

# ***ENERGY TECHNOLOGY PRIORITIES FOR 2006***

## **AN INTERVIEW WITH IEA EXECUTIVE DIRECTOR CLAUDE MANDIL**

### **IEA OPEN BULLETIN**

Mr. Mandil, what do you regard as the 2006 priority for energy technology development?

### **CLAUDE MANDIL**

First, let me extend our New Year's wishes to all *OPEN Bulletin* readers.

The short answer to your question is that there is no single energy technology development priority for 2006. The IEA sees many different priorities. What they have in common is their potential contribution to getting the world onto a sustainable energy path.

If you look at virtually all the solutions that can converge to create more tenable patterns for production and consumption of energy, developing and deploying more efficient, cleaner energy technologies are central steps in the process. This is an important policy issue.



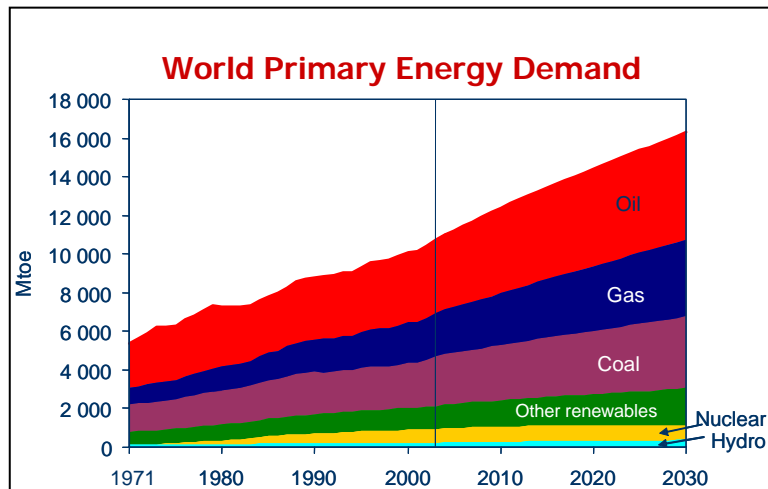
Claude Mandil, IEA Executive Director

Unfortunately, we have no crystal ball to show exactly how the energy mix of the future will look. Nobody has ever been able to predict scientific or technological breakthroughs or major developments in world affairs.

So we must continue to focus on advancing technologies for very wide-ranging energy options. And because technologies take a long time to move from the laboratory to the market place, research,

development and demonstration (RD&D) are urgently needed right now. Governments and industry should work in partnership to underwrite longer-term R&D for the technologies that cannot promise investment incentives of short-term commercial benefits.

During 2005, the world faced some major oil supply difficulties. And recent headline news about gas supplies have rung some alarm bells. These developments underline the very serious challenges posed by projected growth in energy demand over the coming three decades. If government energy policies do not change, the world will be using 52% more energy in 2030 than in 2003. And one quarter of the world's population will still have no access to modern energy. Global CO<sub>2</sub> emissions will grow by just over half from 2004 to 2030. This represents an 83% increase over 1990 levels and takes us far beyond the likely emissions targets for the post-Kyoto period.



Source: IEA *World Energy Outlook 2005*

All around the world, energy policies will have to change if we are to shore up the three pillars of sustainable development: energy security, economic growth and environmental protection. These “Three Es”, as we call them at the IEA, have a complex relationship. Basically, economic growth is difficult without energy security; but neither should be pursued at the expense of environmental protection.

If energy policies are to take us in the right direction, they must be underpinned by technology that uses energy differently, or technology that uses completely different forms of energy. New avenues of opportunity need to be opened up through scientific and technological breakthroughs, notably in areas like materials sciences and nanotechnology.

Meanwhile, more vigorous steps are needed to accelerate deployment of existing, tried and tested energy technology enhancements not yet realising their full energy-saving and climate-protection potential. Also, given the slow pace at which large installations like power stations are decommissioned and replaced, it is today that the latest technology should be introduced, otherwise inefficient, climate-unfriendly technologies may be locked into systems for decades to come.

Since there is no universal energy-supply remedy that suits every geographical situation, national circumstance and popular preference, we need to be focusing on a whole range of technology advances and innovations that can contribute to more diversified, more secure energy supplies, at affordable prices and with lower, or even zero CO<sub>2</sub> emissions. We cannot put all our eggs in any basket at present, or even in two or three.

### **IEA OPEN BULLETIN**

If there is no single priority technology approach, could you elaborate on some of the key areas for focus?

### **CLAUDE MANDIL**

I can give some examples. For instance, while more radical changes in ways of producing and using energy will be needed in the longer term, the logic of greater energy efficiency is manifest today. There is vast scope for energy efficiency improvements in homes, in industry, in the workplace and in motor vehicles. Each unit of energy saved represents a gain in both energy security and avoided emissions. IEA estimates that 15% of energy consumption could be saved by 2030 through efficient use of existing technologies.

One of the big obstacles to energy savings is a lack of public awareness. For instance, how many householders know about the energy they would save if they bought appliances boasting the lowest life-cycle energy costs? An IEA study has calculated that if everybody in OECD countries bought such appliances, residential electricity consumption in OECD countries would be reduced by 33% at net negative cost, using existing technologies. Using the lowest life-cycle-cost household electrical equipment and appliances in OECD countries would accordingly mean avoided emissions from power generation sufficient to meet 30% of the OECD countries' Kyoto Protocol emissions targets.

Again, are many people aware of how much electricity is used by electrical appliances and equipment when switched off or in "standby mode"? If all appliances in OECD countries were fitted with devices that can limit this consumption to just one watt, the peak electricity load would drop by the equivalent of power output from 20 large plants.

In motor vehicles, do many drivers know about the huge hidden potential for energy savings? Regularly maintaining tyre pressure, for instance, can reduce fuel consumption by 5% at no cost.

Improvements of this sort are welcome news for the transportation sector, which is the second largest producer of CO<sub>2</sub> emissions. Oil use in transportation is expected to expand from some 47% of global primary oil consumption today to 54% in 2030. It is crucial that manufacturers and governments continue to work hard on fostering development of

technologies that improve vehicles' engine efficiency. Consider hybrid electric vehicles that generate supplementary electric power as they run on gasoline or diesel.

But further development is also needed on technologies permitting use of other forms of energy to drive the motor. An example is vehicles driven by fuel cells with hydrogen. This technology could power 30% of the global vehicle stock by 2050, but the pace of R&D needs to be maintained. Numerous technological and economic questions need to be addressed, not least establishing efficient and economic CO<sub>2</sub>-free ways of producing hydrogen and masterminding the vast infrastructure changes required.

Biofuels are another very promising alternative. IEA's analysis suggests that they could account for up to 25% of total transportation fuels by 2050. Flexifuel engines able to run on various combinations of gasoline and biofuels are moving steadily into the market. Bioenergy for various applications promises huge climate and economic benefits, so long as no issues arise over competition with food production for land use. Further development is crucial to maximise crop yields and efficiency.

As we know, other renewable energy sources like windpower and solar energy can contribute enormously to diversifying energy supply. Their climate credentials make them key components in any viable energy mix. Windpower, both offshore and onshore, is fast claiming market share and so is solar energy for a range of specialised markets. But these energies will need to reach greater technological maturity if they are to become fully competitive in all markets. That is why the focus on R&D and demonstration for new renewables like these is so important, as is the essential deployment effort to bring costs down through the technology learning curve.

Nuclear is another very powerful, cost-effective means of producing large amounts of CO<sub>2</sub>-free electricity. Some countries are doing a major nuclear re-think. Our view is that Kyoto targets will not be met at moderate cost without nuclear. But there are a number of issues to be addressed before nuclear can become a worldwide answer to our prayers. One is convincing the public that nuclear waste can be stored safely long-term. Here again, can scientific research and R&D open new doors?

What about thermonuclear fusion power? For the twenty-second century, this could become a source of economical and safe baseload electrical power. It is good to note that plans are now going ahead for building the ITER project's experimental facility. This is another priority area for R&D. Our children's children and grandchildren may be grateful to us for having pursued this effort. But fusion power will not bridge any energy gaps in the foreseeable future.

Together with heat production, power generation is expected to account for some 40% of total primary energy demand by 2030. For the moment, electrical power generation will remain heavily dependent on fossil fuels, and particularly on coal, which is widely available and cheap. Through the impressive new technologies, power stations can be much more efficient, cutting both fuel consumption and CO<sub>2</sub> emissions. But, as I have

observed, power stations have long lives and emissions reduction needs to be built into today's new constructions.

That is why technology for CO<sub>2</sub> capture and storage (CCS) has recently entered the energy scene with such impact. It involves extracting CO<sub>2</sub> from gas streams during electricity production, industrial processes or fuel processing. This captured CO<sub>2</sub> can then be transported by pipeline or tanker to storage locations like deep saline aquifers, depleted oil and gas reservoirs or un-minable coal seams. The technology has yet to be demonstrated, of course, in a commercial-scale power plant. CCS is at present seen as a high-potential option for large-scale use of fossil fuels. Public acceptance and proof of permanence in the storage of CO<sub>2</sub> are issues, again underlining the importance of sustained R&D and demonstration efforts.

Fuel cells using gas, and not hydrogen, are another power generation option, which could account for 2%-3% of global generation capacity by 2050, largely in combined heat and power applications.

These are just some of the many important components in the future energy mix. Each has its own set of technology issues. I would repeat that technological breakthroughs will be needed throughout the sector, notably with hydrogen and fuel cells. Also, in the oil domain: industry's impressive effort must continue, taking drilling farther and farther off-shore, enhancing oil recovery techniques and exploiting more difficult deposits. More than ever, the R&D effort throughout the energy sector must mobilise new technologies and reduce costs.

### ***IEA OPEN BULLETIN***

So, could you tell us how is IEA is helping governments to find solutions?

### **CLAUDE MANDIL**

The IEA's name is often linked spontaneously to oil market issues. It has been much in the news recently in connection with the collective action of IEA member countries following interrupted Gulf of Mexico oil supplies caused by Hurricane Katrina. This collective action made the equivalent of 60 million barrels of crude oil and oil products available to the market.

As we have seen, oil market issues are far from being IEA's sole focus. In fact, the Agency's energy technology R&D activities were written into its founding charter. In its role as policy advisor to its [26 member countries](#), IEA has a constant eye on the role of energy technology in relation to not only energy security and climate change but also the related questions of energy market reform and outreach to the rest of the world.

An important area of IEA's energy technology work is the legal framework it provides for some forty specialised international collaborative programmes to conduct R&D and associated information dissemination. These [Implementing Agreements](#), as they are known, provide member countries and non-members with the opportunity to work

collaboratively and to share the fruits of their efforts. Implementing Agreements generate significant cost savings. A recently created Agreement provides for collaboration on market deployment of renewable energy technology. Another new programme, in the making, will deal with technology use in electricity transmission and distribution. Nobody has forgotten the recent power blackouts.

High on the IEA's current agenda is the mandate it received from G8 leaders at their summit in Gleneagles (United Kingdom) last July. The Agency has agreed to be a partner in the G8 "Dialogue" with other significant energy consumers and to play a major role in delivering the G8 Plan of Action on climate change, clean energy and sustainable development. We are proud to be undertaking an extensive programme of analysis, assessment and dissemination in response to this request. It is shaped around promotion of energy efficiency in buildings, appliances, vehicles and industry, clean coal and fossil power technology, as well as CO<sub>2</sub> capture and storage, renewable energy, hydrogen and strengthening international energy R&D efforts.

The G8 work dovetails very well into our existing programmes of energy research, data compilation, publications and broad dissemination of the latest energy policy analysis and recommendations on good practices. Our G8 tasks are well aligned with the concerns of our member countries.

We hope that this work will carry some important policy-making messages to governments, whether members of IEA or not. The role of governments should not be underestimated. It is vital to ensure the proper functioning of market mechanisms, notably in areas such as emissions trading schemes for CO<sub>2</sub> abatement or in banishing the subsidies that prevent consumers from receiving the right market signals. Governments have an important role as the "patient investor" in financing long-term research and development. Governments can foster effective communication of product information and adoption of efficiency norms and standards to guide consumers to the best performing appliances, equipment, motor vehicles and buildings. Crucially, it is governments that can create an investment climate offering incentives to spur ahead development of the technological advances that are so badly needed.

But policy makers need to be well informed. IEA's wide-ranging publications programme is an important vehicle for channelling policy-relevant information, notably the flagship *World Energy Outlook*. Today's decisions can have far-reaching consequences for tomorrow. This is particularly true for energy technology decisions and investment choices. During 2006, another important IEA publication will address this fundamental need for long-term perspective on how individual energy technologies might fit into the mix of options over the longer term to 2050. *Global Energy Technology Perspectives* is the fruit of a major IEA analysis exercise that incorporates numerous criteria governing energy-sector developments over the decades.

It is our hope that all IEA's publications and activities will continue to guide policy makers to the wisest energy approaches for sustainability in the energy systems of today, but also tomorrow.

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## IEA PUBLICATIONS

The following are among many IEA publications and papers dealing with topics discussed in this interview. Many are downloadable free of charge. Click on the title or consult the IEA's [publications pages](#).

[\*Cool Appliances - Policy Strategies for Energy-Efficient Homes\*](#)

[\*Things that Go Blip in the Night - Standby Power and How to Limit it\*](#)

[\*Oil Crises and Climate Change – 30 Years of Energy Use in IEA Countries\*](#)

[\*Renewable Energy – Market & Policy Trends in IEA Countries\*](#)

[\*Offshore Wind Experiences\*](#)

[\*Variability of Wind Power and Other Renewables - Management Options and Strategies\*](#)

[\*Prospects for CO<sub>2</sub> Capture and Storage\*](#)

[\*Legal Aspects of Storing CO<sub>2</sub>\*](#)

[\*Resources to Reserves – Oil & Gas Technologies for the Energy Markets of the Future\*](#)

[\*Prospects for Hydrogen and Fuel Cells\*](#)

[\*Hydrogen and Fuel Cells –Review of National R&D Programmes\*](#)

[\*Learning from the Blackouts -- Transmission System Security in Competitive Electricity Markets\*](#)