EU Hitachi Science & Technology forum

Energy and its Implications for European Society

SUMMARY REPORT

17-18 May 2003, Antwerp

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Contents

It is my privilege to introduce the summary of the proceedings of the 6th EU Hitachi Science & Technology Forum on "Energy and its Implications for European Society", held in Antwerp, Belgium on 17 and 18 May 2003.

The EU Hitachi Science & Technology Forum was set up in 1998 as a means for Hitachi to contribute to society by providing a platform for public policy debate. We feel that scientists should be more involved in promoting the benefits of R&D to society. In this perspective, we believe that we have a unique base for discussion because the Forum alumni consist of Europeans with various expertise, coming from different backgrounds in science and business.

Through the continuation of our Forum these past six years, I am pleased to say that these key targets are being achieved. The Forum members, who are mostly past participants of Hitachi based internship programmes in Japan, have played a significant role as the Forum's driving force. For Hitachi, the discussions regarding the impact of science on society at the Forum provide substantial insight for the societal expectations of science and technology in the future.

This summary reflects the conclusions reached by the three working sessions after two days of intense discussions led by distinguished policy makers, academia, scientists and, of course, Forum members. I hope the summary provides you with a timely review of some of today's key energy issues together with the result of discussions dealing with specific energy societal aspects. A great variety of topics were covered: the role of governments in energy policy, subsidies, liberalisation of the energy market, renewable energies, CO_2 emission and nuclear power. The discussions represent the views of the different participants in the three working sessions. Very likely, and this seems to me the most important point, they reflect the views of many European citizens when addressing energy issues. They come up with possible solutions which might be helpful to those who are in charge of energy policy in the EU.

In concluding, my thanks to all speakers, moderators, Forum Fellows, Forum Members and to my Hitachi colleagues who made this meeting an interesting and rewarding one.

Michiharu Nakamura

Michiharu Nakamura, Ph.D.
Senior Vice President
President Research & Development Group
Hitachi Ltd.

What is the EU Hitachi Science & Technology Forum?

Mr. John Scowcroft

Mr. Domenico Rossetti de Valdalbero

Mr. Dolf Gielen

Mr. Hiroaki Nakanishi

Since its creation in 1910, Hitachi has kept its founder's commitment to contribute to society through technology. Once more, this long time commitment has been demonstrated by the setting up of the EU Hitachi Science & Technology Forum in 1998 by the Hitachi Corporate Office, Europe.

This Forum gathers European scientists who have all participated in long-term internships in the Hitachi laboratories or plants in Japan. The Forum was designed to meet two objectives. The first one was to provide a platform where these Hitachi alumni can address and discuss societal issues related to science and technology in the daily life of their European fellow citizens. The second one was to provide a yearly occasion to all European Hitachi alumni to meet friends and colleagues
In 1998, the Forum concept was successfully tested with the working theme: "R&D in SMEs, comparison between the EU and Japan". The meeting started the Friday evening to close on the Sunday afternoon with large breaks giving free time to the participants. This format has been kept since then. The 1999 Forum members discussed societal issues related to "Information technology and its benefits to society". Forum members insisted they would welcome a greater personal involvement, especially in the selection of the themes and in the drafting of the subsequent Forum agendas. This led to the creation of a working group appointed for one year, in charge of dealing with these two points. With this development, the Forum was to be run by its members, on topics selected by its members, for the benefit of its members. This was the Hitachi Corporate Office medium term objective.

In September 1999 a newsletter, European Connextion, was launched as a link between Forum members and Hitachi and as a tool to promote the Forum proceedings.
In 2000, the Forum was held in Ireland, following France and Germany, with members coming from France, Germany, Ireland, the Netherlands and the United Kingdom. The theme "Electronic commerce and its impact on society" was covered by scientists, specialists in social sciences and consumers' representatives who all vastly broadened the debate.

In 2001, the 4th Forum took place in Brussels to which were invited all European Hitachi alumni to discuss " Life sciences and their impact on European society ". In answer to Forum members request, a presentation on current Hitachi R&D developments in life sciences was made. Several Hitachi executives based in the EU and in Japan attended the Forum and answered questions related to Hitachi activities. The full proceedings of the meeting were published and widely distributed.
The 2002 Forum was organised in Hungary focussing on "Water Issues and their impact on European Society". In addition to the scientific discussions related to the key-topic, the location of that edition of the forum was an excellent opportunity to inform the participants on the latest developments of the enlargement of the European Union.

The Forum requires the support of experts who have a keen interest in European societal issues, who will be interested in contributing to the overall success of the EU Hitachi Science & Technology Forum through a strong personal commitment. These individuals will make the Forum Fellowship. The Forum Fellows are: Mr. Mark Cantley (Advisor, DG Research, European Commission), Mr. Pierre Longin (President, Longin & Associés, Brussels), Dr. Florian Schmitz (Rechtsanwalt, Clifford Chance Pünder, Frankfurt) and Mr. Robert Verrue (Director General, DG Taxation and Customs Union). The chairman of the Forum Fellows is Dr. Michiharu Nakamura (Senior Vice President, President Research & Development Group, Hitachi Ltd.)

Hitachi, with the active participation of Forum members is committed to contribute to European Society in helping to shape policies which will improve the daily life of their European fellow citizens. In this respect, the EU Hitachi Science & Technology Forum wants to clearly bring the benefits of new technologies to all Europeans.

FORUM REPORT:

Energy and its implications for European Society

Introduction

The 6th EU Hitachi Science & Technology Forum opened to an audience of 80 participants from a wide range of industry sectors who gathered in Antwerp, Belgium from 16-18 May 2002 to discuss "Energy and its implications for European Society." Mr. Norikiyo Koide, General Manager of Hitachi Corporate Office, Europe, welcomed the group of scientists, engineers, executives and policy makers to the Forum. He expressed his appreciation to Delft Technical University for hosting the previous day's educational tour of the Interfaculty Reactor Institute (IRI) – the Dutch national centre for radiation-related university research and education with a primary focus on nuclear reactors, radionuclides and ionising radiation. Mr. Koide noted that the timing of this year's Forum is coincident with energy policy planning being undertaken in the EU and internationally. He said that this provided an opportune time for participants to discuss these issues and contribute their recommendations to the wider dialogue.

Mr. Koide explained that the agenda had been designed to provide insight into the working structure of parameters by which policy-makers are currently evaluating future energy decisions and legislation. He explained that participants would hear presentations on key issues such as sustainable development, energy security, and climate change, along with overviews of existing and emerging energy supplies and technologies, including nuclear, oil and gas, electricity, renewable energies and hydrogen. In effect, these presentations constituted preparatory briefings for the participants, which the afternoon working sessions could draw upon in putting forth Forum recommendations on energy conservation, tackling climate change and promoting new energy technologies.

Mr. Hiroaki Nakanishi, General Manager Global Business, Hitachi Ltd. officially opened the Forum by thanking the participants for having accepted Hitachi's invitation to discuss energy and its implications for European society. He reiterated the importance of the EU and its project to become the leading trading partner in the world. Mr. Nakanishi also emphasised on the role companies should play in the societal debate on the benefits and limitations of new technologies and referred to the Forum as a way to encourage such debates. Mr. Pierre Longin, Hitachi consultant, served as the moderator for the morning session, drawing linkages between the series of presentations and building a supporting framework for the participants to engage in a constructive analysis of the issues.

Introduction to Energy issues and their societal implications

Mr. John Scowcroft, Head of Environment and Sustainable Development, Eurelectric

Mr. Scowcroft started his presentation by explaining that energy issues cut across a number of larger social priorities, including sustainable development, climate change, environment, air quality and health. Within the European context, enlargement plans and energy liberalisation policy are creating a pan-European energy market, which increases the complexity of and need for determining balanced and consistent policy-making.
Mr. Scowcroft felt that the Forum participants should have a clear understanding of the current negotiations surrounding climate change issues and implementation – especially as these issues impact energy markets and investments. He explained that the EU's May 2002 decision to ratify the Kyoto Protocol under the United Nation's Framework Convention on Climate Change will require the EU (by 2012) to reduce its greenhouse emissions by 8 percent below 1990 levels. He pointed to a graph which indicated that the EU had managed to reduce emissions by 4 percent from 1990 to 2000, but that projections indicate that emissions are expected to grow considerably, exceeding the Kyoto targets. Electricity has traditionally been a main contributor to EU emissions reduction to date, reducing by 3% its greenhouse emissions, whilst electricity consumption rose 21 percent (1990-2000). He said that measures like emissions trading are necessary to enable companies and electric utilities to economically and efficiently integrate environmental goals into business strategies, decision making, and investments for providing energy. He listed Eurelectric's suggested criteria for establishing a European wide emissions trading system, noting the necessity for:
• Equality of effort between sectors;
• The use of voluntary approaches; the inclusion of JI/CDM credits;
• The inclusion of all six greenhouse gases.
Mr. Scowcroft also elucidated a number of other energy measures which will be necessary for Europe, not only with respect to climate, but also to ensure a secure and stable future energy market. He noted the need to use less electricity when possible, and that measures such as replacing electric motors with more efficient models or using more efficient light fixtures could significantly reduce electricity consumption.
Mr. Scowcroft stressed that Kyoto targets, and possibly larger energy security goals can't be met without continued contributions from nuclear and large hydropower. Natural gas use has the potential for further growth, but much needs to be done to ensure that gas markets are kept open, competitive, and transparent. He said that coal remains a vital fuel worldwide, and that development of advanced coal technologies in Europe can have a global impact on future energy mix choices. Renewables have great potential to contribute substantially, but he questioned whether the right mechanisms are being used to bring them to market.
In closing, Mr. Scowcroft emphasised that public policies can often be contradictory, where energy policies can contradict environmental policies, which can contradict tax policies. A climate policy, for example, which favours nuclear energy for its minimal greenhouse gas emissions can contradict with environmental policies concerned with nuclear waste and safety. Likewise, a climate policy endorsing renewable energy may contradict with economic policies opposed to increased taxes and energy rising prices. Mr. Scowcroft urged public policy makers to take a balanced and consistent approach to future energy decisions.

Energy generation, consumption and alternative uses

Renewable energy

Mr. Domenico Rossetti di Valdalbero, Scientific Officer, DG Research, European Commission

Mr. Rossetti's presentation was designed to inform participants about EU objectives for increasing the percentage of renewable fuels and technologies. He explained that the key drivers for renewable energies are to:
• Reduce pollution and greenhouse gases;
• Ensure security of energy supply;
• Improve European competitiveness.
With respect to competitiveness, for example, he noted that Danish wind turbines currently comprise 45 percent of the world market—which brings economic benefits to these EU companies. Mr. Rossetti argued that in a business as usual scenario, especially at the world-level, CO2 emissions will continue to grow – and added that renewable energy could be employed to slow this trend. He provided several slides which showed global installed wind energy capacities, noting that this growth is driven by the European Union (75 percent of the world market)-particularly Germany, Spain and Denmark. He also showed where photovoltaic (solar) capacities have increased 10-fold in the last decade, though the EU percentage comprises about 20 percent of the world total.
Mr. Rossetti described the EU directive on the promotion of electricity produced from renewable energy sources, which provides an indicative target of 22 percent of "green electricity" by 2010 (compared to 14 percent in 1997); . He acknowledged that in order to reach the Directive targets, the price of renewable energy sources will need to be more competitive with the electricity derived from traditional sources (natural gas, coal, nuclear) which is around 4 eurocents per kWh. Wind energy has a current price range of 4-9 c/kWh; biomass 4-8 c/kWh; and photovoltaic 25-50 c/kWh. He noted that in addition to technological advances, the internalisation of external costs, i.e. to take into consideration social and environmental damages (e.g., health impacts coming from air pollution) could make renewables more price competitive. In this regard, he made strong arguments for current EC policies and instruments for moving the energy system towards more sustainability (cf. R&D, subsidies,…).
In a short discussion following Mr. Rossetti's presentation, several participants carried forth the

notion of ‘contradictions’ raised by Mr. Scowcroft: that policies to site wind turbines can often be in conflict with environmental preservation and land use policies. It was also noted that photovoltaic cells can be discretely integrated into existing infrastructure and, despite current cost barriers, they don’t carry the social burden that wind turbines confront. Participants also questioned whether the use of wind power will continue in the EU after subsidies expire. Mr. Rossetti was felt that this answer depended largely upon whether the subsidies will work in jump-starting the technologies.

Hydrogen

Mr. Dolf Gielen, Energy Analyst, Energy Technology Policy Division, IEA

Mr. Gielen informed participants that hydrogen is currently receiving a lot of attention as another element in the future energy supply mix. He explained that ‘hydrogen’ is a name for a variety of technologies and it is rapidly emerging as a major component of clean sustainable energy systems. It is relevant to all the energy sectors—transportation, buildings, utilities, and industry. Hydrogen can provide storage options for intermittent renewable technologies such as solar and wind; and, when combined with emerging decarbonisation technologies, it can reduce the climate impacts of continued fossil fuel utilisation. He stated that hydrogen is a flexible energy carrier which can contribute to a sustainable energy future.
Mr. Gielen noted the dominance of petroleum in the transportation sector and suggested that hydrogen could become a viable, new fuel for road vehicles. He said that hydrogen generated from renewable energy sources, provided a “near zero” greenhouse gas option for the transportation sector. Unfortunately, current costs are prohibitively high. He presented a cost comparison, explaining that conventional vehicles currently available to consumers have a cost component of $50 per KW compared to today’s hydrogen prototypes which cost $5,000 per KW. In his opinion, this enormous cost differential could not be overcome by subsidies or carbon abatement incentives. As such, Mr. Gielen estimated that hydrogen for vehicles would not be a viable option before 2040, and certainly not within the next 10 to 20 years.

Mr. Gielen closed his presentation by suggesting that hydrogen and electricity production will ultimately come from sustainable energy sources and that fossil fuel will likely remain a significant and transitional resource for many decades.

European Energy policy
EC Green Paper on Energy Supply

Ms. Helen Donoghue, Principal Administrator, DG Transport & Energy, European Commission

Ms. Donoghue started her presentation by emphasising that she believes that energy is an issue for public debate and analysis; and, that she hoped the Hitachi Forum and its recommendations could contribute to the ongoing public debate. She provided an in-depth presentation on the EU’s Green Paper on Security of Energy Supply, explaining that the paper was produced in response to the following trends: growing world energy demand growing, tighter supply/demand balances, oil price volatility, geopolitical developments and environmental concerns over air quality and climate change. Additionally, European energy production is peaking such that external dependence is increasing (now 50%, forecast 70% in 2030). Moreover, energy market liberalisation and competition, along with EU enlargement are creating complex new conditions which must be planned for. In the bigger picture, there may exist a variety of trends and constraints, but the world is still looking to the same (fossil) resources.
The aim of the Green Paper is to create a sustainable energy policy: “For the good of the public and the smooth functioning of the economy, the uninterrupted physical availability on the market of energy products at affordable prices for all consumers, in the framework of the objective of sustainable development.” Ms Donoghue acknowledged that are no quick, easy solutions, only important, long-term choices – and that action and investment will be needed from all sectors. She offered that energy savings and renewable energies will be key to future security. In terms of implementation, she described several EU actions, including:
• Buildings Directive and Renewable Energy Directive;
• Nuclear package (there is a need to deal with waste and safety -- without which the nuclear future looks dubious);
• Completion of internal energy market;
• Dialogue, partnerships with neighbouring countries (Russia, Caspian area);
• Research, technological developments;
She closed her presentation with the following guidelines for a step-by-step process which opens up development prospects and addresses our mutual energy dependence:
• Development and implementation of a long term integrated approach to security of energy supply;
• Step changes in energy use needed to de-couple economic growth from rising energy needs;
• Stable but dynamic markets to innovate and invest in a diverse range of new, cleaner and more efficient technologies and infrastructure;
• Development of producer-consumer dialogue;
• Safety and security must be assured.

Response to the Green Paper

The Forum was structured in a way to provide expert responses to the morning presentations, in particular the sweeping EU Green Paper on Security of Energy Supply. Responses were heard from the petroleum sector, industry, the Climate Action Network and the Swiss Government.

Petroleum Industry

Dr. Peter Tjan, Secretary General, Europia

Dr. Tjan started his presentation with an overview of key points necessary for formulating a broad EU plan on energy supply security, including:
• Need to ensure a Sustainable World in environmental, social and economical dimensions;
• Energy is a main driver for Economic Growth;
• Recognition that Europe is a major energy consumer and will continue to depend heavily on imports of primary energy;
• Increasing concerns about the environmental impact of energy use;
• Some environmental issues are local, some global;
• Europe has significant know-how on energy technology.
He also described what he believes are the key structural weaknesses in the EU energy market. In terms of supply, there is a high and growing external dependency and a continued reliance on fossil fuel. Moreover, there have been only small contributions from renewables, and the future for nuclear and coal remains uncertain. In terms of demand, EU consumption will continue to grow at the rate of 1-2% per year, mainly by transport and domestic sectors. There is also an economic risk due to relative failure of energy efficiency and conservation measures and the volatility of energy prices.
Dr. Tjan presented several options for consideration, which focused on reducing and modifying patterns of consumption and encouraging cleaner energy usage and energy conservation measures. He also felt that it was necessary to promote the diversification of types & sources of energy, to keep nuclear power options open, to promote renewables and to enhance dialogue with energy (oil) producing countries.

From the perspective of the oil industry, Dr. Tjan pointed out that the transportation sector had already achieved major improvements in energy efficiency and reduction of CO2, and that other sectors must now follow. He said that cleaner fuels have dramatically reduced emissions and allowed the car industry to meet reduced consumption targets. Unfortunately, the speed of implementation of alternative fuels vehicles has been slower than expected.

With respect to supply, the oil industry foresees no threat of exhaustion of oil and gas supplies and no resource constraints to satisfy these demands. To this end, the oil and gas industry will invest US $ 1 trillion over the next 10 years in new European oil and gas facilities. In this regard, he suggested that the Green Paper underestimates the potential for indigenous and international oil and gas sources. Dr. Tjan’s view is that energy security should not be measured by the degree of import dependency but rather by the level of diversity of energy sources. EU security is served by the expansion of world-wide supplies through the free flow of investment and the integration of global and European energy markets. In this respect, the real issues are the rate of investment and technical progress to expand energy supply: within the EU (UK, Norway, The Netherlands); with connected countries (Algeria, Russia, Libya, Egypt); and internationally. He also expressed the following positions:
• the role of policy makers is to foster the right climate for investment;
• inappropriate regulation or additional taxation would adversely affect production and distribution;
• energy taxation is not a good tool and should be minimised.
Speaking on security, he suggested that solving issues in the Middle East would be more important and useful than many of the Commission’s other measures. Moreover, despite a number of international incidents which have the potential to disrupt energy security (e.g., Gulf Wars, Nigeria, etc.), these have gone virtually unnoticed vis-a-vis the market. In his opinion, the system works.
In closing, Dr. Tjan acknowledges that policy making isn’t easy, it’s about making difficult choices. He felt that too little has been said about the potential of technology, and it is important not to extrapolate our current world, but think about it in fundamentally different ways. Also, many of the solutions to energy challenges can be found in consumer choice. He posited that quality of life and lifestyle choices, (e.g.What temperature do you want the house to be? Do you drive to work or take public transportation?) will be the major determinants impacting supply and demand.

Industry representative

Mr. de Bresson, Head of Energy Marketing Group, Pechiney

Mr. de Bresson's presentation focused on the importance of reasonable electricity pricing standards as a critical and necessary element for sustainable industrial growth. Energy price is an important index for industrial consumers and stable pricing is necessary for business investment. In this regard, policy measures oriented toward introducing greater market liberalisation or internalising energy consumption externalities should be careful to not also introduce too much price volatility. This, in his opinion could equate to destroying thousands of manufacturing jobs.
To elucidate his thoughts, Mr de Bresson considers the current, liberalised electricity bidding practices to be "bizarre," which creates difficulties for investors and users. He also asked participants to look at results of electric industry restructuring efforts around the world, where he suggests scandals, loss of capital, asset write downs, and investment shortage are derived from poor economic governance and irrational energy pricing schemes. He urged participants to consider the relative value of trading an old, but stable system of subsidy for a new one which, for industry, carries levels of uncertainty and risk which would be wholly unacceptable for business or residential customers.

Non-governmental organisation

Mr. Jason Anderson, Climate Action Network

Mr. Anderson focused his comments on various environmental aspects of security of energy supply, expressing the view that energy security and environmental protection can be achieved in concert. Mr. Anderson's view of the energy market constraints were similar to many of the previous speakers, pointing to potential supply shortages resulting from increasing demand, decreasing EU production, declining nuclear options and pressures to reduce CO2 emissions in power generation (coal). Environmental security issues include the depletion of finite natural resources, the social risk of large outages due to safety problems, such as nuclear accidents or pipeline ruptures. He stressed that "affordable" prices must compensate for social externalities.
Mr. Anderson suggested a number of supply-side options for EU consideration:
• Increased use of combined heat and power production;
• Retro-fitting of existing power production plants;
• Fuel switch to low-carbon fuels;
• Increase in energy efficiency of new power production plants;
• CO2 removal;
• Use of biomass for electricity production;
• Increased wind power production;
• Increase of other renewable electricity production.
…and demand-side options:
• Reduction of stand-by losses of household appliances;
• Increased use of efficient appliances in households;
• Efficient cooling for households;
• Efficient lighting for households and services;
• Recycling of aluminium;
• Reduced electricity use in the Chlorine industry;
• Efficiency motor technologies.
With respect to the EU's recent legislative activities, Mr Anderson expressed his concerns that efficiency and renewables get strong rhetorical support in the Green Paper, but legislation is weak. In particular, renewable energy progress is slow and the new buildings directive delays action. He said that completion of the energy services directive is unlikely, and the liberalisation directive side-steps a number of renewable energy issues. In an expression of support for the value of energy conservation and efficiency, he said that it will be easier to meet demand with renewable sources if there is less demand to meet.

Government

Mr. Jean-Christophe Füeg, International Energy Affairs, Swiss Federal Office of Energy

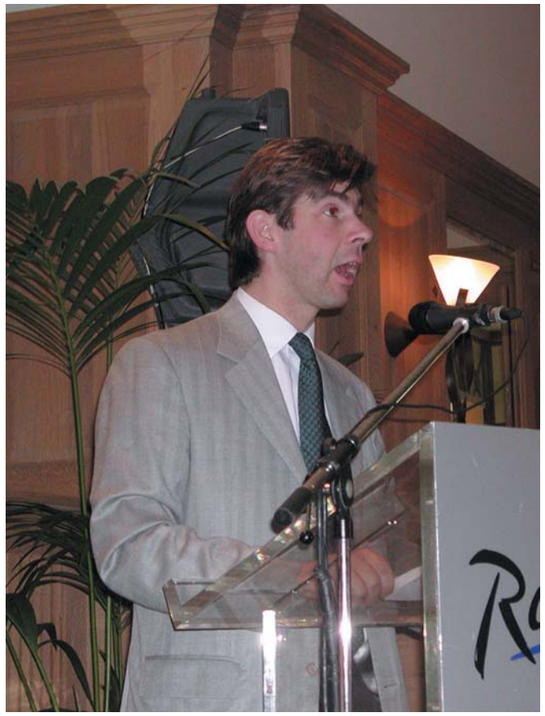
Mr. Füeg presented a very interesting overview of the traditional roles of government in the energy sector. He explained that in the 1990s, governments focused on opening and liberalising markets; now they are more concerned about security of supply, especially following the 1999-2000 oil price volatilities, the California electricity crisis, September 11, and the Iraq war. Mr. Füeg also delineated a number of specific, traditional roles for governments:
• Shaping markets by setting market framework, regulator, investment, competition authority, and standards;
• Guaranteeing prosperity and international competitiveness;
• Collecting taxes;
• Shareholder in energy assets: central state or regional/local level;
• Financier/investor: little in energy sector, more in energy-impacting sectors (transport, agriculture);
• Diplomat: international stability, energy dialogues;
• Market interventionist: state aids, subsidies.
With respect to the EU Green Paper, Mr. Füeg reiterated what he referred to as the undeniable fact—that self-sufficiency in energy is impossible. As such, it will be necessary to diversity supply geographically and across the range of fuels and energy sources. There will need to be a strong focus on curbing energy demand and to keep working on sustainable applications of all present and future energy options. He also noted that hydrogen will not be the panacea to security of supply with Green Paper timeframe.
In terms of recommendations, he suggested that short term gains could be achieved by investing in strong diplomatic relations with OPEC, Russia, other producing and transit countries, as well as investing in trans-European energy networks. Within the EU, it may be useful to stock strategic supplies of energy and to find sustainable methods for using traditional energy supplies, e.g., natural gas supply diversity, clean coal technology and acceptable nuclear production and waste storage. He was cautious about the absolute impact that renewable can have in displacing fossil-fissile fuels, especially in the absence of state intervention, subsidies, taxes, or feed-in tariffs.

Mr. Füeg offered a number of conclusions, noting that government policies have not been very effective due to the lack of binding instruments and political/public acceptance. Moreover, the conditions for more interventionist energy policy have not (yet) been established. He suggested that governments might be able to gain public support for stronger energy policy action when tough choices emerge in response to the need for new power plant capacity and meeting Kyoto targets. He also challenged the participants to appreciate that energy policy debates are not always about energy choices, but about social issues (e.g. coal subsidies, state employee status, environmental impact). Regarding the role of government in energy policy, Mr. Füeg states that the United States has its policy in line with its foreign policy, but the EU, on the other hand, has none such in this regard. He also noted that energy ministries are often undermined by other government bodies responsible for larger issues such as economy, industry, finance and sometimes environment. Echoing some of the other speakers, Mr. Füeg questioned whether consumers are prepared to commit to tough energy choices and whether, in the end, they will be "willing to pay."

Update: EU Enlargement and its impacts

Mr. Antoine Ripoll, Administrator, European Parliament

In order for Forum participants to have a deeper understanding of the geographical and political context within which EU energy policy is taking shape, Mr. Ripoll gave a brief presentation on EU Enlargement objectives and measures.
Mr. Ripoll informed participants that enlargement is one of the most important opportunities for the EU to further the integration of the continent by peaceful means, extending a zone of stability and prosperity to new members. He explained that in March 1998 the EU formally launched the process to include thirteen applicant countries: Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, the Slovak Republic, Slovenia and Turkey. This task poses a unique challenge, in terms of the number of candidates, the area (increase of 34%) and population (increase of 105 million), and the wealth of different histories and cultures. He explained that enlargement is expected to significantly benefit countries and the Union – through a single set of trade rules, a single tariff, and a single set of administrative procedures which will simplify dealings for third-country operators within Europe and improve conditions for investment and trade.
Mr. Ripoll delineated the benefits of enlarging the Union to include these countries are political, economic, and cultural:
• The extension of the zone of peace, stability and prosperity in Europe will enhance the security of all its peoples;
• The addition of more than 100 million people, in rapidly growing economies, to the EU's market of 370 million will boost economic growth and create jobs in both old and new member states;
• There will be a better quality of life for citizens throughout Europe as the new members adopt EU policies for protection of the environment and the fight against crime, drugs and illegal immigration;
• The arrival of new members will enrich the EU through increased cultural diversity, interchange of ideas, and better understanding of other peoples;
• Enlargement will strengthen the Union's role in world affairs - in foreign and security policy, trade policy, and the other fields of global governance (even if the Iraq crisis showed the huge difficulties to face in that field).
He also noted that benefits have already been



Mr. Antoine Ripoll

Dr. Shigeru Azuhata

Mr. Jeffrey P. Hardy

Dr. Jan Kretzschmar and Mr. Enzo Millich

achieved in Central and Eastern Europe, where stable democracies have emerged, with democratic institutions and increased respect for minorities. The economic reforms in these countries have led to high rates of economic growth (higher than the EU) and better employment prospects. As a result the Union enjoys growing trade with these countries (17 billion trade surplus in 2000), and this generates employment and growth in the member states.
The European Union has not defined its limits in geographical terms, but every applicant country has to meet the basic conditions laid down by the European Council in Copenhagen. Thirteen countries are involved in the enlargement process at this stage, and in the coming years other countries are expected to submit applications for membership. The EU has identified as potential candidates the countries of the West Balkans region, including the states of ex-Yugoslavia, which have the prospect of one day joining the EU. The Stabilisation and Association process, which is the framework for the EU's policy in the Western Balkans, offers the prospect of accession to the Union, and an assistance programme to support that aim. Norway and Switzerland have applied in the past, and may one day reactivate their applications.

Japan's energy situation and Hitachi technologies for a sustainable world

Dr. Shigeru Azuhata, General Manager, Power & Industrial Systems R&D Laboratory, Hitachi, Ltd.

After lunch, the participants enjoyed a presentation on Japan's energy situation and development of Hitachi technologies for a sustainable world. Dr. Azuhata's presentation on Japan's energy situation and recent energy policy measures enabled participants to clearly see that implementing sustainable energy policy is indeed a global challenge. In particular, Japan is confronted with the need to ensure balanced energy imports, improve thermal efficiencies of power generation, utilise renewable energy, and deregulate the power market. In June 2002, Japan signed the Kyoto Protocol, which will, as in the EU and elsewhere, require the government to pursue energy policy measures which limit CO2 emissions. Among these measures, the Japanese government has called for an amendment of the 1999 law on the rational use of energy. This includes increasing the use of renewable energy generation up to 1.35% of total electricity supply by 2010 and requiring industrial users to submit plans for rationalisation of energy use.

Dr. Azuhata presented a variety of Hitachi technologies which are playing an important role in helping Japan to improve energy efficiency, reduce emissions, and improve the country's long term security of energy supply. In particular, he introduced slides featuring Hitachi's wide line-up of gas and steam turbines. These technologies are commercially employed in utilities across Japan, in pulverised coal-fired power plant, pressurised fluidised bed combustion (coal and natural gas), and integrated coal gasification combined cycle (coal and natural gas). These technologies greatly improve the efficiencies of the feedstock fuels and significantly reduce stack emissions. He also presented an overview of Hitachi renewable energy technology developments, including the Bifacial Solar Cell, which can be installed in thousands of unique, un-intrusive applications in buildings, airports, along highways, as part of fencing and on street lamps.

On the subject of nuclear power, Dr. Azuhata explained that this reliable energy source has grown the most since the 1970s and will continue to be an important part of Japan's energy supply mix, with certain advantages in helping Japan to meet the CO2 constrained world prescribed by the Kyoto Protocol. He gave a short overview of Hitachi nuclear power technologies. Dr. Azuhata noted that nuclear lifecycle CO2 intensity is lower than coal, oil, natural gas, solar, wind – because there are no 'fuel associated' CO2 emissions. He emphasised that only hydropower can produce lower total net emissions.

Working sessions

Three parallel working sessions, comprised of participants and panellists, were formed for the afternoon discussions on energy conservation, climate change and energy technology. Each group had a chairperson and a rapporteur. Their recommendations were presented to the plenary session on the second day.

Working session I:
What should governments do to promote energy conservation?

Mr. Jean-Christophe Füeg, International Energy Affairs, Swiss Federal Office of Energy
Rapporteur: Ms. Linda Geux, KPN Mobile

Working Session I was tasked with exploring various options for governments to promote energy conservation and efficiency. Before putting together a set of recommendations, the group discussed the need and value of energy efficiency. They noted that improving efficiency raises the question of collecting data on energy consumption and use – which is extremely difficult due to both the lack of information and the ways information is collected. For example, energy use in rail transport could be either electric or diesel; are rail cars half full or half empty? Data collection is extremely complex and methods are not in place for accurate measurement.
The group also discussed the perplexing question of why most people agree with the concept of conserving energy, but take little or no action or responsibility. The group suggested that there are a number of reasons for this:
• Consumers are not informed about energy saving potentials;
• Limited knowledge of costs: few customers are aware how much they pay for their electricity;
• Split incentives, e.g, the landlord-tenant dilemma where the landlord is not interested in putting more efficient equipment because he does not pay the bill;
• Consumer habits create inertia, even for simple changes like utilizing more efficient light bulbs.
• The problem of climate change is not something people are directly aware of -- in contrast to diesel emissions, for example.
They also discussed what could be considered a 'vicious circle' where greater efficiency (along with general increases in GNP/wealth) yields more disposable income which in turn can be used to acquire and consume more energy and energy services. Likewise, savings gained through more efficient refrigerators can also lead to consumer choices for larger models, yielding no net gains. The same can be said for vehicles, when increased fuel efficiencies are offset by increased kilometres travelled.
The group agreed that of the three major consuming sectors, industrial and transport customers are responsive to economic signals; they noted that more needs to be done to impact behaviour changes for private motorists and residential consumers. They suggested the following policy instruments are available to governments:
• Providing information
• Standards & regulations
• Fiscal incentives
• Voluntary Agreements
• Finance/R&D
In particular, most private consumers are not aware of their energy consumption patterns or the associated costs. Consumers have to be made aware of when, how and how much energy they use. They suggested that regulations in combination with better information (e.g. programs to promote energy efficiency for home users in France) can be successful. They were convinced that incentives work better than simple price increases, because without explanation and/or suitable alternatives users will object to price increases.
They also suggested that consumers would be responsive to 'responsible consumption' upon more fully understanding how their individual actions can result in aggregated benefits. To this end, the group concluded that improvements in energy conservation are closely tied to consumer psychology and effective government messaging and marketing. They noted a parallel example in waste separation which stands as a viable model for achieving similar responsible energy consumption behaviour.

Working Session II:
What is the best energy technology for defeating global warming?

Dr. Jan Kretzschmar, Innovation & Renovation, VITO (Flemish Institute for Technological Research)
Rapporteur: Mr. Etienne Dancer, ELYO Group

Working Session II was tasked with exploring the topical, if not intractable, question of the best energy technology for defeating global warming. Group II reported that their session was filled with lively debate on a range of issues which factor into the question of climate change, including deforestation, the life expectancy of petroleum reserves, timelines to develop viable alternatives to oil and coal, the ability of uranium resources to supply a world dependent on nuclear—and what to do with the waste. The potential of hydrogen--how to produce it and when fuel cells might be available. Will global warming continue even if Kyoto targets are met? They also explored scenarios where CO2 emissions are allowed to continue growing and whether carbon sequestration technologies (e.g. CO2 injection in depleted oil and gas fields, the role of bacteria in absorbing CO2 and deep, undersea storage of CO2 are valid solutions.
The group took a very balanced approach to its task by first calling into question the validity of the relationship between greenhouse gas emissions and climate change. They recognised the existence of a wide range of expert opinions on the subject, some in direct contradiction. They suggested that, in their opinion, the current base of knowledge was 'enough' to inspire action, if not mandate it. The 'precautionary principle' was cited as a useful guide for governing action: "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically."
In this context, the group more specifically addressed how to reduce CO2 emissions from energy consumption. They recommended:
• The introduction of low carbon fuels and technologies across all the major consuming sectors;
• The potential of biomass, wind, solar, hydrogen and nuclear energies;
• The need to find alternatives to oil, particularly in the road transportation sector
• The need to reduce 'citizen' contributions, through better education and rational energy use;
• Increased taxes to change fossil fuel consumption are not likely to be politically acceptable .
They also recommended that all forms of carbon sequestration/storage be explored, especially in the context of the [expressed] current necessity to reduce atmospheric concentrations. In listing the options, the group raised the caveats that these are all expensive and possible ineffective measures.
    • forests/sea
    • bacteria
    • chemicals
    • storage
In reaching its conclusions, the group presented a comparison between nuclear and renewable energy, based on installed capacity and availability. As an example, 1,000 MWs of electricity, could be generated by one nuclear power plant operating at 90%. In comparison, it would require 500 wind turbines, each with 5MW capacity operating at 30%, to provide the equivalent amount of electricity to the market. In this regard, the group offered the following recommendations for the best energy approach to mitigating climate change:
• Nuclear power is the preferred solution for providing electricity at near zero CO2 emissions now (waste is the perceived problem; industry should better communicate the current ability to deal with it).
• New, renewable technologies and sequestration technologies, along with better consumption behaviours for the longer term.

Working Session III:
What should governments do to promote new energy technologies?

Mr. Enzo Millich, Consultant
Rapporteur: Mr. Fabrice Axisa, INSA Lyon

Session III restricted the discussion to the public authority role in promoting new renewable energy sources and rational use of energy technologies. Following the moderator's suggestion the group split into subgroups, tasked with addressing the following topics:
• Research, development, demonstration and market deployment of renewables and energy efficiency technologies;
• New legislation and fiscal measures in renewables and energy efficiency sectors;
• Other financial incentives, such as feed-in tariffs, subsidies, green certificates.
Concerning what governments should do to promote R&D, demonstrate, and deploy renewable energy and energy efficiency, the subgroup provided the following statements and conclusions:
• Improve awareness of public on energy issues by :
o Information campaigns for general public and specific training programs for schools;
o Provide examples of best practice, particularly in the rational use of energy;
o Promote replacement of oil by natural gas;
o In transport sectors, enhance the role of railway versus road
• R&D activities should be modulated according to the specificity of each EU member country. No specific action should be provided for EU as a whole, but it should be proceeded to cost estimates of each national R&D program. Trade off with non-EU countries, in particular a candidate country should be enabled.
• EU candidate countries: include energy technology and energy industry cleanliness in a roadmap: create a European database for improving the

access conditions of these countries.
• Market deployment: financial incentives should be provided for a better penetration of theses technologies into the energy markets; standards should be continuously improved, non technical barriers like public acceptance of these technologies and reduced administrative burdens should be implemented
Concerning new legislation and fiscal measures necessary to be implemented by public authorities , the second subgroup suggested the following:
• At EU levels, call for proposals for each state in qualities and quantities of renewable energy sources. This call for proposal includes milestones, subsidies related to achievement and time-limited subsidies or grant for each state in order to assure new renewable energy structure economy but not to provoke market distortion;
• A European scientific committee to control the quality of the achievement for each member states;
• EU can allow each member states to propose fiscal special measure for structures which product or promote renewable energy;
• To enhance efficiency of energy consumption, propose standards for building isolation, heating, cooling, lighting and control;
• Compulsory technical control of transportation means should be set up in order to reduce the energy used for transportation. Towns can be encouraged to develop bus, subway to limit the use of car downtown.
Concerning which kind of additional intervention should be implemented by governments in order to develop new energy technologies in this field, the third subgroup suggested:
• In the case of a newly created renewable energy market, subsidies and feed-in tariffs should be preferred in order to enhance the take-off of these energy technologies. Theses instruments are particularly suitable for candidate countries as well as developing countries.
• In the case of already developed energy market, green certificates system should be given a preference as it will not engender any market distortion.
• However, these three instruments should be progressively utilised for long term energy issues.
• Public authority's involvement will increase if these instruments are adopted by EU members and candidate countries.

Summary presentation on working session conclusions

Mr. Jeffrey P. Hardy, President, IDA Consulting

In summarising the presentations and recommendations of the Hitachi Forum, Mr. Hardy noted that the discussion re-enforced the understanding that energy has deep relationships with each of the three pillars of sustainable development — the economy, the environment and society. For policy-makers, planning for a sustainable energy future will be a major priority, which will require broad societal consensus around the strategic choices of economic, environmental and social development. Transparency, stakeholder involvement and institutional flexibility will be key ingredients of any set of decisions. Final choices will also require different policy mixes, likely incorporating fiscal, regulatory and research and development efforts to overcome barriers to the adoption of new approaches.

Mr. Hardy highlighted the fact that several speakers had mentioned the appropriateness and the good timing of this Forum's focus on energy and society, especially since a number of national and international policy-making bodies are currently tackling the same issues. He mentioned that in addition to the EU work on the Green Paper, various new directives and the public debate, that the United Nations Commission on Sustainable Development (UNCSD) is also putting forth recommendations for the rational and sustainable use of the world's energy resources.
Mr. Hardy noted that the cross-cutting nature of energy and energy policy was evident in the recommendations of the three working sessions - who all touched on the need to promote renewable energy, change consumer behaviour and introduce subsidies. Another cross cutting theme was the acknowledgement that as energy use continues to grow, a key question will be how the world's economies can use less energy, and diversify and expand energy production, while maintaining economic growth and prosperity.

In his conclusions, Mr. Hardy identified the circular nature and trade offs inherent in the participants' discussions on energy policy, notably:
• Government intervention vs. market forces -- which works better, taxes, incentives or both?
• Climate policy vs. environmental policy vs. economic policy – which takes precedent? Can they we accomplished in unison?
• Short term fuel and technology decisions vs. long term – should government leap frog to sustainable energy now? Or pursue business-as-usual (unsustainable) patterns until economic and political conditions are favourable?
• What are the characteristics of a good citizen? Willingness to pay (e.g. taxes) or more sustainable consumption behaviour?

He also noted that all the working sessions and many of the expert presentations were convinced that making the difficult choices required for implementing energy policy (consumers and policy makers) would be greatly facilitated in an environment of greater knowledge. It was noted that this forum provided an excellent opportunity of non-energy sector citizens to have a much deeper understanding of:
• the necessity for sustainable energy policy;
• the difficult tradeoffs involved in creating and implementing such policy;
• the important role that each person has in the energy market (both in terms of consumption patterns, and in providing the proper signals to policy makers).
In conclusion, Mr. Hardy delineated the key recommendations of the Hitachi Forum participants:
• Low carbon fuels and technologies should be introduced across all the major consuming sectors;
• The potential of biomass, wind, solar, hydrogen have promise and should be subsidised to encourage market penetration;
• In order to promote renewable energy, subsidies, feed-in tariffs and green certificates should be preferred in order to enhance the take-off of these energy technologies;
• Alternatives to oil are necessary, particularly in the road transportation sector;
• Transportation challenge may require compulsory action—both in terms of fuel choice, but also for modal choice;
• Nuclear power is the preferred solution for providing electricity at near zero CO2 emissions in the present and near-to mid- term;
• Nuclear waste is a perceived problem; industry should better communicate the current ability to deal with it;
• Renewable technologies and sequestration technologies are advocated as key to tackling climate change;
• Financial incentives should be provided for better penetration of new energy and efficiency technologies into energy markets;
• Standards should be continuously improved, non technical barriers like public acceptance of these technologies and reduced administrative burdens should be implemented;
• Increased taxes to change fossil fuel consumption are not likely to be politically acceptable;
• Regulations in combination with better information can be successful;
• Consumer education and public dialogue are critical to creating behavioural changes in energy consumption; and for creating an enabling environment for difficult political decision-making.

Closing of the Forum

Dr. Michiharu Nakamura,
Senior Vice President, Hitachi Ltd.

Dr. Nakamura congratulated the participants and the planners for generating an interesting and successful dialogue on energy and its implications for society. He noted that year after year this group has addressed the relationship between science and society – and every year the group learns that the more a country supports and finances R&D, the more competitive that country becomes. In this respect, he implored the European Commission to ensure that science and technology is given an appropriate priority, enabling it to continue contributing to the prosperity of the European Union.
He explained that the Forum is an example of Hitachi's continued social responsibility and commitment to activities which contribute toward a truly sustainable society. He stressed that Hitachi believes in the power of dialogue and collective thinking for advancing technology's contribution to society, and that it is his hope that the participants' efforts reflected in the Forum summary can contribute constructively to the policy debate in the EU.
In closing, he announced that next year's Forum topic will be on transportation issues, technologies and choices.

Speakers

From left to right: Mr. Thierry de Bresson, Mr. Jean-Christophe Füeg, Mr. Pierre Longin, Ms. Helen Donoghue, Dr. Peter Tjan, and Mr. Jason Anderson.

Mr. Jason Anderson	Energy Specialist, Climate Action Network
Dr. Shigeru Azuhata	General Manager, Power & Industrial Systems R&D Laboratory, Hitachi Ltd.
Mr. Thierry de Bresson	Head of Energy Marketing Group, Pechiney
Ms. Helen Donoghue	Principal Administrator, DG Energy & Transport, European Commission
Mr. Jean-Christophe Füeg	International Energy Affairs, Swiss Federal Office of Energy
Mr. Dolf Gielen	Energy Analyst, Energy Technology Policy Division, IEA
Mr. Jeffrey P. Hardy	President, IDA Consulting
Dr. Jan Kretzschmar	Research Director, Innovation & Renovation, VITO
Mr. Enzo Millich	Consultant
Mr. Antoine Ripoll	Administrator, European Parliament
Mr. Domenico Rossetti di Valdalbero	Scientific Officer, DG Research, European Commission
Mr. John Scowcroft	Head of Environment and Sustainable Development, Eurelectric
Dr. Peter Tjan	Secretary General, Europia

Working Group for the May 2004 Forum on Transportation, Stockholm

The working group has been set up in 1999 to give the Forum members the possibility to become more personally involved in the selection of the Forum topic and, subsequently, in the drafting of the Forum agenda. The current working group consists of the following members:

Amaury Catlin	Belgium
Dónall Mac Dónaill	Ireland
Cathalijne Dortmans	The Netherlands
Niek Ijzinga	The Netherlands
Primoz Kerkoc	Slovenia
Bulent Önay	Turkey
Sylvestre Perrin	France
Monica Tramontan	Italy

EU Hitachi Science & Technology forum

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Finally, we would like to sincerely thank the Forum Fellows: Mr. Mark Cantley (Advisor, DG Research, European Commission), Mr. Pierre Longin (President, Longin & Associés, Brussels), Dr. Florian Schmitz (Rechtsanwalt, Clifford Chance Pünder, Frankfurt) and Mr. Robert Verrue (Director General, DG Taxation and Customs Union) who, throughout the preparation of the Forum, helped us with excellent comments and suggestions.

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EU Hitachi Science & Technology *forum*

Guided tour of the Interfaculty Reactor Institute at the Delft University of Technology.

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