For Official Use **SG/SD/RT(2006)2**

Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development **06-Sep-2006**

English - Or. English

GENERAL SECRETARIAT

SG/SD/RT(2006)2
For Official Use

Round Table on Sustainable Development

Chairman's Summary Note of the 14-15 June 2005 Meeting of the Round Table on Sustainable Development

DO WE HAVE THE RIGHT R&D PRIORITIES AND PROGRAMMES TO SUPPORT THE ENERGY TECHNOLOGIES OF THE FUTURE?

Paris 14-15 June 2006

For further information please contact Richard Doornbosch, Principal Advisor, Round Table on Sustainable Development, OECD, 2 rue André Pascal, 75775, Paris Cedex 16, tel: +33 1 45 24 14 57, email: Richard.Doornbosch@oecd.org

JT03213124

English - Or. English

The following is a short summary note of the discussion on 14-15 June, issued under the Chairman's responsibility. Please note, in keeping with Round Table procedures, a detailed note of the meeting will not be circulated.

The meeting was focused on two broad questions.

1. Are there technical possibilities within reach that would enable us to meet expected demand for energy in more secure and less polluting ways?

Security of supply concerns start to diminish given the abundance and distribution of alternative fossil fuels

There was broad agreement that because fossil alternatives to conventional fuel and energy are geographically widespread and can substitute at moderately higher prices, security of supply concerns are limited in the medium to long term.

Not withstanding broad agreement under this heading, two refinements were made. Firstly, although 'peak oil' may be a misleading concept, there will be a peak in *easily accessible* oil. Easily accessible oil will not be located in everyone's backyard and will be under the control of countries that will not always give access to international companies. The same may hold - to a lesser extent - for gas. Secondly, energy security is not only an issue of having sufficient resources available at a reasonable price and in geographically widespread locations: it is also a question of making them available at the right price and at the right time. Because of the capital intensity and long lead times of the projects needed to bring these resources on-stream, the scale of the challenge remains formidable in any scenario and depends to a large extent on well functioning international product and capital markets.

Neither nuclear energy nor renewables are likely to increase their shares of the forecast energy mix on a sufficient scale or in time to influence ghg emissions

There was broad agreement that for the next 50 years increases in the energy supply will almost inevitably come from fossil sources. Unconventional oil and gas together with coal seem to be the most competitive and convenient alternatives to conventional fossil fuels and they are widely available. Canada has, for example, more oil - from tar sands - *in situ* than Saudi Arabia. It was noted that these fossil alternatives will most likely become competitive on a large scale in the next 5 – 10 years.

Furthermore, it was noted that two alternatives that in terms of their technical potential could make a difference, solar and nuclear, are unlikely to make really significant inroads in the marketplace. Solar energy will simply be too expensive in the coming decades to make a difference. Some participants suggested that solar energy could be providing up to 10% of the total primary energy supply in 2050 if appropriate government policies were taken. It was noted that the nuclear sector will be hard-pressed to replace its existing capacity and expand it sufficiently even to retain its current share in the energy mix. Although technically nuclear energy could expand more rapidly, public opinion and the political climate is unlikely to allow a return to the peak growth rates of the late 1970s that would be needed if its share of the energy mix were to increase significantly.

Other renewables such as wind and bio-energy were considered a useful part of the mix – especially as distributed energy sources - but limited in their long term potential. It was noted that it would be impossible to increase bio-energy without compromising the biosphere further because of its low energy density, high demand for water, intensive land use and likely impact on the nitrogen cycle. This is notwithstanding the fact that in specific regions and for specific energy products, bio-energy is already a competitive energy source. Some participants noted that biotechnology could increase feedstock productivity and provide other solutions to the problem of global warming although research is at a very preliminary stage and would only begin to be a part of a solution by the end of the century.

This makes Carbon Capture and Storage a crucial technology when global warming is to be curtailed

Given the dominance of fossil fuels in the coming 50 years, carbon capture and storage technologies (CCS) were considered crucial, probably more so than any other technology. At the same time it was noted that the scale and rate of the challenge was daunting. It was reflected that the size of the investments needed to capture and store 10% of today's CO_2 emissions were roughly similar to the total capital stock currently deployed in the exploration of crude oil.

But without economic instruments that place a price on carbon, CCS will not come forward.

There was strong agreement that in the absence of a government imposed price on carbon the technologies to significantly curtail CO_2 – such as carbon capture and storage – will not penetrate the market within the timeframe needed to prevent GHG concentrations more than doubling. There is no economic reason to store carbon if it can be disposed of freely in the air. Because CCS technologies are very capital intensive, comparable with nuclear power plants, industry is not going to move without a firm government imposed long term price for carbon. In general there was firm support for the use of economic instruments but at the same time the political limitations of both carbon taxes and caps and trade systems were noted.

And even a price of carbon may not be not enough to bring CCS on- stream in time

There was a clear view among some participants that long term price signals were necessary but not sufficient to bring forward CCS technology on the scale required. Technology neutral policies will especially help with near to market deployment. For technologies that imply significant change and development, like CCS, more needs to be done. It was suggested that governments should make a clear choice to develop carbon management technologies and engage in a consistent and long term effort. Only then could industry be asked to perform.

The need for government regulation to validate and certify storage locations and technologies was noted. Long-run slow leakage back to the atmosphere was not likely to be a significant issue. Rather, it would be the local risks at the site that were likely to be the binding constraint. Regulatory innovations would be needed to enable safe management of CCS including mechanisms to transfer liability from operators back to governments at the end of the operational phase of injection projects. Public acceptance may be a similar issue for carbon storage as it is for nuclear waste and therefore credible government risk management policies are needed to make storage acceptable to the public.

In relation to the demonstration and deployment of CCS technologies the importance of learning by doing was noted. As demonstration units are unlikely to happen spontaneously, CCS technologies should be credited by the Clean Development Mechanism and the European Trading System.

The political difficulties with a carbon tax or a cap and trade system should lead to an investigation of other regulations that put a price on carbon.

A suggestion was made to look at alternatives to a price of carbon that could have the same sort of effect but be politically more acceptable. For example, the notion of producer responsibility could be expanded in a clear, credible and gradual way. The carbon industry could be held responsible for the carbon it takes out of the earth's crust and puts in the atmosphere in the same way the nuclear industry is supposed to be responsible for its nuclear waste. If done in a gradual way, for example for 5% of the total emissions in 10 years time, 15% in 20 years and 50% in 50 years time, industry would be given time to adjust and develop least cost technologies without expensive retrofitting and capital loss. This sort of policy could possibly be implemented by governments in a unilateral way.

The California Emission Standard Act of 1990 was mentioned as an example of a market oriented instrument that was far enough in the future not to disrupt current capital stock and influenced the development of zero and low emission cars. From a government perspective it had a limited impact and was primarily a way to mobilise industry R&D investments.

Energy efficiency both on the supply side and on end-use appliances is desirable

There was wide agreement that energy efficiency is worth striving for, although opinion on the precise nature of any objective was more divergent. There is no doubt that improving energy efficiency saves energy and hence money thereby increasing productivity and economic growth. But there was a strong debate on the extent to which energy efficiency could be relied upon to decrease CO_2 emissions on a macro scale, given the possible rebound effect of increased demand simply eating up the gains.

2. Are global investments in researching, developing and deploying these technologies focused where they are likely to leverage the most significant gains, and is the critical mass of investment sufficient given the timescales in which we may wish to effect changes to the energy supply?

Before getting into debate, three key messages from the OECD Global Science Forum conference on the Scientific Challenges for Energy Research were presented. The first was a positive message that the science community considered that the energy problems are, from a scientific point of view, tractable. The second message was that at the same time there are still a lot of knowledge gaps that should be explored. The most promising were photovoltaics, advanced biotechnology, both fission and fusion nuclear energy and, finally, CCS with an emphasis on storage. The current portfolio was regarded as too small and not well balanced. The third message was that developments in these technologies cannot be expected to happen on their own. A policy framework is needed within which R&D can be pursued. A portfolio approach should be taken and decision makers need to make sure the portfolio is sufficiently risky. Without failure, a portfolio is not likely to be balanced and opportunities will be missed. A well diversified, sufficiently risky portfolio should be seen as an insurance policy.

Both the absolute level and the balance of the portfolio seems to be inadequate

The development of R&D investments and the problems that have to be addressed seem to evolve in different directions. Budgets go down whereas the problems are increasing. It was noted that the current R&D effort on solar energy when compared with the expectations for solar research was an order of magnitude too small. There is a complete mismatch between budgets and expectations.

The importance of battery research was stressed for the replacement of fossil fuels in the transportation sector and of the integration of renewables for electricity generation. The public R&D effort on battery research was considered to be very small although this might reflect a relatively large industry effort is driven by the fact that batteries are a crucial factor in the development of electric and hybrid vehicles.

The large share of nuclear research in the overall portfolio was deemed to be inherent in the capital intensity of the technology. Nevertheless it was noted that in some countries nuclear budgets seem high given that there have been no new plants commissioned over the last decade or more.

The balance between research on the one hand, and development, deployment and demonstration on the other is receiving inadequate attention

In general it was noted that technologies don't become cheaper because of R&D but because the results of R&D are deployed in commercial products. This poses a specific problem for solar energy given that there is no natural market to start with and therefore no opportunity to drive the learning curve. Nevertheless, solar energy (photovoltaics) has received a large amount of money in a small number of places. This did not lead to sufficiently declining prices because the technology was still too far from the market. This would imply re-balancing the solar portfolio in favour of R&D. Given experience to date, the progress of solar energy suggested itself as a useful case study.

It was emphasised that energy innovation should not be characterised as an R&D question but that research, development, demonstration and deployment should be treated as an integral whole.

Furthermore deployment of renewables may be hindered by capital market imperfections since, as for conventional energy sources, the large upfront investments are made by large companies and the variable cost of energy use is rather low whereas for renewables the upfront investments are especially for consumers who may be less well placed to finance them.

The objective for energy R&D and energy subsidies should be made clear

Government interventions for bio-energy were criticised because the objectives of government measures were not made clear. As was noted earlier, bio-energy has significant limitations which therefore raise the question of how it can be used best.

Some contributors noted that if energy security is not the real issue but rather CO_2 reduction, the focus on liquid biofuels seems to be ill conceived because bio-energy has more potential to be used for electricity and heat generation. Others felt that bio-energy should be used not where it is most competitive but where alternatives are most scarce, namely, in the transportation sector.

The principal reason for supporting liquid bio-fuel was felt to originate in agricultural policies rather than energy policies. The concern was expressed that energy R&D money should not end up effectively supporting agricultural subsidies.

Does the international co-operative approach to nuclear R&D provide a model for international energy R&D cooperation more generally?

In both nuclear fission and fusion research there has been a clear view on R&D priorities and programmes and a strong degree of international cooperation. In response to declining budgets, the nuclear research and development community has worked more and more closely together in joint research projects. The latest examples are the ITER project and co-operation on the development of generation IV nuclear fission technology. It was noted that more of this sort of approach could be pursued in other areas where energy research not only seems to be *underfunded* but maybe also be *underprepared*.

The need for collective action on the regulatory and legal regime for the energy sector was emphasized. Incentives for clean energy technologies and energy efficiency are needed urgently. Furthermore, intensified international cooperation is needed to improve the functioning of international energy markets.