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QUESTIONNAIRE

1. **Should the vision agreed in the intermediary study of CARS 21 be revised? (i.e. in 2020 the market will be dominated by the improved combined combustion engine combined with growing penetration of electric and hydrogen vehicles and hybrids while in 2050 transport will be decarbonised)**

   It does not seem necessary to revise this scenario since no major changes have taken place that might call for such a course of action.

2. **What potential do different clean automobile propulsion technologies (efficiency in fuel consumption, hybridization and improved transmission mechanism) have to contribute to the decarbonisation target in the short, medium and long term?**

   Technological trends in relation to vehicles

   - **Petrol engine**. An improvement of 20% is expected in energy efficiency over the next decade through the application of proven technologies (hybrid systems, start&stop, smaller engines offering greater compression by means of a turbo-compressor, engines operating in 2T and 4T to obtain a flatter torque curve with smaller engine capacity, direct injection, optimised operation of the alternator, electric steering, etc.).
   - **Diesel engine**. Less potential improvement than petrol engines, although there are already technologies that can be applied to reduce consumption by approximately 10% (advanced injection systems, optimisation of the EGR, two-stage turbo-compressors, hybrid systems, start&stop, electric steering, etc.).
   - **Electric vehicle**. At a European level there is a commitment to introducing electric vehicles which can be recharged (primarily at night). This will essentially turn the fleet of electric vehicles into a large battery, making it possible to accumulate the surplus electricity generated in nuclear and wind-type facilities or optimise operation of combined-cycle plants.

     As for penetration of the electric vehicle, it should be noted that the changeover process involved in switching the automobile fleet from one type of fuel to another is a very lengthy one; in addition to technological barriers and social rejection, it also involves replacing a good whose current useful service life stands at around 15 years. The period 2010-2020 must therefore be considered to be the initial market breakthrough stage, with more major impacts forecast to come in the following decade.

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3. **What is the decarbonisation potential of the complementary measures in the short, medium and long term (for example guidelines on economical driving, use of smart transport systems) and how reliable is that potential?**

   We consider that complementary measures such as those listed below will enable a further 0.1% a reduction in the distance covered per vehicle on top of the reduction associated with improvements in engine energy efficiency.
   Examples of complementary measures:
   - Prioritisation of public transport
   - Improvement in energy efficiency in public transport services
   - Promotion of efficient driving
   - Development and introduction of coercive measures to improve sustainability in transport
   - Use of multi-user or shared car
   - Analysis of the impact on mobility and energy consumption associated with new investments in infrastructures

4. **What are the implications of new propulsion technologies from a life-cycle analysis perspective with regard to vehicles, and a "well-to-wheel" perspective with regard to energy supply chains? What are the implications of the resources on the introduction of innovative propulsion technologies?**

   The incorporation of new energy solutions in the transport sector will require a complete life-cycle analysis of all alternatives, with a view to prioritising usage by CO2 emissions and energy consumption. However, other criteria such as local emissions or diversification of energy sources may make it advisable on occasions to use technologies that do not rank highly in life cycle analyses.

5. **What is the state of play and future situation of technological progress in transmission mechanisms (electrical and hydrogen) and their market penetration? What are the principal associated risks and opportunities for the different interested parties? What will be the economic, social and environmental and employment impact of this progress?**

   The technological development with regard to transmission mechanisms associated with the electric motor, is a total one. The limitations on development of electric vehicles currently lie in the price, volume and weight of the batteries. The existing NiMH batteries are forecast to be replaced by Li-ion ones, which have a greater energy capacity per unit of weight (82 Wh/kg at present compared to 150 for Li-ion batteries currently at production development phase, and 350Wh/kg for the next generation, now at research phase).

At the same time, home recharging facilities will require very much larger contracted power rates than at present. Combined with other factors, this will make it necessary to regulate this type of installation and its charges by law.
Although investment is being made in research both in the US and in the EU in the development of hydrogen as a vector energy for transport, its future application is questionable and in any case, it is not expected to in place before 2030.

6. **How can the dilemma be avoided whereby an electrical transmission system would reduce or cancel out the improvements made in conventional technologies within the framework of the existing and future legislation on CO2 emissions of road vehicles?**

   Electric vehicles must be rated with an associated level of CO2 emissions resulting from the life cycle of the energy they consume and compete with other technologies in this aspect. The method of calculation is complex and varies from one EU member state to another; and a common method of calculation should therefore be agreed on.

7. **What measures should be taken at regional/national/European or international level to promote the technological development and market absorption of alternative transmission systems (electrical and hydrogen)?**

   In order to promote electric vehicles the regulatory frameworks must be modified so that the sale of electricity as an automobile fuel can be introduced simply and legally. At the same time, progress is essential in the standardisation of charging methods and equipment.

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