BIOVISION
THE WORLD
LIFE SCIENCES FORUM

BIOVISION PRE-CONFERENCE REPORT FORMAT

INTRODUCTION

BioVision introduces a NEW ARCHITECTURE by adding 9 Pre-conferences in 2006 and a web Forum hosted by BioVision NXT. and will take place between March and October 2006.

The Pre-conferences will ensure continuity, between the two successive forums by enlarging the circle of participants in order to better meet the needs of the key BioVision participants: Science, Society and Industry.

OBJECTIVE

The OBJECTIVE of Pre-conferences is to explore and develop the topics for debate and discussion at BioVision Forum.

The WORK PRODUCT of a pre-conference will consist of an EXECUTIVE SUMMARY of the discussion, RECOMMENDATIONS FOR ACTION and CONCLUSIONS recorded in table format specifically spotting the key issues in the field and the viewpoints of the communities: Science, Society and Industry.

METHODOLOGY

Pre-conferences will consist of small meeting of up to 10 participants to develop the key issues for the BioVision Parallel Conferences in three sectors: Health, Agriculture and Environment.

Each Pre-conference will have Host Partners. The Host Partners with BioVision support will organize the meeting, choose the participants.

The topic recommendations of the Pre-Conferences will be honed and refined for the BioVision Forum. Due to time limitations of the Forum, not all identified topics and issues may be covered in the Forum.

PRE-CONFERENCE TITLE: **BIOENERGY AFTER OIL**

TOPIC DESCRIPTION: BIOENERGY

Science and technology, viability, sustainability and implications for North and South

LOCATION: Paris, France	**DATE:** May 17-18, 2006
HOST PARTNER: OECD Organization of Economic Cooperation and Development	**BIOVISION PARTICIPANTS:** **Dianna Derhak**, Chief Operations Officer **Jean Michel Roy**, Human Sciences Advisor
MODERATOR: Dr. Michael Oborne, Director of Multidisciplinary Issues and International Futures Programme	**PARTICIPANTS:** **Dr. Vaclav Smil**, Distinguished Professor University of Manitoba **Dr. Ken Caldeira**, Staff Scientist, Department of Global Ecology , Carnegie Institution **Prof. David Victor**, Director Program on Energy and Sustainable Development, Center for Environmental Science and Policy, Stanford University **Dr. Birte Holst Jorgensen**, Director, Nordic Energy Research **Dr. Bernard Frois**, Director New Energy Technologies Delegation National Research Agency at the Atomic Energy Commission **Mr. Claude Roy**, Inter Ministerial Coordination for Biomass Development, Cabinet of Ministers, France **Mr. John Newman**, OECD **Mr. David Sawaya**, OECD **Interviews on video tape:** Vaclav Smil Ken Caldiera Bernard Frois David Victor Commentary by Ged Davis, Managing Director, Center for Strategic Insight, World Economic Forum

AGENDA:

1. WELCOME and INTRODUCTION OF PARTICIPANTS
2. OVERVIEW OF BIOVISION
3. BRIEF THEMATIC PRESENTATION
4. DISCUSSION AND BRAINSTORMING on HOT TOPICS, ISSUES, TRENDS
5. RECOMMENDATIONS

EXECUTIVE SUMMARY:

NARRATIVE:

- Background:

Affordable, clean energy that meets growing global demands are the main energy challenges of the 21st Century. Today, we have more questions than answers. We live in a fossil fuel/hydrocarbon dominated world. However, fossil energy is not renewable and the development of alternative sources of energy has now become a major issue, emphasized by the cost of extraction of hydrocarbons and the important societal concerns raised by their environmental impact, including climate change and air pollution.
There is no global one-size fits all for energy. Each country and region will face a bewildering array of options and choices on how to provide for the energy needs of its people. Choices made today will have a profound impact on quality of life, health and well being of people, food we eat, air we breathe, water we drink and the ecosystems ability to sustain itself for the next generation and beyond.
The Preconference on Bioenergy focused on the possibilities offered by bioenergies, their promises and difficulties, and the role to be played by the life sciences in their development. It was held in conjunction with the two day OECD Global Science Forum (GSF): Conference on Scientific Challenges for Energy Research in liquid fossil fuels, biofuels, coal power, carbon capture and storage, nuclear energy, solar power, electricity networks, hydrogen and fuel cells, energy and research policy. The Global the Global Forum examined scientific maturity - timescale to competitive viability; extent of the gaps in science knowledge; the principal obstacles to the technology fulfilling its potential role and the potential impact of the technology on the global energy future? Participants in the full meeting included more than 150 experts from Germany, Australia, Belgium, Canada, Denmark, United States, Finland, France, Iceland, Italy, Japan, Norway, New Zealand, Netherlands, Poland, United Kingdom, Sweden, Switzerland, and European Commission. Following the full meeting of the GSF, a separate, small expert group meeting was held to discuss the issues of Bioenergy and make suggestions for framing the topic for debate at the Biovision 2007 Forum. The video interviews mentioned above are incorporated by reference into this report.

Bioenergy is stored energy from the sun contained in materials such as plant matter and animal waste, known as biomass. Biomass is the oldest known source of renewable energy—and has been in use by humans since the discovery of fire. Biomass is considered renewable because it is replenished more quickly when compared to the millions of years required to replenish fossil fuels. The wide variety of biomass fuel sources includes agricultural residue, pulp/paper mill residue, urban wood waste, forest residue, energy crops, landfill methane, and animal waste. Energy in the form of electricity, heat, steam, and fuels can be derived from these sources through conversion methods such as direct combustion boiler and steam turbines, anaerobic digestion, co-firing, gasification, and pyrolysis.

- Central issue:

The discussions concentrated on the question of biofuels and their real capacity to satisfy a portion of our future energy needs now covered by fuels of fossil origin. The experts insisted that their role should be analyzed as that of a complement to fossil fuels and not of a substitute to them, because oil, in particular, will see its importance declining but will nevertheless remain a key player in the energy

game. And they criticized the title chosen for the Conference session (Bioenergy after oil) for inducing the simplistic idea of a future where oil does no longer have a role, suggesting as possible alternatives : “Bioenergy in our energy future », or « Can bioenegry compete with oil ? »
Accordingly, the central issue is about the importance of biofuels on the energy scene of the XXI century: will it be a minor or a major one ? This issue elicited lively exchanges among experts, revealing that it still is controversial, and the answer is clearly dependent on a detailed appreciation of their current limitations and of the possibility to overcome them in the future, an area where the life sciences have a role to play.

• Potential of biofuels:

The main acknowledged positive aspects of biofuels and bioenergy in general are:
- the renewability of their source, biomass;
- the even geographical distribution of biomass;
- their resulting easy adaptability to local needs
- their environmental friendliness as far as $C0_2$ emission and greenhouse effect are concerned
- their economical benefits in terms of employment and new sources of revenues, especially in the South

• Current limitations of biofuels:

- cost: A key issue is their cost and their competitiveness with fossil based fuels, which makes their development heavily dependent on the evolution of the oil market, a complex and multi-determined phenomenon. For this reason, many experts insisted that financial incentives (fiscal ones in particular) are an absolute need to boost their developmement.
- dependence on hydrocarbons: Many biofuels currently require major adjunction of hydrocarbons to be usable.
- availability of land: Producing enough food to feed the world population is the major challenge faced by agriculture in the decades to come, and this challenge means that more land should be made available for food production. However the development of biofuels will also require the dedication of extensive cultivable surfaces. According to certain calculations, this conflict of demands on agriculture implies that bioenergy can at best satisfy 30°/° of our future energy needs.
- environmental consequences: In spite of their positive impact on the greenhouse effect, biofuels are not without negative environmental consequences, due not only to the use of traditional energies in their production, but also to the additional burden they will put on water resources and the multiplication of pollution problems linked to intensive agriculture (fertilizers…).
- weakness of productivity: The energy productivity of biomass based fuels remains weak compared to that of fossil based fuels.
-- byproducts: The production of biofuels results in the massive production of residues that need to find a place in the industrial and economical process.
- acceptability issues: Bioenergy has a positive image in the public opinion (modern, environment friendly…). But it is unclear whether the transformations induced by their development (for instance at the landscape level) will not radically transform that attitude, thereby raising societal obstacles to this development.

• Main challenges in the development of biofuels

In view of these limitations, the development of biofuels faces a number of important challenges, such as:
- reducing their cost and increasing their competitiveness
- increasing their energy productivity
- making them compatible with food production needs
- improving their environmental impact

In order to meet these challenges, a number of important scientific and technological innovations are under way in the North, supported by national and international programs. The emphasis is now put on the energetic conversion of the lignocellulosic part of the biomass, that makes a higher part of it available for energy production. These new approaches are not only thermochimical but also biochemical (enzymatic hydrolysis, photosynthetic microorganisms) and represent a crucial area for the articulation of the life sciences and the bioenergy problem.

CONCLUSIONS:

TOPICS AND SUGGESTED ISSUES:

How do we meet growing demand for affordable clean energy?

What role does bioenergy play in a world dominated by fossil fuels?

Can bioenergy compete with oil? Can low density energy compete with high density energy?

What are the short, medium and long-term prospects for bioenergy?

What is the role of bioenergy and what are the relative advantages and drawbacks of the technology home vs. industrial use?

What role does scale have in the attractiveness of bioenergy?

Prospects for bioenergy differ with countries of the North and South:

Can lessons learned from the Brazil experience be applied to other countries or is the Brazil success sto unique phenomenon? What are the economics of biofuels production in Brazil and elsewhere?

Did drilling for oil have anything to do with it? What is the role of subsidies in promoting biomass?

Sugar vs. soybeans, deforestation vs. subsidies? Why can Brazil do it economically?

What are the inputs for bioenergy? The experts recommend highlighting the Brazil story as a case study

What are the tradeoffs for land for agriculture, land for energy production and land for biodiversity?

Should we use food crops to produce energy, because we can get energy in other ways?

How do inputs/outputs affect the bioenergy process?

What happens if oil prices drop?

How will the food system be effected if bioenergy is adopted on a large industrial scale?

What will be the effect of monocrops on soil?

Is bioenergy a transitional option or can it be a fuel as an end stage?

Can we find ways to use biomass more efficiently?

How do we feed the world? How will the food system evolve? What if we make the agricultural system m efficient and leave green areas and maintain biodiversity and use our existing energy resources m efficiently?

Can we liberate land for nature?

Is there a role for Bioenergy with cabon capture and storage?

Where does co-firing of existing powerplants fit into the equation or blending of ethanol?

From an agricultural systems point of view: What are long-term implications of for monoculture crops long term sustainability? How can we diversify monocrops? Can we rotate crops or afford to leave fallow?

Is biofuel an option for transportation or a transitional experiment?

In the abstract, bioenergy is socially acceptable, but once it is deployed large scale will public accepta change?

What existing systems need to be replaced to make room for commercialized, mass-industrial bioenergy

What are the broader relations and interactions with global energy systems , climate stabilization etc?

On the Science side: ------What is the state of the science with transformation of cellulose? Role of enzymes and biotechnology?

RECOMMENDATIONS FOR ACTIONS:

Some experts strongly argue that industrial bioenergy may be a transitional option that loses its appeal v

increase of scale. However, bioenergy may be an attractive option to emerging and develo economies.

Others insist on the long term potential of bioenergy and strongly recommend that a presentation and

discussion of the state of advanced biological technologies for liquid fuels--notably, the cluster of technologies often called "cellulosic biomass."- is included in the Biovision session.

More research is seen as on the following points:

- improving energy crop yields relative to inputs (land, fertilizer, water, etc.)

- improving the efficiency with which crops are transformed into usable energy forms (liquid fu electricity)

- minimizing possible adverse environmental consequences of biofuels production (pests, chem applications, soil degradation, etc)

- achieving better management of resources and using them more efficiently.

- government policies to promote resource efficiency.

There is consensus on the fact that west is over using energy while the developing world needs to more

energy to improve its standard of living, but not follow in the footsteps of the over consuming west.

We need to learn to do with less in the west and that may be easier than we think.