FOR MEMBER STATES AND THE CORPORATE SECTOR TO IMPLEMENT THE RENEWABLE ENERGY DIRECTIVE, WHICH WILL TAKE EFFECT IN DECEMBER 2010.

These texts provide information on the sustainability criteria to be applied to all types of biofuels, including biofuels imported into the EU, and what should be done to ensure that only sustainable biofuels will be recognized under the obligations imposed by the Directive⁽¹⁾.

• **Sustainable Biofuel Certificates:** The Commission encourages industry, governments and NGOs to set up «voluntary schemes» to certify biofuel sustainability - and explains the standards these must meet to gain EU recognition. One of the main criteria is that they have independent auditors that check the whole production chain, from the farmer and the mill, via the trader, to the fuel supplier who delivers petrol or diesel to the filling station. The Communication sets standards requiring this auditing to be reliable and fraud resistant.

• **Protecting untouched nature:** The Communication explains that biofuels should not be made from raw materials from tropical forests or recently deforested areas, drained peatland, wetland or highly

biodiverse areas - and how this should be assessed. It makes it clear that the conversion of a forest to a palm oil plantation would fall foul of the sustainability requirements.

• **Promote only biofuels with high greenhouse gas savings:** The Communication reiterates that Member States have to meet binding, national targets for renewable energy and that only those biofuels with high greenhouse gas savings count for the national targets, explaining also how this is calculated. Biofuels must deliver greenhouse gas savings of 35% or more compared to fossil fuels, at least initially, rising to 50% in 2017 and to 60% (for biofuels produced from new installations) in 2018. The following three documents can be found at http://ec.europa.eu/energy/renewables/biofuels/sustainability_criteria_en.htm:

- the Communication on voluntary schemes and default values in the EU biofuels and bioliquids sustainability scheme;

- the Communication on the practical implementa-

tion of the EU biofuels and bioliquids sustainability scheme and on counting rules for biofuels;

- the Decision on guidelines for the calculation of land carbon stocks. The Commission will publish a report on indirect land use by the end of the year, as requested in the Renewable Energy Directive.

Hervé Fischer

(source: press release of the European Commission)

(1) Directive 2009/28/EC on renewable energy sets the Union an overall objective of a 20% renewable energy share of total energy consumption in 2020, which is then broken down into binding national targets for Member States. In the transport sector, each Member State must also achieve the objective of incorporating 10% renewables. These renewable energies include solid biomass, wind, solar energy, hydropower and biofuels. Only biofuels fulfilling EU sustainability criteria are taken into account in achieving the objectives set by the Directive and are eligible for government support, for example in the form of tax relief.

The European Parliament got involved unequivocally



The use of biofuels in transport has been strongly debated in the European Parliament when the climate and energy package was being discussed in 2008. The transport sector accounts for one quarter of total greenhouse gas emissions in Europe. The new regulatory framework sets a 10% target for the share of biofuels in transport petrol and diesel consumption by 2020, and requires for both production and imports to comply with European sustainable development criteria. These objectives must now be fulfilled.

At the time when the directive on renewable energies was being debated by the Parliament and the Council of the EU, the biofuels sector was facing some very serious accusations. It was allegedly responsible for rising food prices, widespread deforestation and even famine in developing countries. Even at the time, these sweeping accusations were rather simplistic. While it may be true that the introduction of biofuels pushed up prices in the very short term, rising oil prices and drought were also to blame. But it is the long-term trend that we should be looking at and, when we do, it becomes apparent that the rise in food prices was caused by a combi-

nation of two things. Firstly, the increase in demand - which, in itself, is a positive thing - in India and China. Secondly, the introduction of incentives to encourage farmers in the United States and Europe to decrease production. Biofuels have not reduced the agricultural land area, but neither do they offer a solution to all the challenges we are facing. So, rather than settling for an over-simplistic approach, we should remain watchful at all times.

Biofuels will have a role to play. However, to bring their advantages to bear, we need to develop a transversal approach to agriculture, integrating both farmers and industrialists. We, Members of the European Parliament, have often pointed out the dangers of an inadequately coordinated policy. Biofuels can contribute, with other techniques, such as synthetic fuels, electricity and hydrogen, to reach the ambitious 2020 target. In addition to reducing greenhouse gas emissions, they will generate new jobs and reduce oil dependency. Lastly, they will help improve the financial situation of farmers, who have been facing so many problems recently. The European Parliament will clearly support this approach.

Alejo Vidal Quadras

Vice-president of the European Parliament



This share rose in EU27 to 3.4% in 2008, then 4% in 2009 (10.5 then 12.1 Mtep). Comparison of the current trade with the directive on biofuels objectives (2003/30/EC) therefore gives 4.8% for 2010, for a 5.75 % target. It has to be said that the biofuel incorporation rate performances of the countries vary widely. A good many of them will certainly resort to imports to meet their targets.

CAR MANUFACTURERS AND AIRLINES STAND AT THE HEART OF THE BIOFUEL DEBATE. JOSEPH BERETTA OF PSA AND PIERRE ALBANO OF AIR FRANCE HAVE ACCEPTED TO SHARE THEIR POINT OF VIEW. WHILE REGIONAL, STANDARDISED 1ST-GENERATION BIOFUEL MARKETS ARE SUITABLE FOR THE AUTOMOTIVE SECTOR, ONLY THE VOLUMES PROMISED BY 2ND-GENERATION BIOFUELS WILL ENABLE THEM TO MAKE A QUANTUM LEAP IN TERMS OF INCLUSION. HOWEVER, THE AIRLINE INDUSTRY - WHICH WILL BE ENTERING THE ETS IN 2012 - WILL SOON ALSO BE TAPPING INTO A GLOBAL 2ND-GENERATION BIOFUEL MARKET. WE MAY BE IN FOR A BUMPY RIDE...

Biofuels and automobile: standards have to be established



© Andy Han

Long-term forecasting is never an easy task. The first step is to identify the major milestones: a factor 4 reduction in CO₂ emissions by 2050, and a 20% share of renewable energies in the European energy mix by 2020. The next step is to apply these targets to the automotive industry: regulation to reduce CO₂ emissions to 130 g per km by 2015 and to 95 g per km by 2020, and a 10% share of renewable energies in transport fuels by 2020 (biofuels, biogas and electricity).

Realistically, the transportation and automotive sectors will still be largely dependent on liquid fuels - including of course biofuels - in 2030. Biofuels must account for 10% of the total energy content by 2020. The automotive industry is caught between the hammer and the anvil in all of this. On the one hand, the European CO₂ regulation establishes a fleet-average CO₂ emission target of 130 grams per kilometre by 2015. Manufacturers failing to meet this target will have to pay a penalty of 95 euros per extra gram, multiplied by the number of vehicles sold. The long-term target is 95 grams per kilometre, to be reached by 2020, and the CO₂ emissions of vehicles running on biofuels will be reduced by 5 grams until the end

of 2015 only: no such reduction applies in the 2020 standard. We should therefore be working towards introducing a reduction for biofuels in the 2020 standard, as they will by then account for a significant share of overall transport fuel consumption. On the other hand, consumers do not want to see any changes: their engines must continue to run correctly and reliably, the purchasing price must not be affected and the new fuels must be easily available.



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PSA has an experience of 10 years with B30

Lastly, consumers consider the environmental image of a firm when making their purchasing decisions, and all the industry players are working on this image. Europe has defined sustainable development criteria to allow for the use of biofuels.

However, the industrial sector has warned that these criteria are inadequate to meet consumer expectations.

There are standards for conventional fuels and for bio-

fuels, but nothing concrete on fuel mixtures. The latter may produce collateral effects, such as deposit formation, oil dilution, and an increase in the aggressiveness of the oxygenated substances in the biofuels. To offset this risk, we would like to see a European standard for fuel mixtures. In fact, the engine and the fuel must always be mutually compatible. Biofuels could throw current engine anti-pollution systems off track, and thus have a negative impact on local pollution. PSA - thanks to their additive-enhanced particulate filter system - can use a 30% biodiesel mixture, with which it already has a great deal of experience. In addition, their petrol vehicles are compatible with E10 (petrol containing up to 10% of ethanol).

As of 2020, second-generation biofuels from biomass will also be used. They will be fully compatible with fossil fuels and first-generation biofuels, as their development cycle includes a synthesis phase. This second generation will be 100% compatible with all engine types. Therefore, by 2030, we will be able to reduce significantly oil dependency in the transportation sector through the use of biofuels.

Joseph Beretta

Head of Energies, Technologies and Automotive Emissions at PSA Peugeot Citroën

International aviation in need of second-generation biofuels

Aviation is responsible for 2% of anthropogenic CO₂, but polls show that the public's intuitive perception estimates this responsibility at 12%, which shows just how poor the image projected by aviation is in terms of its climatic impact. Yet the average fuel efficiency of Air France is 95 g of CO₂/passenger/km (i.e. 3.8 litres/pa./km). Fuel efficiency varies between 8 l/pa./km for a short take-off Paris to London flight, and 2.8 l/pa./km for a Boeing 777 linking the West Indies to the mother country. 80% of emissions are attributable to long haul flights, however, and only 20% to short and medium haul flights, 9/10th of which are emitted on routes offering no modal alternatives. Aviation fuel efficiency gains are easy to calculate: for every ton of kerosene burned, 3.15 tons of CO₂ are emitted. This points the way to the main technological levers for improvement:

- renewing the fleet with aircraft with better designed aerodynamics and engines will accomplish 80% of the forecast reduction in emissions;
- optimisation of load, air traffic control and routes will do the rest.

Air France invests €2 billion each year in the

renewal of its fleet. Its climate plan consists of three steps: measure - reduce - offset. Measuring is easy. Air France provides its customers with an online calculator, and produces CO₂ reports for its key accounts. But the efforts made are not successful in offsetting the growth in demand, and compensatory tools need to be developed. This is why Air France actively supports the implementation of a global ETS for aviation.

Over the long term, the [income]/[mobility] correlation is perfect, and the [mobility]/[oil liquid fuel] link is firmly established. As we are currently short of technological breakthroughs, we must look into substitutes for the fossil carbon in fuel. For Air France-KLM, these alternative fuels must be ethically acceptable, which 1st-generation biofuels are not on account of the food and forestry-related controversy they generate. The other crucial criterion is that they must be "drop in" fuels, in other words they must be capable of being loaded in today's aircraft. At the end of the day, only CTL (Coal to Liquid), GTL (Gas to Liquid), BTL (Biomass to Liquid) and HVO (hydrotreated oil) fuels meet these specifications.

Europe is not lagging behind in its alternative fuel R&D, but it does have some catching up to do regarding its international position. Take for example the U.S. companies grouped around Boeing, who pushed for the SAFUG initiative aimed at defining eligibility criteria for alternative fuels pursuing an approach oriented towards the social acceptability of biofuels. We could also mention the IATA initiative (10% biofuels by 2017), representing 92% of world traffic. Europe is getting itself organised with the SWAFA, notably involving ONERA, Airbus, Snecma, and IFP. As part of the Grenelle environmental law, Air France has committed itself to closing its domestic routes if a more effective modal alternative exists. And KLM is aiming for carbon neutrality in its 2007/2012 strategy.

One difficulty will lie in finding the raw material for making aviation biofuel, because it means competing with the diesel and jet fuel sectors - which use the same resource (oil) - and the kerosene market represents only 7% of oil sales, with higher technical specifications for aviation biofuels are than for cars.

Pierre Albano

Vice President Environment, Air France-KLM

The contribution of biofuel certification to the sustainability of the European biofuel market



CERTIFICATION IS AN IMPORTANT TOOL FOR IMPROVING THE SUSTAINABILITY OF THE EUROPEAN BIOFUEL INDUSTRY. HOWEVER, THE CONTRIBUTION OF CERTIFICATION IS LIMITED AND ALONE WILL NOT GUARANTEE SUSTAINABLE BIOFUELS. COMPLEMENTARY ACTIONS ARE ALSO NEEDED FROM GOVERNMENT AND THE BROADER BIOFUEL INDUSTRY, SAID NADINE MCCORMICK, ENERGY NETWORK COORDINATOR OF THE INTERNATIONAL UNION FOR CONSERVATION OF NATURE (IUCN).

Sustainable biofuels: or no biofuels

Approaches for implementing sustainable biofuel policies can be analysed along different scales: mandatory to voluntary, national to international. Most of the commodity schemes that exist are voluntary and international in nature, such as the roundtables for soy, palm and sugarcane as well as the meta-standard from the Roundtable on Sustainable Biofuels (RSB, 2010). Other approaches include government regulation, such as the criteria contained with the European Commission's Renewable Energy Directive (RED) and international standards such as those under development at ISO. Companies can also set up their own private schemes. While each approach has their individual strengths and weaknesses (Dubois, 2008), the main difference lies in the *process* for standard development, which leads to different outcomes in the *content* - and ultimately affects the credibility and acceptability of the scheme.

Arguably, the sustainable biofuel market is different to that of other commodities, such as FSC wood or MSC fish; producers are not aiming at a niche market but have blending requirements in more than 50 countries worldwide. There is a demand from governments for sustainability (as a minimum, GHG reduction) and especially from broader civil society. If unsustainable biofuels proliferate in the market, the biofuel market will likely be threatened through a reduction in policy targets and mandates. Biofuel targets have already been reduced in countries from Germany to Indonesia to New Zealand, while temporary moratoriums have also been implemented, such as in Tanzania during 2009.

In short, rather than simply differentiating a product, biofuel certification acts as a "license to operate" for producers. It is therefore important to get the certification "right".

Defining credible biofuel standards

A certification scheme is only as good as the standards it sets; the final content of the standards depends on who sits at the table. The most balanced and effective standards originate from a true multi-stakeholder approach, meeting the requirements of business and civil society. For example, conservation communities can provide guidance on biodiversity, while companies can offer a reality check on what is feasible in a supply chain.

This approach is supported by the ISEAL Alliance, which has developed Codes for Standard Setting and the assessment of sustainability impacts. When setting social and environmental standards, ISEAL members ensure a process that is transparent and based on participatory decision-making. Such an approach should be considered by governments when considering which schemes to accredit for use in their jurisdiction.

Full Members of the ISEAL Alliance

The global association for social and environmental standards



Encouraging convergence to improve implementation

While most sustainability schemes are split along the 3 commonly accepted elements of sustainable development (economy, society, and environment), differences arise in the detail across different schemes, depending on the specificities of the issue/commodity as well as the expectations of a multi-stakeholder group.

In some cases, significant divergences have arisen between schemes (Scarlat et al, 2008). For example, the EC is innovative in proposing minimum sustainability criteria for biofuels to qualify towards the target, it is focused on high biodiversity value areas and GHG emission saving, and does not contain social criteria. Differences in how the criteria are defined between different schemes are also important, particularly where one is perceived lower or easier to attain than in another scheme. Such differences between schemes create an unlevel and confusing playing field for biofuel producers to operate in. This confusion ultimately acts as a barrier to producing more sustainable biofuels. To address this, the leading roundtables are undertaking a benchmarking exercise with a view to reducing confusion between standards through mutual recognition.

Limits of certification

Where biofuels are produced, certification can help to ensure the sustainability of the production, but not the use. While the market may determine total production, such levels could potentially be too high for ecosystems already under pressure from food, feed and fibre demands. It is therefore up to governments to set realistic targets (IRGC, 2010).

Secure land tenure is also one of the main determiners of whether biofuels are developed sustainably or not. Governments need to provide the necessary frameworks to allow for effective consultations when concessions are being considered. Governments in producer countries in particular need to enforce legal requirements for environmental impact assessments, and fill in legislative gaps where they exist. The Global Bioenergy Partnership (2010) has developed indicators to assist governments in developing countries.

The broader transportation system has a role to ensure that where biofuels are used, they are used as sustainably as possible and are not being wasted in inefficient engines or needless journeys. A reduction in overall fuel demand will therefore mean that biofuels percentages will go further.

Conclusions

Certification is a useful tool to guide producers to more sustainable action. However, biofuels are different to other commodities in that sustainability is not a niche market but a license to operate in Europe. It is therefore essential that when developing sustainability schemes ISEAL's Code of Practice is followed to ensure that the process, and therefore the content, is credible. This alone will not ensure the sustainability of the biofuels market. Governments and industry also need to provide the relevant conditions to ensure that the use as well as production of biofuels is truly sustainable.

Nadine McCormick

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The CO₂ balance of biofuel sectors: Straight-A students are rewarded with simplicity

Directive 2009/28/EC imposes the use of sustainable biofuels in Europe. One major criterion concerns the economy of greenhouse gas emissions (GHG) compared with fossil fuels, from 35% on 1 December 2010 (1 April 2013 for installations in operation before 2008), to 50% on 1 January 2017, and 60% one year later for plants commissioned after 2016.

The directive provides a method for calculating GHG emissions and tables of typical and default values, supplemented by communications (see p.8), which Member States must refer to when assessing their biofuel production industries. In Europe, the JEC Consortium - which includes the Commission's Joint Research Centre - together with EUCAR and CONCAWE are in charge of developing and updating this system.

The directive states that each Member State must provide a list of regions in which the cultivation of biofuels generates on average less GHG than envisaged by the JEC (which establishes typical global averages by sector), based on a calculation method that is to be explained. The approach may seem complex, but the stakes are high: if a Member State succeeds in proving this, and if its biofuel production industries meet the sustainability criteria set by the directive, then those industries will be exempt

from calculating the actual economy in greenhouse gas emissions plot by plot, and will be able to use the Directive's default values for all the energy crops produced in the approved regions. Which makes things much simpler in technical and administrative terms!

France has taken the matter very seriously by entrusting the analysis of the life cycle of its biofuel industry to a steering committee comprising the ADEME, the Ministries of Agriculture and Environment, and FranceAgriMer, associated with a technical committee composed of industrial players, technical institutes and environmental NGOs. This work produced a methodological reference framework in 2008 and results in April 2010.

GHG emission reduction due to first-generation biofuel use

Reduction of GHG emissions	ADEME 2010	Directive 2009/28/EC		
		Type values	Default values	
Ethanol (ETBE excluded)	sugar can	72%	71%	71%
	sugar beet	66%	61%	52%
	corn	56%	56%	49%
	wheat	49%	32 to 69%	16 to 69%
Biodiesel	soybean	77%	40%	31%
	palm oil	76%	36 to 62%	19 to 56%
	sunflower	73%	58%	51%
	rape seed	59%	45%	38%

As a result of this study, all of its energy-crop producing regions (beet, corn, wheat, rapeseed and sunflower) qualified for the default calculation method, with the exception of 4 of 18 regions producing wheat for bioethanol. But the story does not end there. Once the GHG economy criterion has been determined, another needs to be defined for the non-use of land presenting a high value in terms of biodiversity or important carbon storage. Whereas determining non-eligible primary woodlands, wetlands, forests and bogs (or possessing one such quality in January 2008) should not prove a problem, determining the areas designated for the protection of nature and grasslands might be more difficult. The Commission has not defined criteria for these areas of grassland and, with the existence of Natura 2000 areas and natural parks and the emergence of "green and blue" networks, this could quickly become a geo-economic brain-teaser... and also prove a great source of encouragement for second and third-generation biofuels, without which - in France and elsewhere - the targets for incorporating renewable energy into the transport sector could be difficult to achieve without resorting to massive imports.

Hervé Fischer

For a new paradigm of the agricultural development



The Common agriculture policy (CAP) reform process - which began with the 2008 "Health Check" - is crucial, not only for the agricultural sector itself but for the whole European project.

In both Europe and the rest of the world the 21st century will see either a firm transition towards global governance, or a deepening of divisions that will put the entire human race at risk. Three challenges in fact lie ahead:

- the full range of environmental issues: biodiversity, the protection of natural resources (water and soils), and the fight against global warming;
- the energy issue and the mass shift from fossil fuels to other energy sources, which will completely change the construction of development models;
- the food supply issue, since there are now over 1 billion hungry people worldwide, and by 2050 there will be 2 to 3 billion more.

These 3 challenges are intrinsically linked to agriculture, and they can only be resolved in the medium and long terms if they are incorporated into the agricultural policy itself. Guaranteeing food safety and providing an adequate food supply in terms of quantity and quality are no longer the only issues. The task now is multifold: protect natural resources and biodiversity, prevent global warming and optimise production performance and agricultural yield. At first glance, these goals seem to be contradictory and impossible to achieve. To succeed, the agricultural devel-

opment paradigm will have to be changed. The fundamental principle of this new paradigm is to make the most of nature's potential, in order to combine economic performance with ecological performance and social performance as well. The aim, in fact, is to replace the current model, which, thanks to fossil fuels, ignores all the natural mechanisms and specialises in agricultural production and livestock breeding. The scope is huge, and several new strategies, such as organic farming, soil preservation and sustainable agriculture - which are currently being tested and which I am promoting at a European level - offer a lot of potential for reducing the use of inputs and drawing full benefit from solar energy through photosynthesis.

I made the decision to go down this road several years ago, and my choice is reflected in my report to the European Parliament on agriculture and the fight against global warming⁽¹⁾. This should also emerge in the opinion issued by the European Parliament as formalized by MEP George Lyon's report⁽²⁾. There is a whole new frontier to explore, and the debate emerging in Europe must anticipate and guide new developments in the agricultural sector. This is why debating agricultural policy also means debating the European project itself.

Stéphane Le Foll, member of the European Parliament's Agriculture Committee

(1) Report A7-0060 dated 24 March 2010 available on Parliament's website.

(2) Report A7-0204 dated 21 June 2010 on CAP future after 2013, adopted the 8th of July by the Parliament.

THE UPROAR OVER PALM OIL

CIRAD, the International Cooperation Centre for Agricultural Research and Development, puts certain myths to rest...

Myth No. 1: Primary forest is cut down for the planting of oil palms

Of the 21 million hectares of primary forest that disappeared in Indonesia between 1990 and 2005, only 3 million hectares were used to create palm plantations. The remaining 18 million were exploited for timber, pulp and paper, and charcoal. The deforested areas in which trees were not replanted evolved into degraded savannahs. How can we avoid cutting trees down? It is the timber trade that initially provides people with the means to begin investing in plantations. To avoid more plantations in primary forests, we therefore need to provide an income equivalent to that received from logging, and move palm plantation projects to degraded savannahs. By cultivating all of the degraded land in Indonesia, we could satisfy the entire world's fatty substance needs until 2050.

Myth No. 2: Palm oil is used to make biofuels

Today, less than 1% of global palm oil production is converted into biofuel. 80% goes to food, and 19% to oleochemical products (cosmetics, detergents) and animal feed. So there is no direct competition between food and energy uses. However, biofuels are responsible for placing lasting pressure on the prices of vegetable oils, which have become dependent on oil prices. In addition, in Europe they consumed 20% of the 5.4 million tonnes of palm oil imported in 2009, thus justifying the sustainability criteria required for all biofuel consumed in the EU27.

You can read the full article by Alain Rival at www.cirad.fr

An end to ideological stances

SYLVIE BRUNEL, GEOGRAPHER, WRITER OF *NOURRIR LE MONDE, VAINCRE LA FAIM* ("FEED THE WORLD, BEAT HUNGER", 2009, LAROUSSE) AND FORMER PRESIDENT OF ACTION AGAINST HUNGER, THROWS LIGHT ON THE FOOD CONTROVERSY AFFECTING BIOFUELS.



The sharp rise in hunger riots in 2007-2008 has given a special resonance to one of man's greatest fears: that of running out of food.

The planet's food resources might one day run out - at least according to a certain school of thought, well represented by the media, NGOs and governments, each reinforcing the millenarian beliefs of the other. In reality, all it took was a cyclical 10% decline in production in 2007, caused in part by poor harvests, for prices to soar. In 2009 they then fell sharply, resulting in serious income problems for farmers.

In fact, the cyclical surge of 2007-2008 was above all triggered by speculation and anticipatory purchase, and highlights the extreme dependence of many developing countries on their food imports. This is explained by the fact that, during **the debt crisis, most developing countries turned to global markets to feed city dwellers.** International agricultural competitiveness led to the determination of global wheat, corn and rice prices without consideration being given to real production costs, with levels fixed by the most competitive Northern producer and artificially achieved through export subsidies and direct agricultural income aid. **The subsequent invasion of cheap agricultural products - to which governments had given priority over their internal production to reduce national debt - decimated producers in the South.** As a result, farmers in the North are feeding the cities of the South, while

farmers in the South are finding themselves forced to abandon their land because the income it generates is insufficient.

But can we accuse the countries in the North of wanting to starve developing countries? Such invective is more generally the result of media opportunism than scientific reality. First, because countries have not coordinated the maximization of their short-term interests. Second, because developing countries have been the first to sacrifice their farmers on the altar of industrialization and social peace, for which cheap food in urban areas is required, and the importation of which supplies currencies. **The sharp rise in prices at the beginning of 2008 only highlights the absurdity of this food dependence.**

These food-related tensions, which have resulted in both urban discontent and the resurgence of the great Malthusian fears (Is the earth overcrowded? Are we going to run out of food?), take on special meaning at a time when sustainable development is becoming the political priority of the North. This is why we must address the issue of food supply, especially as agricultural land set aside for food crops is under an ever-increasing threat from other possible uses. **At the heart of the problem are biofuels, currently the focus of clashes. However, as geographers have affirmed time and time again, our use of the total area of agricultural land is far from optimum.** Ways exist of increasing agricultural production - both vertically (yield) and horizontally (surface) - in Latin America, Eurasia, and the United States. So should it fall to these continents to feed the world? It would appear that the current situation is providing farmers around the world with an opportunity: that of finally being considered full partners in their governments' growth strategies. There is a growing divide between world-market-oriented, subsidized, capital-intensive, labour-poor modern

agriculture and family-owned establishments home to struggling farmers unable to break into the urban and international markets. This divide largely transcends North-South differences, and the current food crisis shows that it is not sustainable: offering small producers the opportunity to live comfortably from their work is the only condition for resolving the food dilemma and making it possible for food prices to drop in domestic markets.

In this context, the biofuel debate takes on a particular significance: What effect might it have on the issue of agricultural income, both in the North and the South? How is our attraction for biofuels affecting the race for agricultural land in the South? Can we draw a contrast between food crops and cash crops, and urge farmers in the South to turn their attention to food production? What would such an injunction imply in terms of geography? How would it be implemented by the countries of the South? What would the impact on farmers be?

These questions open up avenues of research, which we need to pursue. And **yet invective abounds in the media - take, for example, the systematic accusations against the oil palm grown in Indonesia and Malaysia, or the reluctance to consider all aspects of sustainable development, necessary for an impartial investigation into the viability of biofuels.**

Consequently, this contribution is first and foremost a call for additional studies on this subject. As long as ideology takes precedence over the facts, the issue of biofuels cannot result in durable solutions for either the planet or those dwelling, building solutions and attempting to live with dignity on it. **For the 1.3 billion poor farmers - many of whom are suffering from hunger for want of remunerative prices and a guaranteed market - this has become essential.**

Sylvie Brunel

CASH CROPS AND AGRICULTURAL GROWTH: AFRICAN COTTON SETS THE EXAMPLE

Will biofuel crops inevitably have a deleterious impact on access to food? Not necessarily... in its 2008 report, the FAO points out that African cotton is an emblematic example of a non-food crop capable of generating both a farming income and an improvement in production conditions and access to food crop produce. In West Africa, cotton production has in fact contributed to the rise in incomes and to improving access to education and health care. The cultivation of cotton in rotation with coarse grains has boosted the production of cereals, which have benefited from better access to fertilizers acquired through the cotton credit and input system. Cereal fields have also benefited from good farming practices thanks to equipment financed by cotton-generated income. Finally, farmers are able to sell more cereals at markets, especially as the roads built to carry cotton have reduced the marketing costs of food crops and facilitated the integration of regional markets. In short, the African cotton experience shows that under certain conditions the cultivation of biofuels can become an engine for agricultural and rural growth in Europe and worldwide.

Did you know?

One kilo of cotton contains 42% fibre and 52% seed, which in turn contains 36% oil. The rest of the plant is used for animal feed. Cottonseed oil ranks 5th in the world production of edible oil. One tonne of cotton produces 100 litres of oil, or 100 to 300 l/ha. Although rapeseed and sunflower produce 1,000 to 1,200 l/ha, the advantage of cottonseed oil is that it is a co-product of the fibre, which represents 85% of the market value of cotton. As a biofuel, it behaves in the same way as rapeseed or sunflower oil. The ethyl ester of cotton has characteristics similar to rapeseed methyl ester, but it is more sensitive to the cold (which is not a problem when used locally). Cottonseed-oil fuel can be self-consumed by small producers, i.e. it can be produced manually or using small presses, and used directly (pure or mixed with fuel oil) in small diesel engines (other engines need mechanical adjustments). The process requires no chemicals, and generates oil cake for animal feed. Cottonseed oil can also be used at a national level after esterification in direct injection engines.



© Andy Han
François Traoré, Chairman of the African cotton producers Association, during *Les Entretiens européens* last 24 March in Brussels, came to remind us that 20 million people live on cotton in Africa.

European biofuel industry wants to lead the way

SOFIPROTÉOL AND ITS DIESTER, WORLD LEADER OF BIODIESEL, DEMANDS A LASTING PLACE FOR FIRST-GENERATION BIOFUELS.

Although it is sometimes criticised for procrastinating, the European Union has managed to overcome its customary differences and to develop - from scratch - a proactive and exemplary European renewable energy policy. This policy, which is the most comprehensive in the world, should have a positive influence on other producing countries by imposing, for example, "sustainability criteria" for all biofuels consumed in Europe (regardless of whether they are produced there or not).

The rapid implementation of the two key directives - on renewable energies and fuel quality - is an absolute priority, as it will make the Energy and Climate Package operational at last. To fulfil this priority, open-mindedness, realism and a sense of initiative must continue to prevail over ideology and fruitless discussion. This is the only way for Europe to truly embrace the age of green growth.

The development of biofuels responds to a triple requirement, recognised by the Commission, the Council and the Parliament: to fight climate change, reduce our energy dependence, and find new openings for European agriculture, which is undergoing profound changes. With the end of the oil era in sight,



CLAUS SAUTER, GENERAL MANAGER OF VERBIO AG, THE GERMAN BIOFUEL PRODUCER, ALSO WANTS TO PLAY THE FIRST-GENERATION CARD, BY DEVELOPPING BIOREFINERIES WHICH CAN PRODUCE BIOETHANOL, BIOGAS AND BIOFERTILISERS ALL TOGETHER.

The Renewable Energies Directive (EC) - full name "DIRECTIVE 2009/28/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL" dated April 23, 2009 on the "promotion of the use of energy from renewable sources" - is a document which is binding for all member States of the European Union, providing the entire industry branch planning safety and good prospects. It requires all EU member states to use renewable energies for at least 20% of the total energy consumption by the year 2020 - traffic, including electromobility, shall account for 10%. The EU Directive also decrees that biofuels shall only be regarded as such in the future when they display a CO₂ saving potential of at least 35% compared to fossil fuels. Furthermore, the Directive defines biofuels which are particularly worthy of promotion; amongst them are biofuels made from recycling materials.

what conclusions can we draw? The trend in energy demand justifies the decisions taken two years ago. In the transport sector, biofuels are a sustainable - albeit partial - alternative, which can be developed on an industrial scale. They are available, effective and more eco-friendly than fossil fuels.

It should also be emphasized that the production of biofuel crops generates protein-rich by-products that can be used in animal feed: 1.5 kg of protein-rich by-products are produced for each litre of biodiesel. As a direct consequence of this, soybean imports from the American continent have dropped, and land in Brazil and Argentina has been released for other purposes. Biodiesel production also generates vegetable glycerine, which provides the foundation for a new green chemistry industry. There is a buoyant market for green chemicals, which can replace petrochemicals in some applications.

Electric cars and hydrogen-related technologies are not yet widely available. Oil is becoming more and more harmful to the environment, notably due to the increasing use of unconventional sources. So the conclusions are obvious: there is a clear and



Philippe Tillous-Borde during Les Entretiens européens for sustainable biofuels in Brussels

urgent need to continue to optimise and develop first-generation biofuels. Research into second-generation biofuels is ongoing, and we are participating actively in this research. But these new biofuels will not be available until 2020. Furthermore, they will be used primarily in the aeronautics sector, for which no other reliable form of renewable energy has been identified to date. While France is due to submit its national action plan on renewable energies by the end of June, businesses - in order to continue investing - need to know that the strategy for this particularly innovative sector will remain firm and that the decisions taken will be maintained. Sofiprotéol is an active player in the European agro-industry, and is involved in both food production and environmental protection through renewable energies and chemistry. It will continue to cooperate with non-governmental institutions and organisations, as democratic and non-dogmatic debate is the only way to move forward and to build the green economy of the future.

Philippe Tillous-Borde
*General Manager of Sofiprotéol
Chairman of Diester Industrie*

Biofuels can achieve a high degree of CO₂ savings when efficient production processes - for instance biological procedures - are used and the highest possible proportion of the raw materials is converted into energy. These CO₂ savings can be also maximised by recycling fertilisers for agriculture. The ideal solution for this is the compound production of bioethanol, biogas and fertilisers. At the moment, VERBIO is realising two self-developed biogas projects in Germany: a globally unique facility compound for producing bioethanol, biogas and biofertilisers.

The company is thus the first organisation around the world to operate such a biorefinery concept in large scale. The non-food waste material of bioethanol production (the so-called slop), which has up to now always been disposed of, is used as a raw material there. In addition to bioethanol, three other value products arise from these plants: biogas, organic biofertiliser and a mineral nitrogen fertiliser. The output capacity of the facilities amounts to 60 MW in the 1st stage of expansion (2010) and 125 MW in the second stage of expansion (2012). Initially, 480 GWh per year are planned to be produced and fed to the power



supply system in the year 2010 and then, from 2012 on, 1,000 GWh per year.

In a study, the German energy and environment institute IFEU concludes that all VERBIO procedures analysed in the study display significantly more CO₂ saving potential compared to, for example, petrol than the limit of 35% stipulated by the EU Directive "on the promotion of the use of energy from renewable sources". Thanks to the focus on energy production and short transport ways, VERBIO is able to produce biofuels with a CO₂ savings potential ranging between 80 and 90% (compared to fossil fuels) and extremely high energy yield per hectare. Due to the high amount of CO₂ savings, the concept also allows providing the automobile industry with fuels of only low CO₂ emissions per kilometre travelled. Biogas by VERBIO achieves 18 g CO₂/km - a value which is already today significantly lower than the EU's emission limit of 120 g CO₂/km.

With reasonable political conditions given, revitalising the biofuel market may strengthen domestic agriculture and create fair competition, produce new jobs, reduce dependence on fossil fuels and bolster development of CO₂-efficient biofuels.

Claus Sauter

Toward an AgroResource Industry

AN INDUSTRIAL AGRICULTURAL-RESOURCE SECTOR IS EMERGING. PLANT PRODUCTS WILL ONLY GRADUALLY REPLACE PETROCHEMICAL PRODUCTS, AND AS A CONSEQUENCE OF IMPORTANT AND LENGTHY DEVELOPMENTS.

IN FRANCE, IT IS THE ROLE OF THE COMPETITIVENESS CLUSTER INDUSTRIES & AGRO-RESSOURCES, A MEETING PLACE FOR KEY PLAYERS IN INDUSTRY AND RESEARCH, TO SPEARHEAD INITIATIVES AND PROMOTE THE EMERGENCE OF "BIOSOURCED" SUBSTITUTION SOLUTIONS, PARTICULARLY THROUGH R&D IN THE FIELD OF BIO-REFINERY.

Fossil fuel reserves are running out, global warming is becoming a reality, waste recycling is becoming ever more costly and problematic, and unrelenting population growth will require more and more energy and consumer products. There is now an alternative to the oil economy, it is a renewable resource based on plant biomass by using the whole plant. **In this global context of fossil energy dependence linked to oil and gas prices, it is essential to promote and increase the part of biobased products.** Production and development of these new products are based on the **biorefinery concept**.

The biorefinery concept is based on the use of carbon molecules extracted from plant in order to substitute carbons from oil and gas. Considering the carbon cycle, a global use of biomass could limit the impact of carbon dioxide on global warming. The substitution of fossil molecules requires the transformation of the whole plant, especially parts not used as foodstuffs. This strategy leads to reduce as many as possible waste and by-products. **The whole plant valorization will induce the development of new industrial processes and a new chemistry based on plant derivatives molecules.** The objective is to create a sustainable economic growth including new markets based on renewable products, environmentally friendly. The available biomass could contribute to the global energy and material needs only if major innovations occur. Biorefineries would provide energy (biofuel, heat, etc.), molecules (fine chemistry, cosmetics, para-medicinal, etc.), materials (plastics, composites, etc.) and also food ingredients.

Like crude oil, plants are composed of a huge number of different molecules. Each constituent of the plant can be extracted and functionalized in order to produce non-food and food fractions, agro-industrial intermediate products and synthons, whose value is generally inversely proportional to their volume. Carbohydrates, lignin, proteins and fats represent 95% of plants. Five other percents are constituted by vitamins, dyes, flavors or other small molecules that are also considered in biorefinery because of their high value. On the basis of these various plant components, different specific biorefineries can be outlined based on sugars (starch and sucrose),

lignocellulose and lipids as main sources of carbon molecules.

The global scheme of each type of biorefinery consists in several steps, biomass needs a first transformation with a huge separation or extraction of plant components by grinding followed by a fractionation or cracking by biological or physicochemical technologies. The aim of this step is to release molecules to make a second treatment that consists in a functionalization of biomass extracts. This leads to agro-industrial products considered as intermediates in many industrial sectors. These works on native biomass represent an industrial sector called first transformation. The formulation of these intermediates leads to the development of a large number of biobased products that can be separated in **4 categories**:

- The most important in volume is Energy with first generation biofuel like ethanol or biodiesel.
- Molecules derived from biomass represent one of the most important potentials to produce chemical intermediates named bulk or **synthons** that could be the base of a new chemistry.

The main objective of plant chemistry is to obtain from biomass, chemical synthons that can be used as bulk in biosynthesis pathway and substitute

molecule derivatives from fossil resources. The objective is to get the same molecule when it is possible or develop different molecules with the same chemical properties (functions, reactivity, etc.). Compounds with a high added-value are also included in this category. Plant fibers and polymers are the elementary elements for a large family of biobased materials.

- **Fibers** may be incorporated in composites to substitute glass and carbon fibers. Biopolymers can also be used as matrix in composites. The final objective is to realize composites with plant fiber and plant matrix with mechanical properties and characteristics as close as possible of usual composites.

- The last category concerns **food industries** that are fully involved in biorefinery by valorization of components or fabrication auxiliary.

A limited number of sites in the world are already able to fulfill all the criteria to be considered as an industrial biorefinery. **In the European Union four PCRDT projects dealing with the strategy of biorefinery are supported.**

Daniel Thomas

President of the Industries & Agro-Resources Cluster

BIOENERGY AND PLANT CHEMISTRY: WORK IN PROGRESS

The European Commission launched its initiative in April for a sustainable use of biomass. 81 public and private organisations involved in 4 projects will join their efforts to develop bio-refinery processes for converting biomass into energy and chemicals. The programme, costing a total of €80 million, is supported by the Commission to the tune of €52 million over 4 years. It aims to promote the migration of innovation to marketable products and services, and holds an important place in the European Industrial Bioenergy Initiative included in the SET Plan, whose roadmap provides for a 14% bioenergy share in the EU energy mix by 2020 and, to achieve this, 200,000 local jobs.

The major chemical manufacturers are not far behind. Arkema, for example, is developing a collaborative research programme to establish an industrial process for the synthesis of glycerol - a co-product of the manufacture of biodiesel - into acrylic acid (used in paints and coatings, adhesives, etc.), currently produced from propylene, a fossil resource. The aim is to build a plant chemistry chain of expertise in Lorraine, and to provide the petrochemical platform at Carling with new job opportunities through retraining. This programme represents investments of €11 million over 3 years.

More generally, an entire plant chemistry sector - supported by European REACH regulations toughening conditions of use for molecules of concern - is stepping up efforts to propose industrial-scale alternatives to phthalates and other chloromethanes. Take for example Vandeputte Oleochemicals and Novance with their fatty acid esters. Or Roquette, a member of the IAR cluster, which has just launched Vegereach - a tool designed to inform manufacturers of plant alternatives to petrochemicals - and which proposes an electronic directory of bioproducts since September.

Hervé Fischer

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The leading French "biodiesel", Diester is manufactured mainly from French grown rapeseed and sunflower.

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- Rapeseed and sunflower crops allow for reducing the amount of fertilizer and chemicals used on following grain crops.
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The entire sector is working
for the future.

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- "Plant chemistry" is growing as a renewable alternative to petrochemistry in sectors such as paints, inks, lubricants, road surfacing, cosmetics, and pharmaceuticals...

For additional information regarding the Diester sector:
www.prolea.com and www.faiteslepleindavenir.com



the oil and plant
protein sector

LOOKING FOR CLEAN CARS

The clean car is also driving Europe forward

ANDRÉ FERRON COMES BACK ON THE ROAD PLANNED SINCE 40 YEARS BY THE EUROPEAN UNION IN FAVOUR OF LOW-CARBON VEHICLE.



Europe took its first steps in the clean car revolution in 1970, when it introduced the first anti-pollution directive and thus set the stage for the EURO standards. In the 90s, lower targets were set for greenhouse gas emissions from clean cars, and the European Union signed up to the Kyoto Protocol. In 1995, its strategy was based on voluntary commitments. European manufacturers committed to reducing vehicle emissions to 140 g CO₂/km by 2008, with the possibility of achieving 120 g CO₂/km by 2012. Japanese and Korean manufacturers made similar commitments. These commitments fell through, and in 2007 the Commission decided to go down the legislative route. It agreed to the "integrated approach" advocated by the profession, and set a joint target of 120 g CO₂/km by 2012 (130 g/km for car manufacturers and an extra reduction of 10 g/km for other stakeholders). The regulation adopted allows an extra 3 years to reach the target and - up until 2015 - provides for subsidies for all vehicles emitting less than 50 g/km and for ethanol engines. On the other hand, it introduces dissuasive sanctions and establishes a target of 95 g/km for 2020. The same type of regulation is currently being adopted for new light commercial vehicles, with a target of 175 g/km by 2016. These regulations are not part of the 2008 energy-climate package. The latter does not provide for any measures specific to the transport sector, other than the following three: the inclusion of civil aviation in the European quota system; the definition of a 10% target for renewable energy in transport by 2020; and two European Industrial Initiatives (EIs) in the SET-Plan (on hydrogen & fuel cells and sustainable bio-energy). Biofuels are a significant factor for airline companies, and are playing a major role in helping the member states to reach the 10% target. However, electric transport systems are being encouraged in two ways: to calculate how much electricity from renewable sources is used by electric transport, the member states can choose to use either the average share of renewable electricity across the European Union, or the share of renewable electricity in their own country. Furthermore, the

amount of renewable electricity used by electric vehicles is automatically multiplied by 2.5.

The financial and economic crises of 2008-2009, and their considerable impact on vehicle sales, pushed the European Union to intervene decisively in the automotive sector in general, and in the clean and electric car sector in particular. The goal was to prevent a social calamity, safeguard the 12 million direct and indirect jobs in the European car industry, and put it on the path towards more viable & sustainable development. The European Recovery Plan of 26 November 2008 covered the whole of the economy and included special provisions for the financial and automotive sectors. The latter has benefited fully from the temporary relaxing of the rules on state aid to industry (until the end of 2010). This applies not only to the supply side (support for companies in difficulty), but also to the demand side (support for green products). Individual countries have introduced non-compulsory



and non-harmonised bonus and scrap premium schemes, but the automotive sector has received real Community support via the EIB and, since March 2009, has benefited from the European Green Cars Initiative (one of 3 European initiatives to support innovation in the automotive, construction and manufacturing sectors). Green Car is a Public Private Partnership supported by the EIB worth a total of €5 billion. Its purpose is to promote industrial research into all forms of land transport. Hybrid and pure electric vehicles, along with batteries and intelligent networks, occupy a prominent position in the initiative, which, in terms of priority, puts them on a more equal footing with fuel cells and biofuels.

2010 will mark a turning point, during which the future of the clean car and of the European car industry will be decided. The Union's ability to promote a common industrial policy will also be put to the test. At the start of 2010, the new EU Commissioner for Climate Action, Connie Hedegaard, announced the development of a Transport-Climate package along the lines of the Energy-Climate package, including a "Strategic Plan for Transport Technologies". This package will be part of the new European transport

policy, the White Paper on which is due to come out at the end of 2010. The Commission must also decide in 2010 whether to end the temporary rules on state aid, and how to help the automotive sector along its new route.

The key to success lies in ensuring the adherence of the member states and of civil society to joint choices and objectives when they are divided by diverging interests. It is tempting for the Union to remain "neutral", to avoid favouring one Member State over another. However, we cannot afford to ignore our shortcomings in the electric vehicle sector. This would be a huge risk to take if China and the United States decided to invest massively in electric transport. Germany, Portugal, Denmark and, above all, France and Spain are arguing strongly within the Council in favour of electric vehicles. But they are the only 5 of the 27 Member States to do so! Only a small handful of MEPs from the relevant Commissions showed an interest in electric vehicles during the first round of debates on the future transport policy. Despite this situation, the Commission has not failed in its role. Its Action Plan (see insert), which was unveiled on 28 April, clearly promotes specific measures for electric vehicles. It was right to take this risk, as on 6 May the Parliament followed suit by unanimously adopting a resolution on electric vehicles. Thus a new opportunity has arisen for the European Union to demonstrate its ability to promote joint projects that foster development and create new jobs in Europe, which is in its interests as well as those of the planet.

André Ferron

Research manager at Confrontations Europe

THE EUROPEAN UNION ACTION PLAN FOR GREEN CARS⁽¹⁾

The Action Plan comprises 7 chapters. Its implementation will require the revival of the High Level Group CARS 21, chaired by Commissioner for Industry Mr. Tajani and comprising all the stakeholders in the sector.

1. Completion of the regulatory framework currently being defined.
2. Supporting research and innovation in green technologies.
3. Market uptake and consumer information.
4. Global issues (standardisation and Raw materials initiative).
5. Employment (ESF use and establishment of a European Sectoral Skills Council).
6. Mid-term review of CO₂ emissions legislation.
7. Specific measures for electric vehicles (placing on the market, standardisation, infrastructures, financing, power generation and supply conditions).

⁽¹⁾ COM(2010)186 final on 28/04/2010, named "A European strategy on clean and energy efficient vehicles".

What do the users of automobiles really want?

Driving is an expressive activity: what you drive and the manner in which you drive it expresses aspects of your identity. Automobiles promise not only mobility - access to distant destinations - but a sense of autonomy (from the Greek 'autonomos': having control and direction over one's own affairs). Drivers value the feelings of control, convenience, freedom, independence, identity, mastery, spontaneity, speed and status that they get from driving a car. It was these symbolic and affective benefits that helped make the fossil-fuel powered car one of the most successful technological products of the twentieth century. These psychological satisfactions will be important in determining the acceptability to motorists of the electric car.

Electric vehicles and their associated charging infrastructure will initially be introduced by and for the urban commercial and public sector delivery and maintenance fleet and this will serve to normalize their presence on the road to private motorists considering electric car purchase. At present the biggest problem facing electric cars affordable to the private motorist is their limited range, giving rise in recent trials to "range anxiety", with drivers warily recharging their cars - and thus temporarily removing them from

use - far earlier than they needed to. Of course this initial response dissipates with growing experience with the vehicle, but is an initial barrier to acceptance. The roads of Europe are likely to see a "mixed fleet" over the next two or three decades, with combustion engines continuing until the oil runs out or proves too expensive, plus the gradual introduction of hybrids, electric vehicles, and perhaps other power sources.

"Man has the peculiarity of, on the one hand, proving extremely adaptable if circumstances so require and, on the other, resisting change if he can."

But to move towards a sustainable transport system it will not be enough to just attend to supply side issues and trust in technology to reduce the oil dependency and greenhouse gas emissions from vehicle production, use and disposal. Increasingly, more and more drivers are reporting that they find driving less fun and more stressful these days, due to congestion and the perceived behaviour of others on the road, and are keen to cut their car use.

Demand side externalities such as congestion costs, road deaths and serious injuries, community severance,

improving public health through increasing active travel and reducing pollution need addressing. Short car trips, of less than around 3 kilometres, need replacement by active travel alternatives - walking or cycling. Medium and long car trips need replacement by (clean powered) public transport modes - bus, Metro and train. Cleaner, greener travel needs changes to our daily travel choices as well as technological changes to vehicle power trains.

Small changes to our patterns of life, to the way we live, work and play, can cumulate and make large differences to carbon footprints. Delivering sustainable transport will require effective planning and a modest budget to improve the urban infrastructure and the active travel experience, plus political vision, leadership and courage, promoting a healthier, less stressed, more decarbonised and better quality future for the citizens of Europe. Fewer fossil-fuel powered car kilometres, more psychological satisfactions from other travel modes.

Stephen Stradling

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Where are the key to sustainable mobility?

FOR PHILIPPE PAYEN, DIRECTOR FOR STRATEGY AND RESEARCH TO VEOLIA TRANSPORT, THINKING "SYSTEM" IS NEEDED, ALONG WITH GIVING A DYNAMIC INFORMATION TO THE TRANSPORT SYSTEM USER.

The population explosion, growing urban concentration and changes in lifestyle patterns have created a widespread need to better control travel time and costs, and a demand for straightforward, attractive and made-to-measure transport solutions. In this context, given the lack of a credible alternative, the private car has for a long time been regarded as the easiest solution. This has created a captive market, and steered consumers away from other alternatives. Now, in view of the drawbacks associated with vehicle ownership (tolls, green taxes, parking costs, congestion, energy, etc.), public and private transport providers are facing a new challenge: that of diversifying the transport offer and integrating new solutions in order to deliver a viable alternative to cars in major agglomerations.

Under this systemic approach to urban mobility, there is no reason for the private car to be stigmatised. It has an important role to play in the travel chain, alongside public transport systems. It is also a valuable complement to other individual solutions such as taxis,

shared taxis and "soft" transport modes (i.e. non-motorised transports, so called zero emission transport or active travel alternatives) like walking and cycling. The electric or hybrid "clean car" responds to a genuine need. It should be integrated harmoniously into a full and varied range of sustainable city transport solutions.

Thanks to the technological progress made by manufacturers, electric vehicles no longer pose any major problems. However, their integration into the transport system, the development of a charging infrastructure and of the associated services, and the long-term future and recycling of batteries do raise a number of issues. The only way to resolve them is if all the stakeholders work together. Such cooperation is a key factor in the success of the electric vehicle. Veolia's research teams are working on these issues now.

The new information and communication technologies that have invaded our daily lives are a good example of how we can tackle the challenge of mobility integration and simplification. For instance, the development of NFC mobile telephones, which are able to interact with their immediate environment, heralds the beginning of a new era. Thanks to their interactivity, these new telephones are able to provide travellers with continuous information in time and space. Thanks to their flexibility, they facilitate

the purchase of travel tickets, access to services and the integration of modes of transport. They are modern and innovative, and hence improve the image of public transport and provide an opportunity to attract new customers. Therefore, there is now a close link between actual mobility and digital mobility.

As a provider of safe and sustainable mobility services, Veolia Transport is focusing firmly on all of these digital services in order to improve the efficiency of public transport networks. The aim is to use the information provided by these new services to the best possible advantage, in a context where transport systems are increasingly complex to organise and to use. The management of this new information requires unprecedented cooperation between telecom operators, software publishers, industrial companies and original equipment manufacturers, as well as an all-round commitment to bridging the gap between supply and demand.

Philippe Payen



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Sofia's Mobility Challenge

THE CARBON-FREE VEHICLE WILL ONLY MARK FORWARD PROGRESS IN TOWNS IF IT IS ACCOMPANIED BY AN AMBITIOUS AND SENSIBLE URBAN PLANNING POLICY, INTEGRATING PUBLIC TRANSPORT AND INTERMODALITY. AFTER SUCCUMBING TO THE CHARMS OF THE AUTOMOBILE TWENTY YEARS AGO, THE CITIES IN THE EAST OF EUROPE NOW ALSO UNDERSTAND THIS.



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During the current political mandate of Sofia's Council which began at the end of 2007, improved mobility has become a widely accepted policy goal. Policy choices could vary widely depending on whether objectives are economic, improved urban quality or more efficient use of resources. They are made more difficult in Sofia by the speed of recent change and the ambiguity of cultural and urban consciousness of Sofiates. Some illustrations of change since the mid 90s: Car ownership grew from 150'000 to 750'000 and from a lifelong crave turned into a curse. Employment evolved from 75% in heavy industry to 75% in services. The city was initially sleepy and isolated and became speedy and eclectic. It evolved from a command and little private ownership environment to one in which market forces reign. Although it remains embedded in the Orient it now has Western aspirations. Together with the mayor and her administration, I am designing a long-term vision and mid-term strategy for the city's mobility.

The vision is a 20-30 year imagined future and should provide for:

- **harmonious environment** which could be understood as an aesthetic, livable and attractive city;
 - **conflict-free mobility**, meaning little traffic jams, comfortable peak hour public transport and minimum accidents;
 - **sustainable evolution** - a city that has an optimal use of energy and other resources and low pollution levels.
- The strategy**, which has a more observable 10 year horizon, has to promote:
- **urban planning** that renders the city more attractive and agreeable and facilitates mobility through increased choice and competition of different modes of transport leading to reduced car use and overall congestion;
 - **public health** through reduced pollution and noise. My favorite aim is to encourage the rapid development of electric vehicles and supporting charging infrastructure;
 - **social cohesion** by securing mobility for all, which could mean measures for improved public transport or providing investment for alternative modes of transport;
 - **economic growth** by stimulating exchange

through reduced travel times and reduced stress and aggression of travel and through the use and encouragement of new technologies and experimentation;

• **governance improvement** by decentralizing mobility policy making, deregulating - of which the "shared spaces" concept is one example and increasing individual responsibility through free flexible pricing for parking, public transport and other mobility services and more and better public information and therefore increased awareness and understanding.

Perhaps, our most important success to date has been the change of heart and mind set of local politicians, journalists and the public at large. The majority have grasped the conundrum of mobility policy and understood the vacuity of car centered policies and have become actively involved in round table discussions on a wide range of mobility related topics. Although the share of public transport in people's movements has fallen from 70 to 50% it has now stabilized at this relatively high level and many people now agree that giving priority to the development of public transport and other alternatives to individual car use is both desirable and inevitable.

We are grateful to the international engineering and transport consultants Mott MacDonald whom we commissioned to work on our Mobility Master-plan and whose advice and recommendations we are now implementing. They have covered a wide range of subjects, such as modeling, safety, parking, information technology, signage, public transport, pedestrian and bicycle areas, budgeting and organization. We are also seeking advice and learning from city planners and experts from Paris, Madrid, Vienna, Antwerp, Geneva and other European cities.

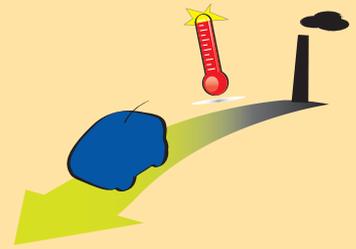
The ultimate public policy goal remains the improved quality of city life. The ultimate challenge for mobility policies is to create conditions for change in habits, life style and modes of behavior that lead to less aggressive and less greedy mobility choices without falling into the trap of collectivist, centralized, inefficient and wasteful institutions and decision making.

Martin Zaimov

Deputy Chair of Sofia's Council

Head of the Mobility Master-plan Working Group

LES ENTRETIENS EUROPEENS LOOKING FOR CLEAN CARS



This innovative event, organised on **14 and 15 April in Paris in collaboration with Confrontations Europe and Sauvons le Climat**, painted a broad picture of the current situation in Europe and across the world and of ongoing projects for its 300 participants.

The conference was opened by Jean-Paul Bailly, Chairman and CEO of *La Poste*, and organised in partnership with companies and stakeholders - many of whom have expressed themselves in these articles - from a wide range of backgrounds, which is in itself indicative of the new challenges that the clean car presents. The event provided us with an opportunity to delve into the main technological, industrial, socio-economic and political challenges that must be met if the European automotive sector is to participate not only in the fight against climate change but also in establishing a sound European industrial base that will stimulate growth and employment.

It took three half days of work to draw up a rough outline of what might be called the second automobile revolution.



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Ni Hong and Anton Smitsendonk the 15 April in Paris

Ni Hong, Director of the Chinese Ministry of Environmental Protection, and Anton Smitsendonk, Chairman of the China Carbon Forum, were the guests of honour at these Les Entretien européens discussions looking for clean cars, which were hosted in the auditorium of the administrative offices of *La Poste*, which is at the head of the French purchasing consortium for electric vehicles for public and private companies and public institutions. This national economic pump-priming initiative for the electric automotive industry, which is expected to spread across Europe, and is one that China may well duplicate. The latter has already taken a first step in early June by announcing the launch of a pilot programme granting subsidies for the purchase of hybrid and 100% electric cars (see p. 23).

You will find Philippe Herzog's conference conclusions and the verbatim transcript of the participants' contributions on pp. 26 and 27, and the conference minutes can be consulted at www.confrontations.org

Electric engines: Renault comes on in leaps and bounds

JÉRÔME PERRIN, FROM THE DEPARTMENT OF RESEARCH, ADVANCED STUDIES AND MATERIALS, MADE A LASTING IMPRESSION ON 15 APRIL 2010. IT HAS TO BE SAID THAT RENAULT, IN PARTNERSHIP WITH NISSAN, HAS FIRMLY COMMITTED ITSELF TO THE ELECTRIC CHALLENGE.

The electric vehicle programme, to be launched by Renault in 2011 in Europe, involves both high-volume production (100,000 to 800,000 vehicles a year) and a rather unique range of models, including the Fluence (initially intended for the Israeli market through an agreement with Better Place), the Twizy (an original four-wheel two-seater) and the Kangoo (electric version of the existing model). Lastly, Zoé, intended to the outer-urban market, will be launched in 2012.

With a €4 billion ticket, Renault-Nissan alliance is from far the most involved car manufacturer in electric vehicles. It has launched the construction of five lithium-ion battery plants, four of which are built by the AESC (Automotive Energy Supply Corporation) alliance

between Nissan and NEC, in Japan (already in production), the United States, the United Kingdom and Portugal. In addition, a joint venture with the CEA aimed at developing a new generation of batteries at a plant in Flins may draw support from the Strategic Investment Fund.

Lithium-ion batteries represent the major technological breakthrough. Developed in the 1990s, they have today reached maturity, and with a battery of the same weight it is now possible to cover twice the distance. Although it is too soon to promise

600 Wh/kg batteries by 2020, we can nonetheless expect an improvement of 30 to 40% compared with the batteries of 2011, which would provide more than 200 km of autonomy and broaden the range of possible uses. Effort must continue in this area, with a particular focus on lifetime, fast charging, control and reuse in a secondary market as a device for storing wind and solar energies, which are intermittent by nature, as this will be needed in 2020, by which time France will have met its commitments under the European climate and energy plan. We must also work on reducing the energy consumed by vehicles for purposes other than motility. Renault believes that the hydrogen fuel cell will not replace

The electric car Zoé should be sold at a price lower than €15,000 in France, €5,000 government bonus included. Additional €100 monthly rent for the battery would finally lead the using cost of the car (battery rent + electricity + maintenance) to a lower level than the one of a classic equivalent car (Clio Diesel-type). Bet they can?



the battery, but will instead be used in addition as a means for extending autonomy. However, if we manage to produce batteries with higher specific energy (300 Wh/kg or more) by 2025, the fuel cell and hydrogen are likely to be ousted from the transport sector. In terms of the electric powertrain, Renault has chosen not to use permanent magnet technology so as not to depend on rare earth minerals, over which China currently has a virtual monopoly. Lastly, we must work to improve charging infrastructures, fast charging technologies (and

even wireless induction charging), and also the intelligent management of energy exchange with the grid by further developing smart grids.

The gradual reduction of the €5,000 premium and its abolishment once the market has been formed will also make it necessary to reduce non-battery related costs, which are currently suffering from the lack of volume. This surcharge, along with that of batteries, will soon be reduced. After a 1st generation of combustion vehicles fitted with an electric motor, then a 2nd generation of wholly electric vehicles but built using old technology, a 3rd generation will see the day in 2015 that will make it possible to significantly lower costs thanks to technological

breakthroughs as purchasing incentive programmes begin to disappear.

Although the deployment of electric vehicles for all will solve the environmental-impact reduction challenge facing the transport sector, engine electrification poses many technical and economic difficulties, and this will call for new partnerships.

Use of electric vehicles will have its place in a new production, electricity distribution and consumption, communication and services ecosystem. For Renault, this means forging partnerships with other stakeholders, similar to those developed as part of the French electric and hybrid vehicle development plan for example⁽¹⁾.

Jérôme Perrin

Director for advanced projects
CO₂ & Environment, Renault

(1) see in particular the French Government press release of 13 April 2010 at www.developpement-durable.gouv.fr

ELECTRIC VEHICLE GLOSSARY

A 100% electric vehicle is a vehicle that has no internal combustion engine, and is powered by an electric motor fed by electricity produced in one of a number of ways:

- **rechargeable batteries;**
- a **fuel cell**. Pairing it with a reversible electric storage device produces a hybrid electrochemical/electrical architecture. The fuel cell operates using a reducing fuel, for example hydrogen, which is either stored in the vehicle itself, or produced from on-board methanol or methane;
- **without a battery** (OLEV: OnLine Electric Vehicle); a vehicle with an engine powered by magnetic induction, via a network of cables buried a few inches below the surface of the road.

The hybrid vehicle combines an internal combustion engine and an electric motor. There are several types of hybrid vehicle, according to the degree of hybridisation:

- **Micro Hybrid**: the lowest level of hybridisation illustrated by the Stop & Start system, which is based on a reversible electric motor acting as starter and alternator, combined with the automatic shut down of the engine when the vehicle stops.

- **Mild Hybrid**: intermediate level of hybridisation. A more developed Stop & Start system, capable of regenerative braking (the electric motor acts as a generator and provides engine-braking torque), and supplying a power increase to help acceleration. In the meantime, the energy is stored in batteries or supercapacitors.
- **Full Hybrid**: the most well-known formula. Mechanical power supplied by thermal and electric engines is combined to drive the car.
- **Serial Hybrid**: an internal combustion engine running at optimal speed drives an electric generator that powers the electric motor, and thus the vehicle. Batteries or supercapacitors are used to store any difference between electricity production and consumption.
- **Integral Hybrid**: a distinctive concept, involving the use of conventional traction in addition to electric motors mounted on the rear wheels.

Three battery-recharging methods:

- **slow charging**: in one night;
- **fast charging**: charging to 3/4 in 30 minutes;
- **quick drop**: exchanging the empty battery for a full battery in 3 minutes.

A PHEV, or plug-in hybrid electric vehicle, is a hybrid vehicle that can be plugged into the mains. Car-to-Grid communications make it possible for a parked car to supply the power grid with its excess electricity.

Marie-Ange Schilling

Manufacturers are almost set...

In Europe, although Renault-Nissan appears to come out on top as the automotive group with the highest ambitions in terms of carbon-free vehicles, it is not the only one preparing to redeploy its product mix and change its business model. PSA Peugeot Citroën and Toyota are of course joining in, along with the German manufacturers (see inset).

Equipment manufacturers such as Valeo and Michelin are not far behind, and are actively developing an innovative mix tailored to the needs of manufacturers, thereby directly contributing to the achievement of transport greenhouse gas emission reduction targets. They came to the Les Entretiens européens event to present their point of view.

PSA is the first to have any experience of the electric car in Europe, and made huge investments in the 1990s in the production of 10,000 vehicles. This ended in failure, and marked the beginning of the group's strong belief that the clean car's economic model had to be built around versatility and autonomy, better reflected by the hybrid vehicle than by the 100% electric vehicle. PSA went on to develop an expertise acknowledged in the field of biofuels - and of biodiesel in particular (see p. 9) - and very quickly integrated the Stop & Start system developed by Valeo into several of its models. However, bearing in mind that carbon-free vehicles are now a common factor in public policies owing to a new awareness of climate change, an increase in fluctuating trends in oil prices, and significant progress in battery technology, the PSA group is currently working on building an economic model for an electromobility that is both *"pragmatic and focused on the customer, who should have access to a wide range of vehicles, be they hybrid or 100% electric, and of new electrical items"*. As a result, in 2011 it will be marketing a four-wheel drive hybrid DS5 and 3008 (a combustion engine at the front, electric at the rear, 94 and 109 g CO₂/km) with nickel-metal hydride batteries, followed in 2012 by a rechargeable hybrid vehicle. Before the end of the year, PSA should have released some electric vehicles on the market, including a compact city car derived from the Mitsubishi i-MiEV with lithium-ion batteries, a commercial vehicle

designed by Venturi, and a scooter. It will complete its mix in 2011 and 2012 with hybrid and 100% electric versions of the REVOLTE model and with the BB1, a mini 4-seater car described as the *"perfect city car"* and powered by Michelin's motorised Active Wheel technology. PSA will also remain faithful to its belief in the importance of versatility, as it will soon be offering its customers leasing programmes for electric vehicles that will allow customers to swap their electric model for a combustion car when needed in order to



Citroën DS5 hybrid



Toyota Prius hybrid plug-in

guarantee mobility.

It is in the same spirit that Toyota is rolling out its *"right vehicle, right place, right time"* strategy, with a European hybrid vehicle, and even a rechargeable hybrid vehicle, it believes unites the *"best of both worlds"*.

It must be said that Toyota is no stranger to the subject as the inventor of the Prius, the 1st hybrid vehicle in the world (1 million vehicles sold between 1997 and 2008). It launched the Prius 3 in May 2009 (full hybrid, 89 g CO₂/km), and expects to sell 400,000 models per year. Even if Toyota is not alone in the market since Honda began marketing its Insight hybrid in February, the group is not letting up, and has announced the release of a hybrid model in each of its vehicle ranges by 2020. The Prius is equipped with nickel-metal hydride batteries, but up to 30,000 rechargeable hybrid Prius models equipped with lithium-ion batteries will be built in 2012. In late 2009, a pilot series of 250 of these rechargeable vehicles was leased in Europe, including 100 in Strasbourg, as part of a joint experiment with EDF. And although Toyota believes considerable progress still needs to be made on batteries for use in 100% electric vehicles, and that they are not yet financially viable in all markets, it is nonetheless preparing for the release of a small city car, the FT-VE, in 2012. As for fuel cells, which the Japanese groups never abandoned, Toyota is also planning to launch a first model in 2015.

Hervé Fischer

VERBATIM

Antoine Féral - Head for institutional relations, Michelin. *Demonstration programmes should be the subject of sustained development in order to see as many forms and operating conditions of electric vehicle as possible, and to learn from them. Without this, industrial deployment is not possible.*

Michel Gardel - Vice President External Affairs, Toyota Motor Europe. *The rechargeable Prius has a lithium-ion battery, an electric autonomy of 20 km, emits 59 g of CO₂/km, has a maximum speed of 100 km/h in electric vehicle mode, and a charge time of less than two hours using a standard electrical outlet.*

Édouard de Pirey - Vice President Corporate Planning and Strategy, Valeo. *Valeo's policy is oriented towards reducing CO₂ emissions. Like all equipment manufacturers, the group carries a big responsibility in achieving economies of scale so that these technologies may be enjoyed by everyone.*

Ayoul Grouvel - Head for Electric Vehicles, Brands Department, PSA Peugeot Citroën. *What is the right business model for the electric vehicle? The proposed vehicle must be accessible, easy to use and versatile. The customer will not buy a vehicle if its price exceeds that of the combustion car by more than 10 to 20%.*

ELECTROMOBILITY & GERMAN MANUFACTURERS: STOP AND GO?

Volkswagen - VW has long seemed to lag in the field of electromobility, but since 2009 seems determined not to leave Renault unchallenged. However, whereas Renault expects the EV market to grow to 20% in 2020, VW estimates it at between 1 and 2%. While Renault has announced the arrival of 4 marketable vehicles from 2011, VW is talking of a 100% electric range called e-UP for 2013, preceded by a pre-production run of 500 electric Golf vehicles in 2011. The hybrid range seems more readily available, but has very limited objectives - VW has presented a Touareg hybrid, to be followed in 2013 by a hybrid Passat and Golf. As for Audi, the A6, A8 and Q5 will be equipped with a hybrid engine, like the Porsche Cayenne. However, the characteristics of the hybrid Touareg reveal the limits however of the VW offensive: 193 g of CO₂/km and 5,000 units/year in Europe.

Daimler - Compared with VW, Daimler has a head start in terms of electromobility. The group launched an experimental programme in 2007 with 100% electric Smart Fortwo vehicles equipped with sodium-nickel-chloride batteries, then lithium-ion batteries for a new round of tests in Berlin, Milan, Rome and Pisa. By 2012, Daimler wants to produce 10,000 electric Smart vehicles per year. Daimler has also concluded an agreement with Renault-Nissan for joint investments in small cars and electric vehicles, and with Evonik for the commissioning in 2013 of the largest lithium-ion battery cell plant in Europe. In addition, Daimler began cooperating in March 2010 with BYD on the production of electric cars in China. Its luxury vehicle strategy is less well polished, the only vehicle developed being the hybrid Mercedes S Class (186 g of CO₂/km) commercialised in June 2009, 10 years after Toyota. Any new developments will probably come as a result of the partnership with Tesla, which sells top-of-the-range electric cars. Daimler also wants to market a fuel-cell vehicle in 2015.

BMW - As with Daimler, electromobility is a must for BMW in Europe. In the immediate future, the group seems to be focusing on small urban electric vehicles. The Mini is being tested in the USA, Germany and Great Britain, and BMW will launch a similar operation in 2011 for its Concept Active E, an electric vehicle based on the 1 Series. In parallel BMW is working on developing electric vehicles that are no longer derived from existing cars, but especially designed for electromobility. This approach should lead to the production mid-2013 (2 years sooner than initially announced) of a vehicle that will launch a new MegaCity brand built around small vehicles for urban use and reduced costs. The lithium-ion batteries will be supplied by a joint venture between Bosch and Samsung SDI, which began the construction of a plant in South Korea in September 2009, to be commissioned in 2011.

AUTOMOTIVE INDUSTRY: LINK SOCIAL AND ECONOMY

No new mobility without social new deal

Nobody can deny that the sector has hit hard times. However, European trade unions have stressed that the crisis in the automotive industry outdates the financial crisis. In fact, long before the financial crisis kicked in, car manufacturers had followed a product policy that failed to take demand into account. Clearly, a profit-driven approach fails to adequately meet market expectations.



© DR. *The European automotive industry in question*

The European Metalworkers' Federation (EMF) believes the industry must use the crisis as an opportunity to break the current deadlock, not only to reconnect with the market, but also to respond to new aspirations with regard to environmental protection. We welcomed the European Commission's

Green Cars Initiative and with it the announcement that a Sectoral Skills Council would be established. However, the conclusions drawn by the Competitiveness Council on 25 May were not on a par with the challenges we face.

The conclusions fell short because they laid down plans for the coordination of all mobility systems, both for people and for the transport of goods. There is only

one way to ensure manufacturers break with inadequate manufacturing policy when developing the cars of the future: by including vehicles (most probably electric vehicles) in a coherent and homogenous system that provides interfaces between the different forms of mobility on offer.

The Council's conclusions also failed to address social issues. Local authorities cannot be expected to oversee the vocational training systems built to

ensure there are enough qualified workers to meet the demands of companies. Member States should not be allowed to shirk their responsibilities - especially their financial obligations - so easily. The challenges we face are considerable, and the regions alone will not be able to cope with the tasks at hand. The conclusions also

completely failed to consider what will happen to the workers who are already active in the automotive industry, a matter which remains entirely unclear!

Finally, based on current policy, electric vehicles will not meet the medium-term mobility needs of populations in the rural areas of Europe. The solutions promoted so far focus almost exclusively on urban populations, and the range of products on offer is impressive (bikesharing, carsharing, public transport, etc.). However, the proposed schemes are clearly meant to make profit - a feat more easily achieved in the cities than in the countryside! If the relevant policies do not contain substantive measures granting equal access to sustainable (low-polluting) and affordable mobility, large areas of southern, eastern and northern Europe will be completely neglected.

We cannot allow our path towards sustainable transport in Europe to be mapped out with profit in mind, as this would essentially alter nothing. Indeed, the automotive sector is in urgent need of fundamental and pre-emptive change. The Sectoral Skills Council must serve as the foundation on which to build such change.

Wolf Jäcklein

*Policy Adviser at the
European Metalworkers' Federation*

Giving the right signal to the automotive industry



© Andy Han

European transport strategy needs to be based on a long-term, sustainable vision for the mobility of people and goods. **Freedom of movement is a fundamental right for EU citizens** and a guiding principle of the European Union. Equally, the principle of the free movement of goods is one of the cornerstones of the common market. The key to achieving sustainable transport is thus not to restrict demand for transport services, in particular not against the background of the current economic crisis but to use synergies and co-modality for the various transport modes.

The transport sector contributes a staggering 20% to the EU's CO₂ emissions and actions to reduce this amount are urgently needed. A low-carbon transport system should therefore be at the centre of a renewed and coherent EU transport policy, which has to identify the drivers for and barriers to innovation resulting from research and development and to prioritise investment in environmentally friendly infrastructure. The Spanish EU presidency chose

the advancement of electric vehicles technologies as one of their priorities. Under the Spanish lead and against the background of the resource efficiency flagship initiative of the Commission the EU is encouraging development and widespread use of clean and energy efficient vehicles.

The environmental aspect of cleaner transport means is only part of a larger picture - clean cars, based on clean, preferably renewable energy, hydrogen or on biofuels are an opportunity for the European car industry to reduce the dependency on ever scarcer and thus increasingly expensive fossil fuels and to re-establish their position as market and technology leadership globally. Substituting oil with a wide diversity of energy sources ensures energy security for the transport sector and creates demand for renewable energies which in turn contributes to the EU's targets on CO₂ emission reduction and renewable energy use and thus to its commitments to fight climate change and global warming.

The European Parliament supports the aim of creating a low-carbon transport sector. It has

welcomed legislation on ambitious CO₂ emission targets for cars and lorries, on better fuel efficiency, on the use of biofuels, and is now in the process of also developing ambitious CO₂ reduction targets for light commercial vehicles. Setting a clear legislative framework for the electrification and the 'greening' of the transport sector is an important signal for the industry to invest in research and development of the respective technologies.

A cornerstone for the marketing of electric cars however is that the energy used for the cars is produced in a clean and sustainable way since otherwise the effect on the environment will indeed be negative. In developing and marketing clean, energy efficient cars, **European car makers have the opportunity to again become global leaders in the car sectors,** thereby setting worldwide standards for the transport sector, supporting domestic employment and contributing to the EU's climate targets.

Jo Leinen

*Chairman of the European Parliament's
Environment Committee*

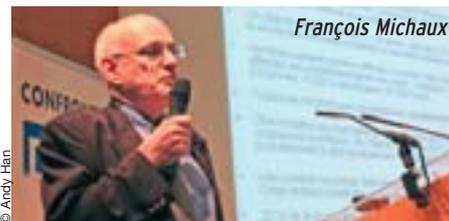
Electro-mobility in Germany and France...

The French and German policies on electro-mobility have one **element in common: the definition of standards for electric vehicle charging and billing systems**. The two countries have drawn up a draft European standard, and are hoping that all the member states will join them in this initiative very soon. Such cooperation is essential if Europe is to create a common electro-mobility market big enough to guarantee the profitability of future projects.

The two policies show **differences** in all other respects. Some will see this as just one more display of Franco-German discord, while others will argue that Europe is taking a more comprehensive approach to complex new developments than other parts of the world.

France got off to an earlier start, and has higher short-term ambitions than Germany: it plans to have 2 million electric vehicles (covering the whole spectrum of technologies) on the road by 2020, and to start putting these vehicles on the market in 2011. Germany expects to produce just 1 million vehicles by 2020, and to start selling them in 2013. **Germany is more frugal:** the government will be investing €500 million over the next 4 years, in addition to the €260 million earmarked for ongoing research

projects. Unlike France, it will not be subsidising the purchase of electric vehicles. The French government plans to pump €1 billion in subsidies and subsidised loans into experiments performed by the ADEME (French Environment and Energy Management Agency), and into research conducted under the PREDIT (Land Transport Research Programme) and by industrial firms. It will also be offering a bonus of €5,000 to the first 100,000 consumers to buy a clean vehicle (light vehicles emitting



© Andy Han

less than 60 g CO₂/km), and has guaranteed the purchase of 100,000 electric vehicles by leading public and private-sector organisations and institutions. Lastly, €1.5 billion will be poured into setting up a network of public charging stations in car parks, at the roadside and at service stations. **The German plan is more progressive.** Until 2011, it will focus on research into battery and engine

technology. This research will be conducted jointly by German research institutes (Fraunhofer, Helmholtz), universities, vehicle manufacturers and electricity producers. Then, from 2012 to 2016, tests will be carried out within a niche market. Mass marketing will begin after 2016. **Germany's goal is both commercial** (to lead not only Europe in the development of electro-mobility, but also the world through a nascent partnership with China), **strategic** (to fully control the battery production and marketing chain to increase its energy independence), and **environmental** (to ensure the development of electro-mobility solutions based on renewable energies).

The French objectives are less global: owing to the significant role of nuclear power in its energy mix, France - unlike Germany - does not have to carry out an in-depth (and rather theoretical) analysis of the renewability of its energy supply. Its priorities are **environmental, geostrategic** (to reduce oil dependency) and **economic** (to provide French car manufacturers with a new engine for growth, and thus help them to emerge from the current global crisis in as strong a position as possible).

François Michaux

Policy Adviser for Confrontations Europe

A clean car rallye Beijing-Paris-Beijing

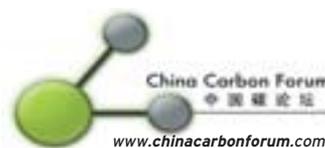
During Les Entretiens européens last 14 and 15 April in Paris, we learned much about China, from several speakers and later at length from Mrs Ni Hong, director in the Ministry of Environment Protection. How did the two Chinese observers experience our Paris conference? Being myself a part-time Beijing resident, let me try to step into their shoes and imagine what might have been some of their surprises.

First of all a surprise about the composition of the Conference. There was wide participation from across society, from government to private and semi-public industry, from the academic world to trade unions, with strong NGO's as convenors. That produced a very open and wide debate.

Another kind of surprising variety was in the great differences between Europe and China and then inside Europe: de Gaulle's nuclear energy in **France** will make electric cars in France (both from French and other producers) by far the cleanest in the world. In **Germany** social structures like codetermination in enterprises, old interests in coal mine trade unions and in some of the Länder are also enduring elements. In **Italy** a preference for gas solutions has something to do with the country's interests in the Mediterranean region. Europe remains polyphonic. Different is also the "cultural" moment of the car in both regions. In China the car is today an object of desire, of shared national and generational pride and

achievement. Europe has had that moment half a century ago. Europeans have grown weary with the car. They keep cars longer, buy a used car rather than a new one, and look for alternative models of mobility, with the help of informatics.

As a Beijing resident I was surprised to hear La Poste had a 100% electric fleet in distant 1910. The laugh came when President Jean-Paul Bailly added that the number of cars in his fleet was then twelve. But now, in alliance with other big enterprises, and with government blessing he will buy thousands of electric cars. The fact that the present successful attempt at creating an electric car market was preceded by two failures was certainly another surprise for this Chinese observer.



The relationship between government and industry might also show differences between Europe and China. The Chinese government works closely at compliance codes, and does not seem to be eager "getting its hands dirty" like the French government does now.

China can rely on its vastness, and its ebullient entrepreneurs in provinces and counties to bring forth

a clean car market at comparable prices. Shall we then perhaps see superabundance like we saw earlier in the number of manufacturers of sewing machines overcrowding the Chinese market? Like the hundreds of TV-set producers of the 1980's?

It has been said that the electric car allows more room for a wide network of small enterprises than we have seen in the world's thermal car industry. Things are changing. Hilarious was - again for me as a pretending Chinese observer - the moment when in Paris someone questioned what would be the "residual role" of the car makers.

So, behind the similarities lurk often differences. There is nothing wrong with that. There is a Chinese saying that mandarins grow on the south side of the Yangtze River not on the north side, where other fruits mature.

We saw much diversity and yet much common inspiration at work at our Paris conference, and that augurs well for cooperation. We in **China Carbon Forum** are happy that in conjunction with Strategy613, with *Confrontations Europe* and *Sauvons le Climat* we could be part of a very productive exploration of similarities and differences. We stand ready to do it again.

Anton Smitsendonk

*fr Netherlands Ambassador
Chairman of the China Carbon Forum*

...but also in the USA, China and Japan

Attempting to compare these three countries is something of a long shot. Reliable information on electro-mobility is widely available in the USA, limited in Japan and evanescent in China. Even if data from several different sources are compared, the degree of accuracy varies so much that only a general picture can be drawn.

The **strategies** adopted are different. **In Japan, the initiative is clearly left to the car manufacturers and the electronics industry** (for batteries). In this country forerunner of electromobility, the government is contenting itself with supporting car and battery manufacturers in their efforts to conquer the new global market, one of its major contributions being the introduction of Japanese standards, i.e. of a tool for capturing external markets. On the contrary, **Chinese and US governments are taking the lead: electromobility is an element in their geostrategy as well as a means for economic warfare**. China wants to reduce its oil dependency, because the current rate of growth in the Chinese automotive market, which is expected to increase tenfold between 2005 and 2030, would lead to national petroleum imports from 100 to 500 million tons/year, which exceeds global new world production capacity. But China also hopes to lead the world in post-petroleum vehicle manufacturing, by quickly making a huge technological leap forward and therefore bypassing its shortcomings in conventional engine technology and making the most of its cutting-edge knowledge of lithium batteries. It is lastly an ecological choice. The level of urban pollution in China is such that reducing

carbon emissions has become a public health necessity. USA's preoccupations are similar to China's ones, excepted for the ecological question, for which - despite every effort made by President Obama - most of the American general public is more sceptical than ever. The USA based its decision primarily on commercial and geostrategic factors. The goal is to restore American leadership of the automotive industry and to get GM and Ford back on their feet, which have to expand their R&D on electric car in return for the federal assistance. Furthermore, electromobility is a clear means of significantly reducing the USA's dependence on oil-producing countries, with which relations have become much more strained.

The level of **government investment** in the 3 countries is also very different. **In Japan, it is very low**, and neither car makers nor the leading battery manufacturers expect substantial aid from the government. Any existing aid **focuses on improving batteries** to reduce production costs (from €1,000 to €500 per kWh), and on increasing autonomy (the goal is to achieve an autonomy of 500 km, as opposed to 160 km now). A share of its investment also goes on research into fuel cell technology, which Japan hopes to put to profitable use in the property and automotive sectors (just like China). Lastly, the Japanese government is offering an incentive for the purchase of "clean" vehicles (tax remission) and is managing both the supply and the re-use of lithium. **China aims to manufacture 500,000 clean vehicles in 2011** (compared with 2,100 in 2008, which raises doubts about the 500,000 target). Between 2000 and 2010,

only \$300 million were invested in clean car technologies. But, **from 2010 to 2014, \$10 billion would finance the electromobility market deployment**, more particularly by allocating means to 13 electro-mobility experiments in major Chinese cities, involving hybrid, pure electric and even fuel cell vehicles. In order to speed up, at the start of June China introduced a substantial bonus for the private purchase of electric vehicles (€5,800 for a hybrid vehicle, €7,200 for a pure electric vehicle), available in 5 of the 13 test cities selected. **These large-scale Chinese investments are far bigger than any of those made in the other countries investigated**. They are part of a package designed to control the entire lithium production and recycling chain, bearing in mind that China is one of the leading suppliers of lithium. Following this 2010 return to work, China seems to accelerate even more to overcome the technological shortcomings of its car manufacturers. A standard policy for both battery production and recycling is being put in place. A new joint venture of 16 public firms, including 3 car manufacturers, is being formed with the objective to "master the core of electric vehicle technologies". It received first €150 million to achieve one's goal. **In the USA, the main priority is to gain full control of battery technology**, with objectives and methods taking a joint approach of American and foreign car manufacturers for R&D funding, in order to expand a domestic industry for batteries aiming at an American world leadership. **There is massive government support for R&D (\$1.5 billion) in a few specific fields**, which nevertheless doesn't reach the Chinese announcements. **François Michaux**

VERBATIM

Jean-Paul Bailly, Chairman and CEO of La Poste - We were given the guarantee that electric vehicles would probably be produced on an industrial scale by 2011, and definitely from 2012, and that the risks associated with battery reliability would be borne by the manufacturer and not by the buyer.

Muriel Barnéoud, Director for Industrial Affairs for La Poste - We believe that merchandise logistics in cities will be electrified, because eventually the cities will close their doors to pollutant transport. This development is a key part of La Poste's strategy.



LA POSTE COORDINATES DEMAND FOR ELECTRIC VEHICLES

With 55,000 cars and 30,000 motorised two-wheeled vehicles, *La Poste* possesses the largest fleet in France. It is an ideal user of electric transport: the vehicles it uses for distributing mail constitute a captive fleet covering distances of less than 60 miles and capable of being left overnight on slow charge. But a first and rather unsuccessful invitation to tender in 2007 demonstrated the need to develop and structure the market.

The Chairman and CEO of *La Poste*, Jean-Paul Bailly, took on this work at the request of the French authorities. He came to the *Les Entretiens européens* debates to talk to us about the Coordinating demand from public and private companies and local authorities initiative, a purchasing group established in January 2009 that brings together public and private economic players⁽¹⁾ with large fleets of light vehicles, urban and regional associations from around France, and the UGAP (Union of Public Purchasing Groups, which will coordinate purchasing transactions). The scheme remains open to bodies not yet associated, and aims to establish a fleet market of 100,000 vehicles in 2015.

Although *La Poste* had initially limited its contribution to the drafting of joint specifications, it has now committed itself to a joint procurement process. On 13 April 2010, a first step was taken in the form of a resolution to purchase 50,000 electric vehicles.

(1) ADP, Air France, Areva, Bouygues, Darty, EDF, Eiffage, ERDF, France Télécoms, GDF-Suez, Suez Environnement, GRDF, La Poste, RATP, Saur, SNCF, SPIE, Veolia, Vinci.

Renault in the electric adventure: from technological breakthrough to sociological upheaval



Renault's strategy is a simple one: to provide sustainable mobility for all, anywhere in the world. The electric car marks a breakthrough in terms of CO₂ emissions.

A diesel-engined Fluence emits 142 grams of CO₂ per km. The same car running on electricity and respecting the current European mix emits 80 grams, and 76 grams when running on natural gas, representing a significant gain. When running on electricity produced according to the French mix, in which nuclear and hydraulic power plays a dominant role, the Fluence will emit 20 grams. Compared with conventional technologies (for which more gains of 20-25% are expected), significant gains may therefore be achieved. So it is important that we have access to extremely low-carbon energy in developed countries, while developing countries could use solar energy.

A 6 million vehicle market

The size of the electric vehicle market is estimated at 10% of the global automotive market in 2020, representing 6 million cars and significant economies of scale. The price of oil, changes in regulation, the value of a tonne of CO₂ "saved", the falling price of batteries (which is a key element) along with the extension of their service life, the rapidity with which the ecosystem will fall into place and the changing attitude of customers will all act as levers. And that is where the main difficulty lies: developing technologies that the customer will accept to pay for - hence the Renault Eco2 logo, which symbolises both the Ecological and Economical nature of the challenge and is found on 40% of Renault vehicles emitting less than 140 grams of CO₂. Ecology and economy must go hand in hand for the impact to be felt.

Who might be interested in buying these vehicles, customers without whom there can be no business model? 50% of the global population is urban (and this is expected to rise to 70% by 2050), which has an impact on the length of journeys. 87% of all journeys undertaken in Europe cover less than 60 km, and 32% of compact saloons never travel further than 150 km at any one time - corresponding to the current autonomy of the electric car. According to our studies, 50% of vehicles in Europe are never used to go on summer holidays and 26% are used occasionally at weekends. It follows that the electric car with its current battery would be perfectly suitable as a replacement for a quarter of all vehicles.

be compared with the total cost of the fuel used during the car's lifetime. In addition, the battery has a longer lifecycle than the car, so it will have a second life after being used in the vehicle. Finally, the batteries are interchangeable.

Renault will be proposing two business models, depending on the situation of the various countries. The customer may buy the car at the price of a conventional car, rent the battery (financed by Renault) and take out a subscription which will cover the cost of the access to the grid and of electricity. In a second model, a single operator will take care of everything: battery rental, infrastructure installation and subscription. The most important element is the

service life of the battery, as it is on this that the rate of depreciation will depend. Its residual value after use in the car is quite substantial, and this is integrated in the business model along with the recycling of lithium. Renault will also be able to provide batteries that will generate electricity at home during the day. Another very important factor is the role of governments, as the electric car will bring real social benefits by reducing CO₂

emissions. In addition, for such an innovation to take off, tax incentives will be needed in Member States.

We are therefore going through a phase of technological breakthrough, but the new technologies will not be implemented if thought is not also given to the microeconomic and microeconomic models associated with these developments. We are working with public and private stakeholders and with companies of very different sizes. We are entering into partnerships with local authorities, producers of electricity and other actors in the transport sector. This new approach represents quite an upheaval, which will require us to redefine our position in a value chain that is also undergoing major change.

The Institute for Sustainable Mobility

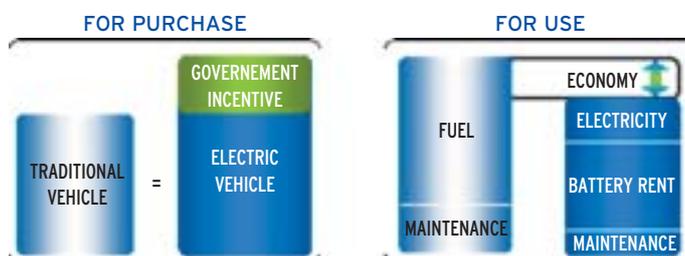
Renault created "The Institute for Sustainable Mobility" with ParisTech in September 2009 to encourage reflection and support this breakthrough. The institute is conducting a research programme on innovative mobility systems, offering courses to train young professionals and scientists deciding to specialise in sustainable mobility, and running awareness-raising campaigns for the general public. The new ecosystem in preparation carries with it a new economic model, which may give rise to new forms of mobility.

Claire Martin

Vice-President for CSR

Director of Renault Foundation

"THE MAIN DIFFICULTY LIES IN DEVELOPING TECHNOLOGIES THAT THE CUSTOMER CAN PAY FOR. THE ELECTRIC VEHICLE MUST BE A RATIONAL CHOICE"
Patrick Pélat, 2010, April the 15th during *Les Entretiens européens looking for clean cars*



The three charging methods

There is the trickle charge, which is already working, the quick drop system, which consists in exchanging the empty battery for a full battery in three minutes, and the fast charge, where there is room for improvement. The latter will charge three quarters of the battery in 30 minutes. We should also emphasize the importance of the navigation system on these vehicles, to reassure drivers worried about running out of autonomy.

A new business model is emerging

The business model of the electric car is very different, and we need to change our intellectual perspective: the total cost of the battery plus electricity has to

2009 FRENCH AWARDS FOR VEHICLES EMITTING THE LEAST CO₂

with 133 g of CO₂/km, France is the EU leader for new vehicles emitting the least CO₂ in Europe

50% of all new vehicles sold in 2009 emitted less than 120 g of CO₂/km

75% of all new vehicles sold in 2009 emitted less than 140 g of CO₂/km, compared with 40% five years ago

The vehicle podium

Diesel: Smart Fortwo (89 g of CO₂/km), Ford Fiesta, Seat Ibiza

Petrol: Toyota Prius III hybride (89 g of CO₂/km), Toyota iQ 68 VVT-i, Honda Insight 1.3 i-VTEC

This year, **8 diesel models** (4 in 2008) and **2 petrol models** emit less than 100 g of CO₂/km (Class A energy/CO₂ label)

3 manufacturers are below the EU target of 130 g of CO₂/km set for 2015:

Toyota and FIAT with 127 g, and PSA with 130 g. Renault comes 4th with 131 g.

2008-2009 developments in France: historical decrease in dieselisation (from 77 to 70% of sales), progression of LPG (0.1 to 1%) and hybrid vehicles (+ 16%)

Charging infrastructures key to the success of rechargeable electric and hybrid vehicles

By 2020, France will no doubt have some 500,000 electric vehicles and 1 million rechargeable hybrid vehicles on its roads. Electric vehicles will be used mainly in corporate fleets, and there will probably also be a market for privately-owned urban runarounds. Rechargeable hybrid vehicles will be more widely used by professionals and private users alike.

Planning and developing an appropriate infrastructure network

A vehicle charging network must be deployed at the same time as rechargeable vehicles - or even sooner. Almost one million charging points should be installed by 2015: 900,000 at private homes and workplaces, and 75,000 at the roadside or in public car parks (60,000 standard output charge ports and 15,000 high-output charge ports). Hence, under the "Grenelle 2" environmental law, regional authorities have an optional public service remit to develop public charging infrastructures for electric and hybrid vehicles. Twelve agglomerations in France have already signed a charter committing them to the development of charging infrastructures; in 2012, €60 million will be poured into the deployment of 1,250 public charging stations in twenty or so agglomerations.

Four challenges lie ahead

•First of all, the definition of **common standards**. Widespread adherence to a single set of vehicle charging standards is vital to the success of the low-carbon vehicle. On 25 May 2010, the European Union asked two European standards organisations (the CEN and the CENELEC) to develop "a harmonised solution to the interoperability of electric vehicles and recharging infrastructures". EDF are assuming their share of responsibility by participating in various task forces within the frame of the "National deployment plan for rechargeable electric and hybrid vehicles", instigated by the French government in October 2009. We are also helping to define and set up a series of cross-border experiments on the basis of the conclusions of the Franco-German task force, which drafted a set of common standards last spring.

The question of **managing energy demand** will arise in 2020, when the number of rechargeable vehicles in the French vehicle fleet will reach 1.5 million. In the meantime, the demand for energy will continue to grow. To prevent an increase in peak load requirements, we must encourage consumers to recharge their batteries outside of peak electricity consumption periods.

•The third challenge lies in the **business model**. Charging infrastructures are costly, especially public charge ports. As things stand - and without government aid - developing a viable business model for public infrastructures is an impossible task. Therefore, the **infrastructure** deployment strategy is particularly

important. This is the fourth challenge facing us. The national plan mentioned above includes a large section on deployment. It recommends the installation of private charge ports to enable motorists to charge their vehicles either at home or at work. By 2020, 90% of charging energy will come from privately-owned, standard-output charge ports. The remaining 10% will be delivered by public infrastructures (of which 85% will consist of standard-output charge ports and only 15% will consist of high-output charge ports. In our opinion, the latter should deliver only 5% - at most - of the total volume of charging energy). Experiments are being carried out across the world with a view to developing flexible, easy-to-use solutions that meet user needs and are technically reliable. On 27 April 2010, partners EDF and TOYOTA - with the support of the Urban Community of Strasbourg - launched the KLEBER experiment in Strasbourg. A pilot run of 100 rechargeable hybrid vehicles - based on the Prius - and 150 public and private charge ports will be tested in a dense urban environment over three years. Other projects are being developed with Renault, PSA, BMW, etc.

EDF's concrete proposals for meeting these challenges

We intend to play an "orchestrating" role in the installation of charge ports at private homes and apartment buildings. We will put our customers in touch with a local network of EDF-approved installers and suppliers. As regards privately-owned charge ports in public places and buildings, EDF are currently considering the possibility of creating a subsidiary to respond to requests for proposals from public bodies and other investors. The deployment of charging infrastructures is crucial if electric and hybrid vehicles are to break into the automotive market. It will largely shape the consumer's response to these new modes of transport. Government support is essential to the success of this deployment. Nevertheless, a number of issues are still outstanding, and power producers will inevitably play an important role in resolving them.

Igor Czerny

Director for Transports & Electrical Vehicles, EDF
Co-Chairman of the French-German Working Group for Electromobility

Electric vehicles call for an extended and stronger public electricity network



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Charging electric vehicles could quickly become commonplace. What could be simpler than plugging the car into a power socket, in much the same way as we already do for mobile phones and laptops? However, the **French Electricity Regulation Committee (CRE)** is currently looking more closely at the problems associated with charging electric vehicles. First, **charging electric vehicles represents a challenge for the equilibrium of the electrical system**. Not so much in terms of the energy consumed - since the projected growth of the electric vehicle fleet could be absorbed by the structural increase in consumption - as in terms of the power drawn off. To maintain the electrical system, we need to avoid situations where a significant proportion of the electric vehicle fleet is being charged at the same time, at times when energy consumption is already at its highest, i.e. at 8:00 am (which marks our arrival at work and an increase in domestic consumption) and at 7:00 pm (which marks our return home and the "peak" of the evening).

In addition, all charging stations - whether public or private - will be connected either directly or indirectly to the public electricity distribution network, which must therefore be extended and strengthened. Charging an electric vehicle will significantly increase the electricity consumption of the average household.

Based on current funding rules, connecting charging stations would demand a considerable financial effort on the part of system managers, which would also have a knock-on effect on the cost of using public networks (the development of which falls to the CRE by law). Finally, since 1 July 2007, consumers have been able to choose their electrical energy supplier (based on European directives). Therefore, regardless of where the electric vehicle is charged and provided that they are invoiced the cost of charging, **consumers should also be allowed to choose their supplier**. For this, **the charging infrastructure would have to be integrated into an information and communication system capable of meeting the challenges of the electricity market**. The charging of electric vehicles thus constitutes a challenge, both in terms of security of supply and in terms of the development of networks and the electricity market. Many aspects of the regulatory framework are affected and, in this age of smart grids, the CRE would like to see all stakeholders working together to meet these new challenges.

Cécile George

Director of Electric Grid Access
Electricity Regulation Committee

Read more in the bimonthly magazine n°18 of the Electricity Regulation Committee (in French) "les réseaux électriques du futur en débat" www.cre.fr/fr/documents/publications/



The reinvention of the automobile is a major issue in the re

We are convinced of the need to reinvent the automobile. Several manufacturers have picked up the gauntlet and are paving the way for new technology, public awareness of the need for change has grown, and there are signs that new technologies are moving into the maturity stage, which indicates a shift in behaviour. It was about time: had our manufacturers simply continued to compete for a bigger share of the fossil-fuelled vehicle market, and to relocate to emerging countries without undertaking strategic change, we would have faced the risk of an industrial and social meltdown.

National policies are starting to emerge in response to this new challenge (see the articles by François Michaux, pp. 22/23). Significant differences are becoming apparent, especially in the methods used to reconcile supply with demand. France has adopted a plan that focuses on building demand, while China, Japan and Germany are all introducing their own research and development programmes and industrial production policies at the same time. This diversity in national strategies could be a source of both conflict and synergy in Europe.

On the supply side, the need to extensively rework the business model has been clearly grasped. Whether it is focused on the product or on service provision, this model must anticipate fluctuations in demand and be able to cope with a sharp rise in fixed costs compared with variable costs. In light of the "quaternary revolution" described by Michèle Debonneuil, the development of service companies able to globally manage vehicles and information, and

to deliver a personalised service to customers who are users rather than owners, now seems to be an option. Of course, governments and businesses must integrate their strategies into a global context, especially since competition is set to get fiercer.

Opinion is divided as to the role of the European Union

China has an industrial policy, the United States is restructuring its industrial sector and Japan can draw on its tradition of technological innovation. But what position will Europe adopt in the competition?



Philippe Herzog and Patrick Pélata during Les Entretiens européens looking for clean cars

It has made a crucial decision to protect the environment and has created a carbon market that puts a - still inadequate - price on CO₂ emissions. But it also needs to think very quickly about investing in "green industry". The transport sector is an absolute priority. It is obviously a matter of common European interest, and a huge social challenge given the importance of the automotive industry in most European Union countries. And

yet it is not necessarily perceived as such. In addition to national rivalries, a number of conflicts between social and human interests must be addressed: we have opted to protect the environment, but not to the detriment of social considerations; **we therefore need to develop sustainable mobility systems and, above all, take care not to underestimate employment and competitiveness problems.** Reconciling different interests and dealing with rivalry between companies and countries is the province of politicians: they need to intervene, and to clarify future prospects - for investors in particular - by setting rules and creating synergies. There are too many divisions in Europe; what is essential in one member country is of secondary importance in another. The problem lies in the inefficacy of the European institutions, especially in developing an industrial strategy. But we can reach an agreement on a few basic principles. Europe needs stronger growth, otherwise we are heading for high unemployment and impoverishment. And this growth must be compatible with our environmental policy and with sustainable mobility. Therefore, we should be looking more closely at the business model

adopted by the green industry, which must boost its productivity by making better use of capital, raw materials and equipment. Of course, the solutions that spring to mind are recycling and, importantly, effective equipment management. **The efficient use of capital influences growth potential even more than hourly productivity. The development of human skills is an essential factor:** at present, it is inadequate.

VERBATIM

Bernard Jullien, Director of GERPISA (Permanent Group for the Study of the Automobile Industry and its Employees) - The arrival of the clean car calls for a radical shake-up of the automobile industry, the structure of which has remained remarkably stable for nearly a century, both in technical and commercial terms, and in terms of the sharing of functions between public authorities, consumers and manufacturers. This raises the problem in Europe of different technological response strategies, of heterogeneous markets, and of an inaccessible EU fiscal lever. The Union remains too focused on the markets at the expense of industrial policies.

Georges Vermeersch, Director of Forecasting and Innovations for Sofiprotéol - Diester Industrie has frozen its investments until 2015, to leave time for reflection on second-generation biofuels. Many studies are being pursued on mobility, downsizing, and the use of alternative energies, and these lead us to believe that diesel consumption will decline in Europe. If we simply maintain our production capacity at 2.5 million tonnes of biodiesel, the incorporation rate will automatically increase to 10%.

Philippe Chican, R&D Programme Director of the "vehicle of the future" competitive cluster - Real developments in electric vehicles will not come as result of use by the general public for reasons of cost and battery availability. Instead, they will be spurred by "captive" fleets of vehicles such as those of *La Poste*, and car sharing plans like *Autolib'* in Paris. These projects will make it possible to develop solutions perfectly tailored to use in the city, meeting short-term mobility needs. It is important that the public does not expect something that looks like their own car and is unnecessarily comfortable.

Didier Janci, Director of Strategy, Economics and Sustainable Development Department at the Caisse des Dépôts et Consignations - The state is legitimately involved in the electric vehicle project. La Caisse des Dépôts, which works closely with French local authorities, is contributing as a long-term investor. The market is in the process of emerging, so special attention must be given to regulatory issues at this time. These include standardisation, the safety of charging systems, and national and European interoperability. The stakes are high because, in the past, inconsistent standards have led to sub-optimal situations in Europe in other areas.

Simon Godwin, Director General of the European Council for Automotive R&D - EUCAR believes that the EU should promote the spread of electric vehicles by leaving the technological options open, as it will be difficult for manufacturers to invest in technologies when no one knows if they will pay off someday. This is why they need public funds from national plans and the RDFP, which unite companies and laboratories to increase the chances of developing solutions suited to the broadest possible market.

Nicolas Buchoud, Technical Adviser to the President of the Ile-de-France Regional Council - Sustainable mobility draws on the environmental, planning and transport policies of one region, and is therefore difficult to manage. It is not enough to want to adopt a cross-disciplinary approach, because expertise, governance and financing concerns invariably result in the reaching of sectoral decisions. The automotive industry sees things from an industrial policy perspective, and this is not appropriate because the bulk of a region's public investment does not concern individual mobility but rather public transport.

newal of industrial policy and of the large European market

Consolidating the internal market

The European automotive market is not unified, and the different national taxation systems work in opposite directions. How can a unified market be established against a backdrop of fiscal discord?

This will be a core issue in the internal market renewal process. But market policies will also have to be brought into line with proposed industrial policies. At present, the Member States are at loggerheads and the Commission's various DGs are badly coordinated. This underlines the importance of the Monti report and of Michel Barnier's policy, which both tackle inefficiencies. **The goal is not so much to "finish off" the single market - it is perfectly normal that local markets still exist - as to consolidate the internal market. The way to do this is to create synergies, so that employment, investment, competitiveness and environmental issues can be managed together and in harmony.** For a while the very idea of a European industrial policy was taboo, in accordance with the Bangemann report. The last few years have seen a change in attitude; Commissioner Verheugen is leading the way by drawing up a preliminary industrial policy based on a "horizontal" approach for a number of "buoyant" sectors. This policy authorises the European Union to award incentives (for research, development, etc.) regardless of the technology, and hence it ensures that no one company is favoured over another. Indeed, the idea that the public authorities should be able to pick and choose between technologies is unacceptable. However, decisions regarding infrastructure systems cannot be made unilaterally by businesses - public institutions necessarily have a role to play. And the complementary relationship between traditional engine technologies and hybrid and electric

vehicles would not be possible without rules and incentives. **Although the Gosplan era is behind us, it does not mean that there is no room for state intervention! Such intervention should be regarded as an attempt to define common objectives and to ensure cooperation between social and economic players within the framework of an intelligent public/private relationship.** Of course, it is not easy to reconcile social, environmental and industrial requirements but, once the objectives have been agreed upon, the full range of legislative, normative and financial instruments can be brought into play to increase the efficiency of investment and therefore technological decisions.

The Commission proceeds by putting together an advisory group, which organises talks between the stakeholders, the public authorities and the civil society with a view to clarifying the problems and developing a common approach. For example, in the seriously ailing textile sector, the advisory group succeeded in promoting a common perspective, which could have formed the basis of a European industrial policy. However, some countries preferred to adopt regulations authorising low-cost imports rather than to introduce production incentives. The advisory group then submits the matter to the Competitiveness Council to ensure that draft sectoral policies are fully implemented. This is the right way to go, and it looks like Commissioner Tajani may have decided so too, as in his communication he suggests reinstating the CARS 21 group and envisages the establishment of a sector-based European Skills Council. The adoption of guidelines will facilitate the use of available instruments to meet common objectives: standardisation, interoperability of plugs and sockets, standards for batteries,

the use of public procurement contracts and temporary public aid. With regard to the latter, as the capacity of each Member State is different, a system of proportionality will have to be introduced and a cost/benefits analysis will have to be conducted. The most difficult task will no doubt be to coordinate taxation policies, and the question of carbon prices (which manufacturers regard as fundamental) will also have to be cleared up. Europe will then be able to put its environmental choices into practice in the industrial sector.

Coordinating industrial and trade policies

Lastly, doesn't Europe need an international strategy? This is one of the most difficult issues. How can trade policy be coordinated with the internal market policy? The former falls within the exclusive competence of the Union. Europe has a "Minister for Trade". On the other hand, the internal market comes within shared competence, and the Member States are heavily involved in decision making and put their own national interests first. Nevertheless, if an international strategy is to be implemented, the European Union's internal industrial policy must be consistent with its trade policy. This poses a fundamental institutional challenge: **the European institutions operate independently and do not share the same "culture", which makes it difficult to impose common perspectives and global strategies.** If we want Europe's environmental choices to work to its advantage in international industrial competition, and make sure that China and other countries do not crush us underfoot, we must argue together for an international strategy that is consistent with industrial revival in Europe.

Philippe Herzog

*Founding President of Confrontations Europe
Special Adviser to Michel Barnier*

Patrick Pélatá, Chief Operating Officer for Renault - Europe is the continent where the value of each gram of CO₂ saved is highest, which gives *de facto* value to the electric vehicle. In this scheme, France is well placed because it uses a very low-carbon electricity, as do Japan and Korea, which are also taking part in the great global competition. Europe is well placed, and will succeed if it coordinates its efforts.

Eric Lemaître, Head of Corporate Affairs for the CEA Technological Research Division - Lithium iron phosphate batteries (cheaper and safer than lithium cobalt batteries) will reduce costs to €200/Wh, compared with manufacturers' current target of €300/Wh. The CEA has set its sights on a 240 Wh/kg battery by 2013, reaching 300 Wh/kg by 2015, to double the autonomy of the electric vehicle and achieve a distance of 300 km.

Gilles Jehan, Development Director for the EDF Transport and Electric Vehicles Division - The slow-charge station (3 kVA) will cost between €500 (at home) and €2,000 (on roads) before industrialisation (€300 to €900 afterwards). The fast-charge station (24 kVA) will cost between €13,000 and €20,000, and the 43 kVA station as much as €60,000. The overall cost of charging should be around €0.04/km using a private infrastructure, and €0.12/km using a public infrastructure.

Gilbert Ruelle, Member of the *Sauvons le Climat* Scientific Committee - The emergence of the electric vehicle is contingent on 4 factors: 1- The rate of the increase in the price of oil, tending towards \$100 to \$150; 2- The evolution in the price per ton of CO₂, which should pass from tens to hundreds of euros to encourage changes; 3- The pace of development of CO₂ capture and storage techniques; and 4- Increases in battery performance.

Philippe Ungerer, Scientific Director of IFP - Coupling hybrid and low-carbon fuel technologies will considerably improve the CO₂ balance of vehicles. Although second-generation biofuels will further improve this balance, putting it on a par with 100% electric vehicles, they will not solve everything because of the constant pressure they will place on land and water use. The breakeven point of the rechargeable hybrid should be achieved for a fuel cost of €1.5 per litre. Our ability to recycle lithium, cobalt and rare earth metals will determine the future of electric vehicles.

Nicolas Bouley, Chief Representative of the UFE (French Union of Electricity)

- The UFE would like to see 920,000 rechargeable electric vehicles in circulation in 2020, and 5 million in 2030. The 6 TWh needed by the French network in 2020 can be provided using existing production facilities if vehicles are left on slow charge. We need to adopt a Darwinian market approach, i.e. vehicles will be selected on the basis of use. The 100% electric vehicle will win out when the users of hybrid vehicles realise that they no longer need to rely on petrol stations.

Hugues Van Honacker, Policy Officer at the European Commission Mobility and Transport DG

- The Commission acts in the areas of research and technical development, market penetration, regulation, and financing. The Fuel Cells and Hydrogen Joint Technical Initiative is funded to the tune of 470 million euros by the Commission, which will also dedicate 500 million to the green car initiative, a large part of which will go to the electrification of transport. A group of experts is in charge of presenting scenarios for the use of alternative fuels in different modes of transport by 2050.

indiscriminately accused of killing off forests and of depriving people of food. We have since found out however that some stakeholders, such as Sofiprotéol in France, are engaged in a process of sustainable development. This company works with 100,000 farmers, is creating jobs, and is generating a new agribusiness transforming oilseeds into oils, oil cakes and biodiesel. But what is most surprising is the effect on the quality of the soil itself, and the industrial prospects of such farming. It not only opens up the future for European farmers, countering the rural exodus and poverty, but also in developing countries such as Africa. Farming will play a central role in the development of regional economic hubs through an integrated approach reconciling agriculture, industry, energy and transport!

Take the clean car as another example. The electric car has a long genesis. It was already on the market in 1912, at which time *La Poste* owned twelve vehicles. Today, *La Poste* centralises orders for electric vehicles for large private and public companies, but it will take a while for the new car to be adopted by the general public because the market has not been developed. Neither in terms of supply - there being no network and no charging stations - nor in terms of demand, as the limited autonomy of the first cars is acting as a

deterrent. Yet some countries are sticking their neck out. The USA, China, Germany and Korea are fusing supply and demand, industry and services! And there is potential for job creation, for example in electric batteries. We are going to have to be careful to make sure that Europe, which is already lagging behind, does not find itself with clean cars running on imported batteries... These were promising debates. The articles published in this *Lettre des Entretien européens* reflect them in part, and may already be seen as a continuation. As Philippe Herzog so beautifully said, "we must hope that our morning dew fertilises political thinking" and above all that it leads in Europe to the collective choice of a new social and economy model, in the quest for common good. The situation calls for a commitment in CAP reforms, in cooperation between industry and agriculture, and in effective public policies for development. It is only by doing this that the European Union's gamble in the fight against global warming and for growth will pay off, and that it will play a leadership role both in terms of cooperation with Africa and of regulation between the major regions of the world.

Claude Fischer

President of Confrontations Europe

2010 PARTNERS OF LES ENTRETIENS EUROPÉENS:

SUSTAINABLE BIOFUELS : 24 MARCH TO THE UNIVERSITY FOUNDATION IN BRUSSELS

CLEAN CARS : 14 AND 15 APRIL IN LA POSTE HEADQUARTERS IN PARIS



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