**Workshop on Forward-looking Activities on Industrial Technologies within FP6-FP7**

**Brussels, CDMA – Room SDR 1**

**Friday, 12 March 2010 * 09.30 – 17.00**

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**Introduction: "Forward-looking activities within FP6-FP7"**

**Herbert von Bose** (Director of Directorate G – Industrial technologies – of DG Research) opened the session. He did a brief summary of the recent history of research in policy agenda, characterised by a growing importance, especially in terms of funding. Such evolution has been accompanied by a shift on the requests from politicians, who demand for concrete outputs (i.e. impact in terms of jobs and sustainability).

In this sense, foresight activities are becoming more and more relevant, in order to give answers to grand challenges, and more and more industry-driven, with public-private partnerships (PPPs), European Technology Platforms (ETPs) amongst other initiatives.

This has also an impact on the design of FPs. The European Commission is willing to reformulate them in terms of "which programmes to answer to grand challenges?" and "how to link individual topics to those grand challenges?" through a process of decentralisation of policy-making. Good examples are the creation of executive agencies or PPPs.

**Michel Poireau** (Head of Unit G1-Horizontal aspects and coordination) presented the agenda and the objectives of the meeting. The European Union is committed to put its action in a longer term perspective, which underlines the importance of forward-looking activities. In this sense, industrial technologies (and more precisely, nanotechnologies, new materials and new production technologies – NMP) are a key sector, which should facilitate the transition towards a knowledge-based economy in Europe. This workshop is based on a synthesis of the forward-looking projects funded under FP6 and FP7 in the field of industrial technologies. On that basis, the aim of the meeting is to share and discuss knowledge on this area, as well as to reinforce links and feedback with the foresight community in Europe. Some key messages and key questions from the synthesis working paper were presented (see attachment).

**Thierry Gaudin** raised three messages/recommendations:

- Research does not necessarily generate innovation, which, indeed, depends more on clients than on producers. To enhance innovation in Europe, there is a need for an innovation culture.

- This cannot be implemented without removing barriers to innovation and avoiding that innovation is captured by a limited number of groups or companies.

- He also underlined the potential role of public procurement, which should be a tool for promoting innovation.

**Jan-Eric Sundgren** partially agreed on this point of view. For him, consumers' attitudes and choices are critical, but innovation can also be producer-driven, through the whole supply chain (business to business) as in the case of the Boeing Dreamliner. He also underlined the crucial role of education, in order to make Europe an attractive place to live and work.

**Élie Faroult** appreciated the synthesis work realised. For him, it is crucial to think on the long term, but also to tell a story, a narrative, to present a vision guiding people and decision-
makers, something which is lacking nowadays. Indeed, he recommended inviting representatives from the "civil society" to events or meetings on forward-looking activities. They should be involved in the reflections, giving their points of views, which can sometimes lead to raise unexpected issues. We should go beyond the opposition between consumers and producers, through the idea of "prosumers". Alain Michel went even further, talking about the possible gap between consumers and/or producers needs and those of the society as a whole. This is very clear when we see traffic jams in our cities.

Michael Matlosz stressed the importance of management of knowledge and of change in public and private organisations. A key element for open innovation is to make compatible the values and behaviours of enterprises and those of researchers and to reward innovation and new ideas (we get what we reward). The role of education is therefore essential. A shift is needed from individual and disciplinary approaches to more collaborative and interdisciplinary ones. He proposed to consider the opportunity to assess the prospects of what the academic community could look like within 20/30 years. As Alain Michel underlined, such new values cannot be promoted from higher education, but from the earlier stages of education. (The issue of education appeared constantly during the workshop).

In this debate about the basic conditions for innovation, Pekka Koponen underlined that looking at consumers' needs and behaviours is very difficult when talking about industrial technologies: "It is not possible to interview a market that still does not exist". Then, he presented three cases: Nokia (when it moved to telecom, this sector represented just 10% of its revenue!) and Kemira (successful industry on cleaning water technologies, previously involved in… agro-chemicals!-) are examples of very positive long-term vision, while the declining forest-industry is a negative example. For years, the strategy has been to increase the production of paper. Now, the global market is declining and it is perhaps too late to change...

François Farhi mentioned the interest to look at weak signals, which became strong driving forces over time. For instance today, the issue of deconstruction, which already appears in construction and in the car industry, should be more widely and systematically applied in manufacturing ("from cradle to grave" concept). He also emphasised the importance of clusters for the emergence of innovation (bringing together academia, labs, universities, SMEs, public authorities on a local or regional basis). Paradoxically FP requirements tend to extract individual participants from their "natural" clusters....

Presentation: "Prospective view of sustainable and competitive European production systems in the period 2000-2010" (Nigel Roome) and discussion

"Vision without action is dreaming, action without vision is chaos" (Nelson Mandela).

Nigel Roome explained that a basic premise to ensure a future competitive and sustainable Europe is to take into account socio-technical systems. He opposed the concepts of "efficiency" and "sufficiency", insisting that the EC action should focus on the later, going therefore from the mere production of goods to the delivery of service functionality to meeting consumers' needs through increased performance of material products. This leads to new paradigms: instead of standardisation, what is needed is a system-sensitive policy. There are of course several obstacles to such a shift:

- Structural: e.g. tax-policy, which does not take into account end of life of products.
- Cultural and behavioural.
- Skills: there are shortages in systemic training, multi-disciplinarity and other soft skills.

In order to make foresight activities useful, some premises are necessary: understanding socio-technical systems, create multi-actors platforms to share visions, removing barriers to
change, develop enabling technologies and demonstrate and disseminate new practices. In terms of the enabling technologies to be developed, adaptability, durability, flexibility and closed-loops are amongst the characteristics required.

These ideas were considered as a too far vision ten years ago, while now they are almost shared everywhere. Europe is too rigid for innovation, for different reasons (business, policy, education…): who will break the dreadlock?

The discussion after the presentation of Nigel Roome covered four main areas:

- What will be the "new future": competition for soil (i.e. used to produce energy or food?), role of China (from place for intense production to place for intense consumption)?

- Designing strategic cascades (from grand challenges to individual topics) requires also to consider and to link successive time horizons: short, medium and long term and to pay due attention to the transition paths. Five years scenarios (as used in industry) can be quite valid to envisage longer term issues if the impact of the actions undertaken during these 5 years is put in perspective of their possible impacts in more remote periods. Th Goergen highlighted the example of FLA work in Bayer, stressing the need to combine big challenges with big enough projects to allow to prepare big strategic moves (e.g. in Bayer: from selling green products to a wider market and innovation approach leading to selling functionalities, very much in line with the sufficiency concept developed in N Roome's study)

- Education, which remains too centralised and standardised (partly due to policies promoted by the OECD, rankings like PISA or the Shanghai one on universities, Bologna Process…). How to break this trend to ensure a better adaptation to local needs? What should be the role of teachers? The Finnish example, always very well ranked in international classifications, was discussed. It is a system where teachers have permanently been socially and professionally recognised over the last decades and where they have a great flexibility in their way of teaching.

- How to engage key actors in forward-looking processes? The example of the BE Bureau du Plan using in support of decision-making the scenario designed for the Futman project is encouraging. But this seems a rare case. Without the involvement of decision makers as shapers and or users, to explore options etc., foresight exercises risk to remain academic.

Further to the discussion, Michael Matlosz launched a provocative question: if innovation is not a strength of Europe and is however a pillar of Lisbon and post-Lisbon strategies how can we build a strategy based on our weaknesses?

**Presentation: "Information on some Swedish forward-looking activities within the forest industry sector" (Gunnar Svedberg)**

Paper industry's trends are currently as follows:

- Prices are declining.
- There is an increased global competition for wood and waste paper.
- The market competes with producers in the Southern hemisphere.
- As a consequence, profitability is weak.

Under these circumstances, CEOs agendas are now threefold:

- Capacity adjustment and capturing market shares in the sector of packaging.
- Improve costs structure (but there is not a big margin).
- Integrate paper and energy generation (biofuels).
Basically, the strategy consists on creating new added-value products, and industry is trying to build its future using the inputs of the European Forest-Based Industry Platform as well as those of EU-funded research projects (e.g. Ecotarget- FP6). Combination of foresight prospects with various socio economic scenarios can help to identify better cost effective ideas and innovation according to each scenario and to select those which perform well under all scenarios.

The vision for the industry consists on becoming less water-and energy-intensive, and to increase recycling, with concrete quantitative targets. New materials, like nanocellulose, should play a crucial role, because of their wide set of applications. This collective FLA work helped to raise awareness within industry, to identify R&D topics and to prepare changes.

There are nevertheless difficulties to solve: demonstration work beyond research phase; difficulty to recruit researchers in social sciences who may bring new ideas and solutions. Last but not least, networking throughout the supply and value chain is necessary, otherwise it will be impossible to change technologies in the industry, in order to develop new packaging and energy products, for instance.

**Presentation: "From insight/idea generation to industrial applications of advanced materials and processes in the oil & gas production" (Francis Luck)**

Francis Luck presented the rationale of the innovation policy carried-out at Total, from idea generation to commercialisation. He insisted on the huge collaboration with research centres. In fact, little research leads to innovation, but there is a growing company culture for innovation and research.

In its R&D planning, Total looks at a 5-years horizon. They launch call for proposals to the academic community, in order to develop technologies able to solve problems. Due to the specificities of the energy sector, technologies must be developed to their limits, like for extra heavy oil, deepwater extractions or sour gas. Half of Total's portfolio has been developed with emerging technologies. For instance, Total requires new materials and processes, able to resist 2000 bar and 300 °C, corrosion, fatigue, etc.

Francis Luck presented some innovation barriers, linked to public administration procedures for approval of projects/initiatives (eg the CCS project in Lacq implied 2 years discussions).

**Presentation: "Industry visions in activating open innovation – The case of Finnish nanotechnology" (Pekka Koponen)**

Pekka Koponen presented how Finland was able to develop nanotechnologies, from being a topic just for researchers, to a more industry-oriented focus. This was done through very participatory foresights, in which public bodies, NGOs, industry and scientists were involved. The particularity of this process was that forward-looking activities were embedded into strategic policy-orientation. As a consequence, it leads to decisions of both authorities and stakeholders.

In methodological terms, the forward-looking activities were conducted through sectoral networks. For instance, Nokia conducted the one on ICT, in order to develop different components of self-phones and to foresee what will happen in this sector in X years. In this sense, Nokia has been successful on anticipating the societal impact of mobile phones, that are not a simple device, but a social phenomenon. Kodak, for instance, was unable to anticipate changes in its sector, were it was the technological leader.
The impact of this forward-looking strategy has been a huge increase in the number of companies involved in nano since 2004, in all sectors. Indeed, the private financing has increased in only four years, being since 2008 higher than the public funding (unchanged).

Further to this presentation, Mr. Sundgren underlined the relevance of what he called "money triangle", very clear in the Finnish example: Consulting – Capital – Contacts.

**Presentation: "Foresight action for multifunctional materials technology" (Stuart Preston)**

Stuart Preston focused on foresight activities for SMEs. In order to attract them, it is necessary to go to them. SMEs involved in high-tech are more likely to adopt forward-looking approaches. This was done for the FP6-funded project SMART: around 900 companies were visited and 12 case studies were generated. The aim was to identify areas of research relevant for materials, through roadmaps and scenarios-building.

Amongst the problems encountered, it is possible to mention:

- Skill shortages (especially of "technicians": people able to use adequate equipment, to follow new processes, to deal with new materials... There are not necessarily scientists, but highly skilled workers).
- Funding (e.g. FP6-FP7 is administratively tortuous).
- Communication between different actors remains difficult.
- Success stories should be communicated to the public.

Stuart Preston insisted on the need of impact analysis of forward-looking activities. In particular, did Europe take advantage of foresight activities it finances?

Again, the discussion was linked with education. **Nigel Birch** talked about attractiveness of engineering and similar studies in the UK. The universities attract foreign students, but not national ones. One of the reasons is that diplomas are too expensive (around £30,000 for a PhD!). Competent students prefer to go to other areas, like finance. Pekka Koponen asked whether education is playing its role as a way of entering society. When Finland was a poor country, education was a key factor to succeed. Is it the same now in Europe?

**Dimitris Niarchos** explained that there is a missing link that could be covered by the EC. Each FP-funded project should have a training component, including a technologic transfer element.

**Derek Flynn** made another concrete proposal. In the UK, if research projects succeed on developing products after the end of the funding, they can receive additional funds. Something similar could be implemented by the EU.

**Presentation: "National priorities of industrial research in Italy" (Claudio Roveda)**

Claudio Roveda explained how national priorities, from key enabling technologies to the future of industry, have been built in Italy. This has been a process supported by both public and private actors, like Pirelli, Finmeccanica, etc. The National Research Plan 2009-2013 and the "Industry 2015" initiative have benefitted from this process.

The rationale was based on a focus on applications (sustainable mobility, energy, healthcare, cultural heritage, made in Italy, Security) versus technology (biotechnologies, advanced materials, ICT, nano). Again, it seems clear that traditional industry can survive if its uses new technologies.
A very important issue, analysed in detail, concerned mobility. A list of critical technologies and the impact of their key functions was analysed, taking into account their advantages, weaknesses, both internal and external factors, etc.

**Conclusions and recommendations**

Michel Poireau thanked everybody for the active participation in the discussion and for all the stimulating remarks and proposals put forward. He indicated the interest of the European Commission to build upon the expertise gathered during the meeting, contributing to further networking on the issue of FLA on industrial technologies.

In his wrap-up, Michel Poireau tried to answer two questions:

- What did we learnt?
- What to do next?

a) What did we learnt?

The working document on "Forward-looking activities on industrial technologies within FP6-FP7" was broadly validated:

- New enabling technologies, their interaction and their convergence through increased multidisciplinarity can help the European both traditional and innovating Commission industry.

- More holistic approaches are needed to meet consumers' needs and to strengthen European positioning on the high value-added production, through better integration of products and services.

- New values and behaviours can strongly influence production and consumption patterns. Industry should give more attention and anticipate such changes.

- Education and training are of paramount importance in this transition process.

Other issues arose from the discussion, going beyond the EC's synthesis report:

- Innovation is not a technical issue only, but a cultural process. It has to involve business to business relationships, stimulating the emergence of innovative entrepreneurs and customers.

- Education and training have to integrate several dimension of knowledge production (e.g. knowledge transfer and a different management open to innovation). Education has to encourage flexibility, multidisciplinary skills and creativity. The role and status of teachers in society should improve in most European countries.

- Foresight should not be reserved to large companies. There is room and need for involving SMEs in such a process, through targeted and participatory approaches suiting their needs.

Some open questions require further reflexion:

- How to communicate future visions to the large public?

- What transition paths have to be followed to preserve short term competitiveness and mid to longer term sustainability?

- Which discontinuities or breakthroughs could impact European industry? What about weak signals? Are not forward-looking activities and future scenarios too much based on mere extrapolation of trends?

b/ What to do next?
- The European Commission would like to maintain contacts with the experts invited to this event. This will be done through e-mail and Email and through further meetings. Such contacts should facilitate the exchange of information about national initiatives on similar topics.

- Two studies are going to be carried out, funded by the EC: one on skill needs in the field of NMP and an ambitious foresight study. Further information and a calendar will be provided when available.

- Appropriate measures should be taken to improve links and dialogue between FLA practitioners and potential users. Stronger links between FLA practitioners and decision makers are needed, in order to mutually understand needs and challenges, through a common language.

Other recommendations and conclusions were underlined by participants, through a "tour de table":

– Foresights are useless if they are not participatory and followed by strategic decisions from the different actors involved.

– We have to learn from the USA, where there are continuous meetings, between different actors. Then, (private) funding comes.

– The role of the money triangle (see above) has to be underlined.

– There is a need for some coordination between forward-looking activities carried-out with EC's support.

– Need for dissemination of forward-looking results towards grand public. Telling then a story, presenting them a future society.

– Learn about the innovation systems in countries like Finland or Sweden. They are based on horizontality, putting people with different background together and linking different elements each other.

– Education is a critical factor. DG Research should reflect on its impact on education. FP could be a tool to move education towards new paradigms: multidisciplinarity, risk-taking, creativity, etc. There are already skill shortages and brain drain (engineers going to the USA or working on finances).

– Public procurement should play a major role for innovation. In Europe, it is not at all the case.

– A variety of stakeholders should participate in FP design: scientists, but also people involved in finance, NGOs, education practitioners, etc.

– Involve ETPs in this kind of foresight activities.

– Invite civil society (e.g. NGOs) to this kind of meetings.