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FOREWORD

The International Ministerial Conference on Nuclear Power for the 21st Century was organized by the IAEA, in cooperation with the Organisation for Economic Co-operation and Development (OECD) and the Nuclear Energy Agency (OECD/NEA), and was hosted by the Government of France. The conference was held in the Pierre Mendès France Conference Centre in Paris on 21 and 22 March 2005. Twenty-five ministers participated in, and a further seven ministers provided statements to be presented on their behalf at, the conference.

These proceedings contain the Conference Summary together with all the written and visual presentations. The closing remarks by the Conference President are also included, together with the Final Statement, which was prepared for the Conference President to reflect the broad convergence of views expressed at the conference by the vast majority of participants.

The Scientific Secretaries for the conference were R. Swaminathan of the Office of External Relations and Policy Coordination and R.I. Facer of the Division of Nuclear Power.
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Mr L. Echavarri
Chair
Mr. C. Mandil
Mr. P. Gadonneix
Mr. M.R. Srinivasan
Mr. J. Stone
Mr. J. Lovelock
Mr. P. Simola
Mr. C. Bataille
Mr. R. Adam
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Mr R. Cirimello Chair
Mr. S. Kondo
Ms. A. Lauvergeon
Mr. K.P. Lau
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CONFERENCE SUMMARY

INTRODUCTION AND BACKGROUND

The aim of this conference was to analyze the current trend in world nuclear power development as a result of recent considerations by a number of Member States regarding the future use and benefits of nuclear power.

It is widely recognized that global energy demand will rise substantially during this century. The increased industrialization and urbanization of developing countries will produce large increases in energy demand in regions that currently have a very low per capita energy use. This increasing demand for energy will need to be met in order to improve living standards for the less well provided half of the world’s population and to reduce the economic imbalances between countries and regions.

At the same time, the use of fossil fuel based energy is identified as a major cause of environmental damage. The release of greenhouse gases by burning fossil fuel in power stations and for transport is seen as a contributor to global warming. It is widely recognized that continued exploitation of fossil fuels and releases of carbon dioxide will need to be controlled.

After a prolonged period of slow development of nuclear power, confined to only some countries of the world, it is now being recognized that nuclear energy has a potentially significant role to play in meeting the energy needs of the planet without damaging the environment. Developments in technology make the economics of nuclear power more attractive, and they may become even more so as fossil fuel prices continue to rise.

For a widespread use of nuclear power, however, there remain concerns on the safety, security, waste and proliferation aspects. The global application of safety standards and appropriate security measures is required to ensure acceptable levels of protection. Effective control measures are required to ensure that non-proliferation commitments are honoured. Handling nuclear waste safely and securely is achievable, but continues to remain a public concern.

OBJECTIVES

The broad strategic objectives of the conference were the following:

- To review the role of nuclear power and to define the potential benefits (energy security, sustainability and improved environmental protection) that expanding nuclear power offers to meet the increasing energy needs of the world.
- To facilitate a discussion on the issue of nuclear energy and society involving experts and decision makers.

ORGANIZATION OF THE CONFERENCE

The conference consisted of two major elements. The first element was invited ministerial presentations on the current and future role of nuclear power in the context of national energy strategies, while the second was round table discussions involving renowned international experts to discuss:

- World energy needs and resources;
- Environmental challenges of the 21st century;
- Driving factors for strategies and choices;
- Governance issues.

These were followed by discussions between the presenters and conference participants.

Opening speeches were presented by the Conference President, Minister Delegate for Industry, France, P. Devedjian, Director General of the IAEA, M. ElBaradei, and the Director General of the OECD, D.J. Johnston, who had recorded a video message to the conference.

CONFERENCE OVERVIEW

This conference was held to enable the future of nuclear power to be discussed at the ministerial level. Participation included 465 experts from 69 IAEA Member States and eight international organizations. Presentations of national visions on the future of nuclear power by 25
ministers in person, and seven presentations made on behalf of Ministers, demonstrated the timeliness and importance of the conference. The participation of about 75 press and media representatives and broad media coverage were further indications of the wide interest in the future of nuclear power.

In many views presented, and in two round table discussions, the potential significant role of nuclear energy in meeting the energy needs of the planet was recognized, in particular that:

- Developments in technology and improvements in management resulted in better safety, and that the economics of nuclear power made it increasingly attractive and fully competitive.
- Nuclear power can contribute in meeting the needs of the Millennium Development Goals and the Johannesburg Plan of Implementation, such as the eradication of poverty and hunger, universal access to plentiful fresh water and energy, and environmental sustainability, without contributing to global environmental stress.

Several countries addressed the IAEA for assistance in commencing, or expanding, nuclear power programmes.

Ministers also emphasized the importance of the highest nuclear safety levels, the highest level of security of nuclear material and facilities, conforming to international non-proliferation objectives and the management of spent fuel and radioactive waste.

France, as the host government, had consultations with a number of Member States, and the Final Statement prepared for the Conference President reflected a broad convergence of views from the vast majority of participants expressed at the conference. It includes widespread support for the development and use of nuclear power for electricity production, water desalination, hydrogen production and other purposes. Developing countries identified their needs and expectations in the use of nuclear power, and it was recognized that the IAEA can support and assist them in investigating their needs, and the steps necessary to adopt nuclear energy, while understanding that each State is free to define its own energy policy. The IAEA was recognized as having an essential role to play in facilitating the development and use of nuclear energy with due regard to the issues of safety, security and non-proliferation, in fostering international cooperation and in information dissemination on nuclear power to the public. The importance of international research and development programmes in the development of innovative nuclear systems, to enable nuclear power to thrive, was emphasized.
ORGANIZATION OF THIS CD

This CD is presented in major sections relating to:

- The opening speeches of the Conference President, Minister Delegate for Industry, France, P. Devedjian, Director General of the IAEA, M. ElBaradei, and the Director General of the OECD, D.J. Johnston;
- Ministerial presentations;
- Round tables;
- Closing remarks by the Conference President, P. Devedjian.

Each presentation is available as a file in the original spoken language, and where available an English translation of the text of the presentation, including the visual presentation material.
SUMMARY OF PRESENTATIONS

Full copies of the opening speeches are included on this CD. This section identifies some of the highlights of the speeches in relation to national energy policy and also in relation to international obligations and agreements.

OPENING SPEECHES

**P. Devedjian, Minister Delegate for Industry, France**, opened the conference, as Conference President, by recognizing that energy issues are a critical concern for humanity. He noted that the global demographic trend and the strong economic growth in Asia are accompanied by a durable increase in energy needs. He identified global warming caused by greenhouse gas emissions from fossil energy sources as a major global concern.

He indicated that, in his view, the idea of the conference was not to promote nuclear energy for all the needs and in all the areas of the world but rather to review the role of this source of energy, to recognize that certain energies — known as renewable energies — are inexhaustible and need to be exploited to their maximum potential, but also that the total production cost of nuclear power is competitive compared with other sources of energy.

He stressed the importance for the conference to examine the structural factors involved in energy choices — including economic, strategic and social factors — and to analyse the importance and framework of international cooperation.

Mr. Devedjian described how France’s energy policy had reduced national energy costs from 5% to 1.8% of gross domestic product and how in 2004 the use of nuclear power allowed France to avoid 36 million tonnes of carbon emissions, or one third of annual carbon emissions, noting that the greenhouse gas emissions avoided in this way correspond to those of the entire European car population.

He also reminded the conference of France’s decision to build a third generation demonstration reactor, the EPR, in order to obtain the data required for an informed choice of future energy systems, and that France has opted for processing and recycling spent nuclear fuel as part of its sustainable development strategy.

Mr. Devedjian re-emphasized that France offers its nuclear technologies and the possibility to use this energy only to those countries which have agreed to put their nuclear sector entirely under the control of the IAEA and to comply strictly with their international nuclear non-proliferation commitments.

**M. ElBaradei, IAEA Director General**, opened his remarks by welcoming delegates to the conference, and thanked Mr. Devedjian for the French Government’s support in hosting the conference.

He then examined the key issues of world energy use, providing the example that the per capita electricity consumption in Ghana is only about 300 kW·h/a, while in Nigeria it is closer to 70 kW·h/a, which he contrasted with France, where per capita consumption is over 7300 kW·h/a — a factor of 100 times greater — slightly less than the OECD average of 8000 kW·h/a, and well below the consumption rates, for example, in Scandinavian countries.

He suggested that when considering the Millennium Development Goals it is quickly evident that the availability of energy overall, and electricity in particular, is central to our ability as an international community to deliver on each of these goals.

The expected substantial growth in energy demand is based on three factors: the drive to raise living standards in the developing world, continued population growth and the never ceasing expansion in consumer products and technologies that increase the quality of life but consume additional energy.

If the developing world were raised to the global average energy consumption rate — about half the standard of eastern Europe — the net result would be a 35% increase in global energy use. If the population growth predicted by 2020 is taken into account, the net increase would be 60%. So it should be no surprise that even the most conservative estimates predict at least a doubling of energy usage by mid-century.
The IAEA’s low projection — based on the most conservative assumptions — predicts 427 GW of global nuclear capacity in 2020, the equivalent of 127 more 1000 MW nuclear plants than previous projections. Elsewhere, plans remain more moderate, but it is clear that nuclear energy is regaining stature as a serious option. Much of the increase in nuclear generating capacity over the past decade has been credited not to new construction but to the increased availability of existing plants.

Energy decisions cannot be made on a ‘one size fits all’ basis. He commented that nuclear energy should not be viewed as being in competition with renewable sources of energy such as wind, solar and geothermal plants. In fact, nuclear energy is not in competition, per se, with any technology. However, the problem remains that no renewable source has been demonstrated to have the capacity to provide the baseload amounts of power needed to replace large fossil fuel plants.

Mr. ElBaradei reminded the conference that the accident at Chernobyl in 1986 prompted the creation of the World Association of Nuclear Operators (WANO) and revolutionized the IAEA’s approach to international cooperation on nuclear power plant safety. Both organizations created networks to conduct peer reviews, compare safety practices and exchange vital operating information to improve safety performance. The IAEA updated its body of safety standards to reflect best industry practices, and put in place legally binding norms in the form of international safety conventions.

He continued that the failure of the nuclear community — both scientists and technical experts, operators and regulators — to effectively market the potential characteristics of nuclear power in comparison with other sources has contributed to a lack of public understanding regarding the risks and benefits of nuclear energy, and that it is important for the nuclear community to make every effort to provide comprehensible, accurate information to support that debate, to ensure that the risks and benefits of nuclear technology are clearly and fairly understood.

Mr. ElBaradei concluded by suggesting that the future contribution of nuclear power will be greatly impacted by innovation — the development of new reactor and fuel cycle technologies. To be successful, these innovative technologies should address concerns related to nuclear safety, proliferation and waste generation, and must be able to generate electricity at competitive prices.

D.J. Johnston, OECD Secretary General, was unable to attend the conference and had recorded a video which was presented at the opening session. He identified that there are an enormous number of challenges to be addressed in the first part of the 21st century, and that climate change must be high on the list, but it is also in stiff competition with development and poverty reduction. He reminded the participants that in November 2004 a group of responsible non-governmental organizations published a report which alleged that global warming will hit the poor countries hardest. The consequences of the continuing rising trend of carbon dioxide levels are likely to be dramatic, maybe catastrophic.

From transportation to electricity generation, major changes must take place, not only to at least stabilize the greenhouse effect but also to adapt to the dwindling supplies of oil, gas and even coal in the longer term. Mr. Johnston commented that many, including the renowned scientist J. Lovelock, originator of the Gaia hypothesis, deplore the fact that nuclear technology has been abandoned by many countries, and he reflected Mr. Lovelock’s opinion that nuclear energy is critical to check runaway global warming, which would have potential catastrophic consequences.

He concluded with the comment that presently some 1.5 billion people do not have access to electricity. Without the nuclear option, this situation is unlikely to change over the next 25 years.
MINISTERIAL PRESENTATIONS

This section attempts to highlight the key issues raised and points made by the ministerial speakers or presenters on their behalf. The full text of each speech is available on this CD.

The ministerial comments on their national positions indicated widespread support for the use of nuclear energy. During the presentations several countries that operate nuclear power plants indicated an intention to continue to do so, or to expand the use in the future. There were also several countries that currently do not operate nuclear power plants that indicated a short term intention to apply nuclear energy for power or desalination applications, and others that, although not committing to nuclear power in the short term, indicated an intention to consider nuclear power in the future. Ministers also emphasized the importance of the highest nuclear safety levels, the highest level of security of nuclear material and facilities, conforming to international non-proliferation objectives and the management of spent fuel and radioactive waste.

NATIONAL POSITIONS

His Excellency Myung Oh, Deputy Prime Minister and Minister of Science and Technology, Republic of Korea, noted that the peaceful use of nuclear energy has contributed greatly to a sustainable and stable supply of energy over the past 50 years. Over the last two decades energy and electricity consumption in the Republic of Korea (ROK) has increased more than fivefold and sevenfold, respectively, and the ROK is now one of the top ten energy consuming economies. Furthermore, it is expected that the consumption of energy and electricity will continue to rise by 50% and 70%, respectively, by 2020.

Given the scarce indigenous energy resources available in the ROK, he stated his firm belief that the application of nuclear energy is inevitable for future economic development.

The ROK has recently launched national research and development projects to develop the VHTR (very high temperature reactor), which can produce high temperatures for hydrogen production by nuclear power.

He predicted another nuclear renaissance in the future. For this, the global community should assign a larger role to nuclear energy in, for example, space heating, hydrogen production, vehicle propulsion and seawater desalination, and expand the application of radioisotopes to various industries. He confirmed that peaceful uses of nuclear energy are inevitable and indispensable options for the reduction of greenhouse gas emissions and future welfare.

He stated that the ROK appreciates the international nuclear society’s efforts in strengthening the non-proliferation regime, and commented that in the ROK there have been various measures in this regard, including reinforcement of an export control regime and IAEA safeguard measures.

He also indicated that recently the ROK has expanded nuclear research and development activities for the innovation of nuclear technologies and enhanced international cooperation by joining international nuclear cooperation projects, such as GIF (Generation IV International Forum) and the IAEA’s International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO).

A. Rumyantsev, Head, Federal Atomic Energy Agency, Russian Federation, reminded the conference that two thirds of energy is consumed by the industrially developed countries, with a population of just over a billion, while only a third of energy is consumed by the planet’s remaining four billion inhabitants. Thus it is clear that, in the 21st century, the world community will be focusing its efforts on making energy consumption in the different parts of the world more equitable. Even if a conservative approach is taken, global energy production will have to increase more than twofold by 2050.

He suggested that in view of its innovative potential, nuclear power could become the basic building block in an energy system ensuring sustainable, economically advantageous and socially acceptable development in the 21st century. He specifically indicated that it is planned to construct and bring into operation an additional 10.38 GW of electrical capacity in the Russian Federation between 2011 and 2020.

Mr. Rumyantsev reported that President Putin of the Russian Federation had said “Today nuclear power is a growing industry … and in many ways its future depends on fruitful international cooperation …”
The Russian Federation’s strategy for nuclear power development in the 21st century rests on the idea of sustainable development and the assumptions underlying the methodology developed under the IAEA’s INPRO and is based on two guidance documents: Russia’s Energy Strategy up to 2020 (approved by the Government of the Russian Federation on 28 August 2003) and An Energy-efficient Economy. He indicated that the INPRO project enjoys active support from the Russian Federation and that the ever increasing number of members (currently there are 21 IAEA Member States plus the European Commission, as well as many observer countries) is proof of the project’s growing international recognition, and he looked forward to closer links with the GIF.

His Excellency A. Marzano, Minister of Productive Activities, Italy, indicated that, regarding nuclear power, a clear change in public opinion, notably by the young, has been seen in Italy.

He indicated that the Italian Government believes that nuclear power should be proposed and maintained as a key element for energy source diversification, security of supply and environmental protection in the single European market. Italy’s energy policy is currently driven by market liberalization, transfer of relevant political and administrative decision making powers to the regional authorities, diversification of supply sources, energy security, efficiency improvements and environmental protection. Significant reliance on oil and natural gas, including from external supply sources, raises concerns about security of supply and the risk of high energy costs. Most of the new power plants in Italy are gas combined cycles, with some coal fired units. It can be noted that Italy is importing about 16% of its electricity supply, and most of this import has nuclear origins.

He suggested that if the European electricity market were to be organized as a single market, a single nuclear market could also be advocated which might be characterized by harmonized technical safety standards, shared criteria for physical safeguards and enhanced cooperation on nuclear waste and decommissioning. This approach, should it be agreed to by other European Member countries, would benefit from economies of scale and the existing institutions, and eventually lead to a more coherent European nuclear policy and long term strategy regarding the future of energy.

He noted that Italy would support strengthened international cooperation and the participation of interested parties from Italy in new European and international nuclear technology programmes and projects.

He concluded that during the past several years it has become clear that nuclear energy is an energy source that is deployable and which it is known how to manage, how to develop and how to deliver to meet our energy needs while coping with the changing world energy outlook.

Huazhu Zhang, Chairman, China Atomic Energy Agency, China, stated that social and economic development in China in the 21st century demands continuous growth of the total volume of energy supply, on the one hand, and requires expedited adjustment to the energy mix, on the other hand, to effectively relieve harmful effects on the environment. These are the two challenges the energy industries are facing in the new century.

According to the strategic energy study, China’s annual consumption of primary energy will be around 3 billion tonnes of standard coal, and the installed capacity of power generation will reach 900 GW(e) by 2020. According to the preliminary plan, the installed capacity of nuclear power will reach 36–40 GW, accounting for about 4% of the total of the country. Nuclear power is going to play a more important role in China’s power generation in the years to come, and developing nuclear power is an important step towards optimizing the energy mix, protecting the environment and achieving sustainable development.

He also stated that China will, as always, actively participate in international discussions on the role of nuclear energy in sustainable development and the status of nuclear energy in energy development in the 21st century, which can enhance communication, understanding and consensus.

His Excellency M. Boutaleb, Minister of Energy and Mining, Morocco, stated that studies of appropriate technical and economic sites for a first nuclear power plant have been carried out and that there is a technical possibility to introduce the first nuclear unit of 900 MW in his country by 2016.

He also indicated that Morocco has good communication and cooperation agreements with the IAEA through its Technical Cooperation Programme, and bilateral arrangements with France and USA are fruitful.
His Excellency J. Koka, Minister of Economy and Transport, Hungary, suggested that as a result of the need for energy, notably electric energy, by a growing world population, it is rational to work for a low carbon intensive energy future as the basis of sustainable development. His conclusion was that at the present time and in the next decades nuclear power is the only viable source of vast amounts of additional energy that is sustainable.

He suggested that beyond the environmental and economic benefits, nuclear power may provide an attractive option in the search for greater energy security, which is the one of the main pillars of energy strategy. The Hungarian energy supply is about 70% energy import dependent, therefore the security of energy supply is a priority of the national energy strategy.

The safe, successful and profitable operation of the State owned Paks nuclear power plant greatly contributes to meeting this challenge. This situation could change significantly after 2012 if the units of Paks were shut down at the expiry of their operational licences. Based on the present tendencies and market conditions, the prediction is that either the growth of demand must be covered by gas fired power plants that produce energy more expensively compared with nuclear power plants, or electricity will have to be imported. He indicated that the Hungarian Government’s position is that the only feasible solution to this problem is the long term operation of Paks nuclear power plant, and to that end the Hungarian Government is ready to provide the necessary support. Detailed assessment of the plant status demonstrates that the condition of the plant is excellent, and the continuation of safe operation for another 20 years at the expiry of the present operational licence is feasible. He noted that public acceptance of nuclear power generation in Hungary has been continuously over 70% for many years.

Mr. Koka also stated that Hungary is particularly thankful for the assistance provided by the IAEA and the US Nuclear Regulatory Commission. The safety of the plant is a precondition for the licence renewal and long term operation.

S. Ajuria Garza, on behalf of His Excellency J. Alberto Acevedo Monroy, Vice Minister in charge of Electricity, Mexico, indicated that the Laguna Verde units have licences until 2020 and 2025, and it is intended to operate these plants until the end of their licence. Consideration will be given to extending the licences until 2040 and 2045, provided that the ongoing studies justify this. He noted that the performance of Laguna Verde is well above the world average and that the Secretary of Energy in collaboration with the IAEA is working on a programme to inform public opinion in respect of nuclear technology for the generation of electricity.

Turki bin Saud bin Mohammed Al-Saud, Vice President, King Abdulaziz City for Science and Technology, Saudi Arabia, welcomed this opportunity to study the role of nuclear energy with ministers and noted that political decisions and public concerns relate to fear of the risk of the operation and disposal of waste from nuclear plants. He indicated that his government continues to investigate the pros and cons of nuclear energy. He stressed the importance of the verification of nuclear material security. As the world’s largest oil producer, he stated that Saudi Arabia looks to balance short and long term benefits for both producers and consumers, looking for a policy of price stability and noting the expectations of an increased demand. He recognized the close relationship between energy and the environment and identified efforts to encourage cleaner oil use.

He reminded the conference of the need to ensure continuing support for the IAEA’s role in ensuring nuclear security and safety.

C. Morella, Ambassador to the OECD, on behalf of the US Secretary of Energy, USA, indicated that the people of the USA believe that, in the USA and in other countries throughout the world, nuclear energy is a key component of a balanced portfolio mix. She stated that the President of the USA is committed to policies that encourage the deployment of current nuclear energy technologies.

She referred to a recent study by the University of Chicago which concluded that US nuclear power plants can become cost competitive with electricity produced by coal and natural gas — once the additional costs associated with building the first plants are absorbed. She stressed that US interest in, and support of, nuclear energy has never been stronger.

She quoted President Bush as saying “To ensure a diverse energy supply, we need to promote safe, clean nuclear power. Nuclear power can generate huge amounts of electricity without ever
emitting air pollution or greenhouse gases. America hasn’t ordered a nuclear power plant since the 1970s, and it’s time to start building again”.

She stated that the US Government will invest over $500 million over the next six years to license the construction of at least two or three new plants. Because of its long term potential to bring clean and cost effective energy to the developing world, and to help industrialized nations increase their energy security and to help all nations deal with some of our most pressing environmental challenges, the advantages of nuclear power are strikingly clear.

Ambassador Morella commented that this is especially true as the next generation nuclear energy technologies demonstrate their ability to produce clean burning hydrogen, as well as electricity, to help free economies from imported petroleum. She supported the view that as international partners united by a common goal, the international community can work together to expand the use of safe, economic, environmentally sustainable and proliferation resistant nuclear power. She concluded by suggesting that in order to advance collective nuclear energy policy objectives, she supported the creation of a joint statement summarizing the message of this ministerial meeting.

She reminded the conference that maintenance of security is important and that the IAEA’s safeguards system is crucial in this regard, and must be given the support and tools it needs, including universal adherence to the Additional Protocol.

His Excellency, P. Rusko, Minister of Economy, Slovakia, stressed that Slovakia is well aware of the challenges to be tackled in the 21st century in the face of a steady growth in energy demand. The national energy policy objectives give rise to several priorities, such as the effort to scale back fossil fuel imports, which is a direct consequence of the effort to mitigate the environmental impacts of energy production. In principle, and very relevant to this policy, he stated that nuclear energy is to be treated as a diversified, an economical and, from the environmental perspective, a clearly ‘green’ electricity production method. Slovakia is ready to support the further development of nuclear power, which — provided that all international standards are met — represents the best and most effective way of mitigating the greenhouse effect.

His Excellency R. Vejonis, Minister of Environment, Latvia, indicated that the Government of Latvia is conscious that nuclear science, technology and applications contribute to many means of human socioeconomic development.

He suggested that the skills and experience in the nuclear area are valuable to all and hence that there is no other option but to cooperate with other countries in order to maintain knowledge.

He noted that disposal of long lived radiation sources, which could well be an international undertaking, remains a challenging task, which is being addressed under EU auspices, but that there is also opportunity for wider activities lead by the IAEA in this respect.

I.C. Seres, Minister of Economy and Commerce, Romania, stated that his country’s nuclear power plants have a proven record of energy cost stability and that, based on the long term commitment to nuclear energy of the Romanian Government, the finalization of Cernavoda unit 2 started in March 2003. He indicated that the Government of Romania is continuing its policy to support nuclear energy as part of the sustainable development of the country and that nuclear power will reduce Romania’s dependence on external suppliers of energy resources.

He noted that the implementation of the Romanian nuclear power programme represents an excellent example of cooperation with partners from Europe, Canada, the USA and other Member States of the IAEA.

S. Sriwidjaja, Ambassador, Permanent Mission of Indonesia to the IAEA, on behalf of the Minister of Research and Technology, informed the conference that, although energy consumption per capita is low, Indonesia is experiencing a high growth in energy demand, due to its high population growth, dynamic economic activities and rapid industrialization. He commented that the issue of security of energy supply is important and needs to be addressed appropriately. A study for Indonesia recommended that an energy mix policy should be applied in which the contribution of oil should be reduced and replaced by gas, coal, renewable energy and other alternative energies, including nuclear energy.

He stressed that the introduction of a nuclear power programme by the Indonesian Government would not only serve as a solution to the rising demand for electricity but is also expected to help save
and prolong fossil energy for other purposes, as well as being a part of the global effort to reduce the effects of global warming.

He commented that over the past few years Indonesia has fully engaged with both the comprehensive safeguards agreement and the Additional Protocol for all existing facilities and has been participating in the development of international safeguards to strengthen the non-proliferation of nuclear material, proving that Indonesia supports the utilization of nuclear energy for peaceful purposes.

He informed the conference that over the past few years Indonesia has fully engaged both in the comprehensive safeguards agreement and the Additional Protocol for all existing facilities. However, as Indonesia is preparing to operate nuclear power plants in the next decade, there are several issues which it feels still need support from developed countries. Among these issues are a joint study on the preparation of nuclear power plant construction, joint research on nuclear safety technology, national regulatory enhancement to meet international requirements and fuel cycle and waste management, and public information on nuclear energy.

He also indicated that in respect of public opinion, the Indonesian delegation is of the view that research and study on environmentally friendly nuclear technology should be further conducted by the IAEA to ensure public confidence concerning the increasing use of nuclear energy as part of the energy mix.

He suggested that Indonesia’s activities prove that Indonesia supports the utilization of nuclear energy only for peaceful purposes, and added that it is their expectation that the conference would address the concerns of Indonesia. He believed that non-proliferation control arrangements on nuclear material and technology should be transparent for developing countries and open to participation by all States, and it should be ensured that they do not impose restrictions on access to the material, equipment and technology necessary for continued peaceful development.

His Excellency A. Minev, Deputy Minister of Energy and Energy Resources, Bulgaria, suggested that, over the long term, it is clear that the need for sustained human development will require a substantial investment in energy generation in the coming decades, and that, given its capacity for emissions free electricity generation, nuclear energy has strong potential as a reliable baseline energy source. He reported that the construction of the second nuclear power plant in Bulgaria has very strong political and public support at the local and national level. More than 97% of the local community, and more than 72% of Bulgarians, strongly support the plans for a new nuclear facility.

He stressed that national responsibility for the safety of nuclear installations is the fundamental principle on which the regulation of nuclear safety and of radioactive waste management has been developed by the international community as endorsed by the Convention on Nuclear Safety and its parties, including the European atomic energy community, and reflected in the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, and acknowledges that the IAEA’s standards and approaches, as reflected notably in the IAEA Safety Fundamentals and Safety Requirements series, constitute an internationally recognized framework which Bulgarian national safety requirements use as a reference.

K. Hirata, Parliamentary Secretary for Economy, Trade and Industry, Japan, reminded the conference that Japan commenced the commercial use of nuclear powered electricity in 1966, and currently around one third of the nation’s electricity needs are met by nuclear energy. He stated that Japan has been steadily working towards establishing a nuclear fuel cycle because, if a practical fast breeder reactor cycle can be realized, Japan will be able to secure a semiperpetual supply of energy.

He then commented on the prevention of global warming, indicating that Japan needs to utilize both nuclear power and renewable energy sources in meeting the demand for energy in an appropriate manner. He particularly commented that, from an energy supply standpoint, the importance of nuclear power would only increase, considering its role in the prevention of global warming and its economic efficiency.

He indicated that he believed that 2005 is a turning point, when nations around the globe recognize the importance of the role played by nuclear power generation.

L. Glasgow, Minister Plenipotentiary, Embassy of Canada in France, on behalf of The Hon. J. Efford, Minister of Natural Resources, Canada, stated that the Government of Canada sees
nuclear energy as an essential ingredient of its energy mix now and in the years to come. She indicated that Canada has been preparing for growth and the all the conditions for a nuclear renaissance are right.

She identified that there is a need to foster and maintain the creative spirit and vision to spark scientific innovation from reactor technology to medical isotope development. She reported that Minister Efford was particularly pleased that, following his visit, the Governments of China and Canada entered into an agreement on nuclear energy cooperation and in January 2005 signed a five year memorandum of understanding to establish a framework for collaboration on research and development programmes and activities.

She reported that recent public opinion polls indicate that eight in ten Canadians believe nuclear power will be part of Canada’s future energy mix, and that recent studies have shown that in some regions of the world, like Ontario, nuclear power represents one of the best options for competitively priced baseload electricity.

She further noted that Canada is working with others within the GIF and INPRO to arrive at an assessment methodology and to provide advice and guidance to designers on how to achieve proliferation resistance characteristics throughout the fuel cycle.

M. Saeidi, Deputy to and on behalf of His Excellency Mr. R. Aghazadeh, Vice President of the Islamic Republic of Iran, President of the Atomic Energy Organization of Iran, stated that the generation of nuclear electricity is the prime priority of Iran’s nuclear programme. He presented the view that that fossil resources are limited and belong to all subsequent generations and unrestrained use of this source of energy is not prudent, and added that the utilization of these resources in processing industries such as the petrochemical industry will generate much greater added value.

He reported that the medium scenario indicated that the production of 6000 MW of electricity by nuclear energy, in addition to the 1000 MW Bushehr power plant, which is now under construction, is essential to cover the needs of the energy required for establishing sustainable development in Iran. He stressed that nuclear energy as a clean and secure source can play an important role in the future of the world.

He said that the objective of Iran’s nuclear development plan is the attainment of self-sufficiency in all aspects of the peaceful use of nuclear energy, including the provision of nuclear fuel.

He invited all countries to participate in the construction of nuclear power plants and other facilities in line with Iran’s long term nuclear programme, indicating that, based on Article IV of the Treaty on the Non-proliferation of Nuclear Weapons, it is the inalienable right of member countries to engage in research, production and the use of nuclear energy for peaceful purposes without discrimination.

His Excellency M. Steinberg, Deputy Minister, Fuel and Energy, Ukraine, noted that this is a well chosen time to conduct the conference, since the renaissance of the nuclear industry has begun. He described the continuing positive public attitudes towards nuclear energy in Ukraine, notwithstanding the Chernobyl accident. He suggested this support was based on the fact that the development of Ukraine is linked to the development of energy supplies, and nuclear energy is the most stable source of these energy supplies. He indicated that although nuclear energy comprises less than 25% of the installed electricity generating capacity it provides over 50% of electricity production, and that although Ukraine has large coal reserves, these are between 600 m and 1 km deep and are hence expensive to mine. He noted that Ukraine plans to justify the extension of the operating period of the existing nuclear plants and also plans to complete a further two new nuclear power plants.

E. Wroblewska, on behalf of His Excellency J. Hausner, Minister of Economic Affairs and Labour, Poland, stated that in Poland the attitude of society to nuclear power is becoming more friendly. A recently produced document, Energy Policy of Poland until 2050, indicates the need to commence nuclear power exploitation around 2021.

His Excellency A. Khreisat, Minister of Energy and Mineral Resources, Jordan, reported that the consumption of energy in Jordan during 2004 was up to 5.9 million tonnes of oil equivalent, with a growth percentage of 3%, and it is expected to have an annual growth of 2.5% during 2005–2015. This requires importing most of the country’s needs in the form of primary energy, which is a big challenge to the economy. He indicated that Jordan was interested in sharing thoughts and means to increase the use of nuclear energy as an alternative means of electricity generation through regional
and international cooperation, in particular the already planned regional electricity market in the south and north Mediterranean region.

**His Excellency C. Sina Diatta, Minister of Scientific Research, Senegal,** suggested that the peaceful use of atomic energy in Senegal would be approached progressively, initially in strategic areas such as education, medical science, pharmaceuticals, agriculture and nutrition.

**His Excellency M.H. Güler, Minister of Energy and Natural Resources, Turkey,** indicated that his government views nuclear energy as a safe, clean and cost effective energy resource and as one of the main components of the energy policy for the future. Nuclear energy, with virtually zero greenhouse gas emissions, also results in a significant reduction in environmental emissions from the power sector.

He informed the conference that it is his government’s view that around 5 GW(e) of baseload nuclear capacity will be placed before 2015 and that nuclear power will contribute to around 5–6% of its total installed capacity by 2020. This will be achieved through diversifying the portfolio of electricity generation options and reducing its dependency on imported fossil fuels through the sequential commissioning of nuclear power into the Turkish electricity grid.

**D. Drabova, Ministry of Industry and Trade, Chairman of the State Office for Nuclear Safety, Czech Republic,** stated that to secure energy at an affordable price and at the same time to be considerate to the environment, a certain proportion of energy generation in the form of nuclear energy is essential in the long term for the Czech Republic. Nuclear energy will help to reduce the environmental load within the Czech Republic, including a reduction of greenhouse gas emissions. Nuclear energy will also support the priority of maximum independence of the country from foreign energy sources.

She confirmed that the level of public confidence in the existing safety regime and consequently public acceptance of nuclear power seem to be the key issues. Considerable thought is being given to ensuring that the public is and feels that it is contributing to the decision making process.

She noted the efforts in strengthening the global safety regime and praised the quality of newly revised IAEA standards and the promising start of the review process both under the Convention on Nuclear Safety and Joint Convention on Safe Management of Radioactive Waste and Spent Fuel.

**His Excellency, M. Akram Sheikh, Deputy Chairman, Minister of State, Planning Commission, Pakistan,** stated that to meet the primary commercial energy demand in 2030, the Government of Pakistan plans to exploit all indigenous sources and diversify the energy mix in the next few decades, including full deployment of renewable energy. As part of this he indicated that the share of nuclear energy in electricity generation is planned to be increased from 0.8% in 2004 to at least 7% by the year 2030 (adding 8400 MW).

Pakistan is convinced that nuclear power will allow it to meet its energy needs for sustainable development because it is free of carbon dioxide emissions. He also indicated the planned use of nuclear plants in combination with hydropower plants to pump water back up into water reservoirs during off-peak periods to enable generation by hydropower plants at peak hours — thus reducing dependence on gas fired turbines during peak loads.

The initial vision is for a minimum of ten nuclear plants totalling 8800 MW by 2030 (8% share of electricity), with a minimal burden on public finances through self-financing and other schemes. Since Pakistan will face an indigenous energy supply gap of nearly 57.4% by 2030, a higher capacity would be advantageous.

**K. Begum, Chairman, Bangladesh Atomic Energy Commission, on behalf of His Excellency A.M. Khan, Minister of Science and Information and Communication Technology, Bangladesh,** commented that less than 20% of the total population of Bangladesh has access to electricity. She stated that with the growth in the population, increasing pressure is being put on biomass fuels, and that biomass fuels are at saturation level, or beyond, leading to forested areas dwindling to 9% and a rapid depletion of forest resources, causing an ecological imbalance and a change in the climate pattern. This biomass use also leads to negative health effects in women and young children.

She commented that nuclear power offers a proven and economically viable option — based upon the absence of greenhouse gas emissions, low operating costs and insensitivity to fluctuations in
Her Excellency L. Xingwana, Deputy Minister of Minerals and Energy, South Africa, noted that the President of South Africa has announced that in eight years universal access to electricity would be achieved. This means an additional three million households will be supplied through the electricity grid. Currently in excess of 300 000 new households per annum are being supplied with electricity.

She stated that in a country that has abundant uranium resources, ways of utilizing this resource for peace and economic development would continue to be sought. The pebble bed modular reactor (PBMR) was borne out of the need to ensure security of supply through diversity. She commented that the decision to proceed with the PBMR project was taken with a full understanding that successful commissioning of the project will contribute towards efforts aimed at meeting the Millennium Development Goals and will enhance sustainable socioeconomic development.

She noted that the IAEA Statute, inter alia, advocates that Member States have the inalienable right to access and/or acquire nuclear technology for peaceful purposes.

She then added that for nuclear energy to succeed a lot of effort has to go towards superior designs that are economically viable and proliferation resistant. Nuclear energy cannot thrive without social acceptance. Programmes aimed at educating the public on the benefits of nuclear energy must be enhanced. It is necessary to guard against talking amongst ourselves and to reach out to society. The development and maintenance of a national infrastructure to ensure a peaceful and safe use of nuclear power is essential. In this regard, she expressed her gratitude for the work done by the IAEA in supporting Member States and hoped that these programmes will in future be enhanced, as the dawn of a nuclear energy future is no longer in question.

She asked that the international community strengthen regional bodies, for example AFRA (African Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology), in terms of implementation of regional projects, and that the international community develop coherent and integrated nuclear regulatory training that will take into account the specific needs and interests of developing countries. She further identified the need for strengthening safeguards implementation and noted that the need for the Additional Protocol cannot be overemphasized. Furthermore, the international community must foster applications of nuclear energy in areas such as desalination and other process heat applications.

She emphasized that nuclear energy has to be an underpinning energy source for developing countries.

A. Dainius, Ministry of Economy of the Republic of Lithuania, on behalf of His Excellency V. Uspaskich, Minister of Economy, noted that there is a clear advantage in the development of large interconnectors, thus providing abilities to reduce investments in power reserves. With this in mind, and with having available highly skilled operators and support staff as well as infrastructure and sites, Lithuania is one of the most attractive places to locate a new nuclear power plant.

His Excellency A. Movsisyan, Minister of Energy, Armenia, noted that for Armenia the nuclear option for the supply of energy is preferable, taking into account the country’s energy security and environmental issues, as well as the existence of appropriate infrastructures, experienced personnel, and institutions for teaching and training.

His Excellency H.A. Younes, Minister for Electricity and Energy, Egypt, noted that currently Egypt is carefully studying technological developments in nuclear power, desalination designs and the performance of the nuclear reactor types and desalination systems suitable for the national requirements.

He noted that most activities in the nuclear field in Egypt have been supported by the IAEA through technical cooperation programmes. He commented that Egypt highly appreciates the continuous technical support from the IAEA and is looking forward to continue this fruitful cooperation in areas of the peaceful uses of nuclear energy.

He reminded the conference that one of the challenges to be faced is ensuring nuclear security and non-proliferation and that Egypt has strongly supported the non-proliferation system from an early stage. He indicated that in this regard President Mubarak launched in April 1990 an initiative to make
the Middle East free from weapons of mass destruction and looked for international support for this initiative.

His Excellency Le Dinh Tien, Deputy Minister, Ministry of Science and Technology, Vietnam, stated that studies show that from 2017 Vietnam will need about 2000–4000 MW(e) capacity of nuclear power. He reported what the strategy for Vietnam electricity development in the period 2004–2010, with a vision to the year 2020, which was approved in 2004, states: “To invest in the study and preparation of necessary conditions for being able to build the first nuclear power plant in Vietnam with installed capacity of about 2000 MW(e) and to put into operation after the year 2015”.

A. Kakodkar, Chairman of the Atomic Energy Commission, Department of Atomic Energy, India, reminded the conference that India has a clearly defined three stage nuclear power development programme, with stage I involving pressurized heavy water reactors, stage II fast breeder reactors and stage III thorium based reactors.

Considering India’s energy resources and projected growth in energy requirements, it is clear that nuclear energy has to play a very significant role in the later half of this century, and the country has to start preparing for it now. He indicated that to realize the growth in electricity generation, it is necessary to deploy fast breeder reactors on a large scale.
ROUND TABLE 1

WORLD ENERGY NEEDS AND RESOURCES AND ENVIRONMENTAL CHALLENGES OF THE 21ST CENTURY

Chairperson

L. ECHAVARRI
Director General, OECD/NEA

Two issues were identified to be discussed in the round table. Invited speakers first addressed the issue of world energy needs and resources and then the issue of the environmental challenges of the 21st century. The full details of the presentations are available on this CD.

This section provides some of the key comments made during the presentations and the full report of the discussions.

C. Mandil, OECD/IEA, provided a vast amount of information on the growing energy needs of the world, and the implications of alternative energy policies. He reported on IEA assessments of various energy growth scenarios, and suggested that the most extreme of these could not be sustained. He identified the growing energy needs in developing countries and indicated that this could exceed the demand from developed countries during this century, with no apparent acceptable means of providing the energy. He suggested that more vigorous policies could curb the rate of increase in energy demand and emissions significantly, but a truly sustainable energy system will call for faster technology development and deployment. He suggested that nuclear energy has to play an important role as part of the energy mix, but it is up to the industry and governments to make this happen.

P. Gadonneix, France, reminded the conference of the French choice of nuclear energy and suggested that, for France, it had proven to be a good choice. He added that it is his view that this choice will prove from the beginning of the 21st century to be an appropriate choice for many other countries in a similar situation.

M.R. Srinivasan, India, commented that certain facts about the energy situation in the world are well known. The world’s population crossed the 6 billion mark in 1999. It is estimated that the population will touch 9 billion by the middle of the century, and this increase will take place largely in developing countries. While the world average per capita electricity consumption is about 2500 kW·h/a, for OECD countries the corresponding number is about 8000 kW·h/a. This large inequality is undesirable and needs to be addressed in a manner that is sustainable from the point of view of continued availability of energy resources and burden on the environment.

He then proceeded to provide specific information with regard to India, where only 55% of households have access to electricity. Biofuels are used for cooking by 90% of rural households. By the middle of the century, India’s population, he suggested, could rise to 1.5 billion. Annual generation of 8000 TW·h (corresponding to an installed capacity of 1250–1350 GW) would provide only a little above 5000 kW·h per capita per annum. While 8000 TW·h may sound very large, in the context of India it is on the low side.

If a populous country like India expands installed electricity capacity based on coal fired plants to reach a level of per capita electricity consumption comparable with OECD countries, the effect on the environment at the local as well as at the global level could be staggering. Keeping in view the environmental consequences, it is desirable that India adopts nuclear energy on a large scale, and meets at least a quarter of its electricity requirements from nuclear power plants. This would correspond to an installed nuclear capacity of about 275 GW. Considering its large electricity requirements and modest uranium resources, India is pursuing a closed cycle approach, and started the construction of a fast reactor only a few months ago. Cooperation amongst all countries, on a bilateral basis or multilaterally facilitated by the IAEA, is desirable to ensure that nuclear power development takes place in an economical manner with due regards for safety and sustainability.

J.M.R. Stone, Canada, presented considerable detail on the effect on the environment of changes in carbon dioxide levels in the atmosphere and suggested that there is an urgency to begin to tackle this threat. He suggested that early action would likely be less costly than trying to resolve the
issue after the climate has changed and the sea levels have risen. He suggested that the time to act to decarbonize our energy systems is now, but he warned that there is no silver bullet — a portfolio of technologies is required. Nuclear energy is only one part of the solution. He indicated that, in his opinion, it is too soon to pick winners.

J. Lovelock, UK, was invited to present to the conference by video. He started with a warning that, in his opinion, global warming is so serious and so urgent because Gaia is trapped now in a vicious cycle of positive feedback. Extra heat from any source, whether from greenhouse gases, the disappearance of Arctic ice, the changing structure of the ocean surface or the destruction of tropical forests, is amplified and their combined effects are more than additive.

He reported that climate scientists are sure that when carbon dioxide in the air increases to about 400–500 parts per million, the earth crosses a threshold beyond which global heating becomes irreversible. The world is now at 380 parts per million and at the present rate of increase it could reach 400 parts per million in a shorter time than seven years. The atmosphere of the earth has been damaged and its natural ecosystems now fail to provide farmlands for our growing numbers. Every year that business continues as usual increasing harm is done. It is not the miseries of the first few skirmishes with Gaia through this century that should most concern us. It is the thought that our heedless indulgence now, if unchecked, will leave ruins for future generations. He suggested that he fears that the worst may happen and our survivors will have to adapt to a hot and uncomfortable world. To retain civilization then, they will need more than ever a secure and reliable source of energy to power the adaptation, and for this there is no sensible alternative to nuclear energy.

He suggested that to have an effect now we need something much more effective than the Kyoto agreement, although he suspected that little will be done until the catastrophes of the intensifying greenhouse becomes frequent enough to make us pull together as a global unit with a self-restraint to stop burning fossil fuel and abusing Gaia. He commented that he believes that in the meanwhile the world nuclear industry will continue to supply electricity in a safe and reliable manner and that this supply will give civilization the chance to survive through the difficult times soon to come.

P. Simola, Finland, provided arguments for a new nuclear plant unit in Finland, in that it covers partly the additional electricity demand and replaces old power plants, it enables, together with renewables, the fulfilment of the Kyoto commitments, it secures a stable and predictable electricity price and it reduces dependence on electricity imports.

C. Bataille, France, provided detailed background on the French technical and legal approach to the nuclear industry. He supported continuing research and technical development, and concluded by indicating that there must remain a major role for parliamentary decisions.

R.M. Adam, South Africa, commented that the world’s available fresh water, less than one half of one per cent of all the water on earth, is disappearing because of unsustainable practices, including agricultural production, increased industrial use, urbanization, deforestation, water diversion and solid waste disposal. He compared the issue of pollution and freshwater contamination to the issue of nuclear waste, which has a lifetime significantly longer than human life. He noted that the chance of leakages from buried waste containers/canisters is expected to increase over time, potentially creating hazardous environmental conditions. However, new technologies such as vitrification will significantly reduce this risk. He concluded that the problem of high level waste disposal is increasingly a political one as opposed to a technological one.

He suggested that it is necessary to conduct an integrated assessment in terms of energy source, environment and economics to answer the following questions: (a) What level of emissions reductions is desired? (b) What are the costs of obtaining emissions reductions by using nuclear power when compared with other methods? (c) Do any costs involved in switching to nuclear power (such as spent fuel disposal) offset any environmental gains from the displaced emissions? He related this by noting that this picture is sharpened by the consideration that hydrogen only realizes its carbon dioxide emission free potential when it is generated using hydrocarbon free sources of energy. In particular, developing nuclear power technology provides power sources that are able to catalytically crack water to produce hydrogen as a by-product of electricity production using waste heat above 950°C. Promising prototypes of such reactors are being investigated currently in South Africa, China and France.
DISCUSSION

This presents a direct report of the discussion and individual questions and responses.

N. BENDJABALLAH (Algeria): This conference is underlining the contribution which nuclear power could make to worldwide development coupled with protection of the environment, and clearly everyone should be in favour of an expansion of nuclear power generation. However, the technology of nuclear power generation is very sophisticated and there are numerous constraints which hinder the mastery of that technology. That being so, is there not a risk that promoting nuclear power will increase the gap between industrialized and developing countries? I believe that more emphasis should be placed on nuclear technology transfer to developing countries so that they may embark on the construction of nuclear power plants.

C. MANDIL (OECD/International Energy Agency): I think it should be borne in mind that in recent years nuclear power generation has been expanding mainly in developing countries. That having been said, I believe that there is a need to promote transfer to developing countries not just of nuclear technology but of all technologies necessary for reducing greenhouse gas emissions. In the case of nuclear technology, of course, it is important to avoid nuclear weapons proliferation, which means that the technology transfer must be accompanied by the application of IAEA safeguards.

P.E.J. GOVAERTS (Belgium): In his opening address the French Minister of Industry, Mr. Devedjian, said that France was aiming to reduce its carbon dioxide emissions by a factor of four by 2050. Was that statement based on a feasible scenario or on wishful thinking?

P. GADONNEIX (World Energy Council): The only scenario presented today — by Mr. Mandil — went up to 2030. We have to think about what will happen after 2030, and with a substantial expansion of nuclear power generation there could be a substantial reduction of carbon dioxide emissions, but I do not have any figures in mind.

C. MANDIL (OECD/International Energy Agency): The ultimate goal is to reduce carbon dioxide emissions almost to zero, and it is to be hoped that a target of a decrease by a factor of four in carbon dioxide emissions by 2050 is feasible.

O. GHERMAN (Romania): Great emphasis has been placed on the greenhouse effect of carbon dioxide. What about the greenhouse effect of nitrogen compounds?

J. STONE (Canada): I focused on carbon dioxide because it is the most important greenhouse gas — apart from water vapour. I could also have talked about methane, which is a stronger greenhouse gas than carbon dioxide. However, it is emitted in smaller amounts, and the concentration of methane in the atmosphere seems to be stabilized. In addition, I could have talked about nitrous oxide (N2O). However, it is associated mainly with agriculture — not with energy production.

O. GHERMAN (Romania): What can be done about our heavy dependence on petroleum as the main source of fuel for use in transport?

C. MANDIL (OECD/International Energy Agency): We are going to use petroleum based fuels in transport on a massive scale for a long time. What can we do given the fact that their use is associated with carbon dioxide emissions and the fact that in the very long term the quantity of petroleum being produced in the world will decline? We must continue our efforts to increase energy use efficiency — perhaps more in the transport sector than in any other sector. In addition, there are partial substitutes that must be borne in mind. The most immediate one, although it will not take us very far, is biofuels, which have become more competitive as a result of recent technical advances. In the long term there is hydrogen, provided it is produced without the emission of carbon dioxide — for example, by means of nuclear power or with carbon dioxide sequestration.

D.J. GONZALEZ GOMEZ (Spain): I should be interested in hearing Mr. Mandil’s opinion about the predictions of the Association for the Study of Peak Oil and Gas (ASPO).

C. MANDIL (OECD/International Energy Agency): The members of ASPO are serious people with whom we maintain a dialogue. However, for reasons that would take too long to go into now, we do not share their views. Of course, a peak in oil production — or at least in conventional oil production — will be reached one day, but we think that day will come much later than they do.

N. BOTARFA (Algeria): If an installed capacity of about 5000 GW is necessary in 2030 in order to meet the world’s total electrical energy demand, for a reduction of 30 000 million tonnes in
carbon dioxide emissions we shall need an installed nuclear capacity of about 4200 GW, as nuclear power seems to be a better economic option than, say, solar power, wind power and carbon dioxide sequestration. That being so, does Mr. Mandil believe that the world’s developing countries will be able to make a significant contribution to the attainment of the carbon dioxide emission reduction goal when their electrical energy demand accounts for 60% of the overall demand increase?

C. MANDIL (OECD/International Energy Agency): Perhaps I did not make it clear in my presentation that, in my opinion, the goal of a very substantial decrease in carbon dioxide emissions will not be achieved through the use of just one technology — be it nuclear power generation, carbon dioxide sequestration, the use of renewables or whatever. All these technologies, and others, will be needed, and all countries will have to participate to the best of their ability and in the light of their public opinion situations.

In my presentation I did not mean to imply anything about whether a country like Algeria should embark upon a nuclear power programme. If, in spite of using all currently competitive technologies, we do not succeed in reducing carbon dioxide emissions enough, the price of carbon dioxide emission permits will rise and other technologies will become competitive, and they will have to be used as well.

J. FROT (France): As a member of the organization Ecologists for Nuclear (EFN) I have made some calculations of the cost of a major expansion of nuclear power generation. Let’s assume that in 2100 the overall per capita energy consumption of the world’s population of, say, 10 000 million people will be half of the present per capita energy consumption in the OECD countries, which is about 4 tonnes of oil equivalent per annum. Then, global energy consumption in 2100 will be twice today’s figure of 10 000 million tonnes of oil equivalent.

Let’s assume that 20% of that global energy consumption is covered by renewables (including hydropower) and 40% by hydrocarbons (including coal). Then, 40% will have to be covered by nuclear power.

Let’s assume that the cost of the complete nuclear power generation cycle — minerals explorations, ore extraction and processing, fuel fabrication, reactor construction, reactor decommissioning and waste management — will be $3/W, approximately the cost (in constant US dollars) of the French nuclear power programme during the period 1974–2000. Then, the annual investment in nuclear power over the next 100 years will be less than 2% of the foreseeable global gross product — compared with 4% in the case of the French nuclear power programme during the period 1974–2000.

P. GADONNEIX (World Energy Council): Over the very long term, forecasts tend to be wrong, largely owing to unpredictable innovations. Nuclear power generation is an area where there will be innovation, but I agree with the general thrust of Mr. Frot’s analysis.

G. TSHELANE (South Africa): The issue of public acceptance has not yet been addressed at this conference. To what extent is it a central issue?

C. BATAILLE (France): Public opinion about nuclear power tends to fluctuate in line with the fluctuation of oil prices — when oil prices are low, the public tends to regard nuclear power as a diabolical energy source. I use the word ‘diabolical’ because there is a kind of religious element in the rejection of nuclear power by people who are wary about its highly technical nature.

Clearly, there must be dialogue, and we politicians should play a major role in arranging it. That is not easy in the face of irrational opposition to nuclear power. We must take account of public opinion, but we should not bow to minority groups seeking every opportunity to hamper the expansion of nuclear power. That applies especially in parliamentary democracies. In France, for example, local populations of a few thousand should not be allowed to dictate decisions affecting over 60 million people. The challenge is to organize dialogue in such a way that local public opinion is represented but not given excessive weight.

M.R. SRINIVASAN (India): I should like to offer a perspective from another part of the world. In India, the chief ministers of nearly all State governments are constantly urging the central government to authorize the construction of nuclear power plants in their respective States. They do so because they appreciate the importance of an assured electricity supply and know that India’s nuclear power plants have been operating well for long periods.
As regards public opinion in general, we have launched a public awareness campaign, inviting, for example, college teachers to visit our nuclear power plants.

There is an antinuclear movement in India, but it is not highly organized. Some university professors, including even scientists, are antinuclear, but we believe that the main reason for their opposition is resentment at not being included in the process of consultation and decision making. We need to involve them in order that they stop thinking in ‘them and us’ terms.

Our overall conclusion is that, if the product is demonstrably good, the seeds of dissent will be killed.

J. STONE (Canada): I believe that the public acceptance issue should be addressed more broadly. We should be thinking in terms of giving members of the public the information they need in order to make wise choices. The dialogue should be an informed dialogue about the level of risk that people are willing to accept. Every form of energy production has an associated risk — for example, the burning of coal is associated with air quality problems and hydrogen is a very dangerous fuel. If the public dialogue is restricted to nuclear power, it will be distorted.

P. GADONNEIX (World Energy Council): All energy sources have an environmental impact and give rise to some negative reactions. In France, as in India, there are nuclear power plants that have been operating well for long periods. The public should be made more aware of this, through the provision of objective information by independent bodies.
ROUND TABLE 2

DRIVING FACTORS FOR NUCLEAR INDUSTRY STRATEGIES AND CHOICES

AND GOVERNANCE

Chairperson

R. CIRIMELLO

Senior adviser, National Energy Commission, Argentina

In this round table invited speakers first addressed the issue of the driving factors for future nuclear industry strategies and then further invited speakers addressed the issue of governance of the nuclear industry. The full details of the presentations are available in this CD.

This section provides some of the key comments and a full report of the discussions.

S. Kondo, Japan, suggested that in the age of technological innovation the competitive operation of current design units and facilities does by no means guarantee the adoption of facilities of the same design as existing ones for their replacement or the addition of new units. In addition, he added that the deregulation of the electricity market has altered the financial landscape for utilities, which are no longer guaranteed a fixed return on investment. Therefore, he suggested that it is essential for nuclear power plant suppliers to pursue improvement of the performance of current designs incessantly if they want to win new orders for construction in tomorrow’s market. As the timeframe for actions to be taken for this purpose should continue for 30 years or so, he identified mid-term actions, which should aim at reducing capital costs, improving robustness in maintaining safety and reliability, and improving human impacts in terms of low occupational exposure and reduction in human interventions.

He suggested that it should be taken for granted in strategic planning for the future that over the long term not just new but truly radical new energy technologies will appear and address effectively the challenges of air pollution, climate change and energy supply insecurity while expanding energy service availability to all on the planet. Therefore, the goal of the long term actions of the nuclear industry should be to develop innovative nuclear energy supply systems which can compete in such new energy markets, making nuclear energy technology sustainable in terms of social acceptability as well as safety, economics and environmental protection.

A. Lauvergeon, France, commented that from the industry point of view the mission is to make these nuclear energy systems available and attractive. She suggested also that the role of States is changing in that States still are responsible for security of supply, safety and environmental policies, but that their tool is no longer the direct control of a national utility; it comes through carefully drafted regulations.

She stated that she hoped that improved economics is the first reason for the renewed interest in nuclear energy, before the climate change factor. Technology is one part, but the answer is also in services. Here again, she indicated that the industry is bringing innovative solutions. She stressed that what she is calling for here is a level playing field. She noted that nuclear energy is carbon dioxide free and commented that it would be only fair that all carbon dioxide free energies should be treated in the same way, adding that although this seems obvious, it is not the case today. She gave as an example that the Clean Development Mechanism of the Kyoto Protocol offers the potential of a win–win solution: it brings benefits to the receiving countries and at the same time offers a complementary action path to developed countries. She asked that in the second round of the Kyoto implementation mechanisms, nuclear energy be restored as an acceptable technology.

K.P. Lau, USA, provided the view that for a successful revival of the nuclear industry we have to address the economic issue, as well as technological, environmental and proliferation concerns, to win over investors and the confidence of the general public.

He concluded by reminding the conference that the USA is supporting the expansion of nuclear power under the leadership of President Bush. He suggested that this level of support provides credibility to the initiative, enabling others within the government and industry to confidently proceed with planning.
J.B. Ritch, World Nuclear Association, commented that ten years ago the phrase “nuclear renaissance” conveyed only a cautious hope within a narrow community of dedicated professionals. Today, he stated that the rebirth of nuclear energy has become an unmistakable reality that is gathering speed and momentum on the full world stage. He indicated that in countries representing the preponderance of world economic activity and world population — from North America across much of Europe to the Russian Federation and on to the leading countries of South and East Asia — the value of nuclear power has been reviewed and reaffirmed. Major countries without nuclear power — such as Poland, Turkey and Vietnam — stand on the threshold of introducing nuclear energy for the first time, and even Italy, the one nation ever to suspend nuclear generation, now plans to reconsider.

He stated that humankind cannot conceivably achieve a global clean energy revolution without a huge expansion of nuclear power — to generate electricity, to produce hydrogen for tomorrow’s vehicles and to desalinate sea water in response to the world’s rapidly emerging freshwater crisis — and proposed that a comprehensive global regime to move beyond Kyoto is necessary, and that nuclear investment should be elevated to a national and international policy priority.

He emphasized that the goal is not to subsidize long term nuclear operations but simply to accelerate the nuclear renaissance for reasons of national interest and the global environment. He proposed that governments must now direct the World Bank and the United Nations Development and Environment Programmes to act in pursuit of a clean energy vision in which nuclear power holds a central role.

M.D. Maillard, France, introduced the second issue and suggested that there needs to be a dual role for governments. He suggested that these should be to guarantee what the market alone cannot guarantee and to protect and reconcile competitiveness and sustainable development mechanisms.

A.C.O. Barroso, Brazil, suggested that nuclear industry governance has to be discussed at the global level for at least three good reasons: accident consequences can have cross-border implications; proliferation and nuclear weapons reduction are international issues; and nuclear power cannot achieve its full potential without international cooperation and cycle integration.

He noted that the world has an increasingly complex and ever changing society in which States remain important actors, but where the actions of non-State actors and even global civil society movements have emerged as major forces. Therefore, he suggested that steering these forces, and coordinating the actions of multiple actors, is a considerable challenge for any global organization, even for those of the United Nations system, that to some extent has legitimacy to hold forums and steer discussions among the representatives of the major players.

He suggested that it is important to notice that governance of the nuclear industry is inherently participatory, since the situation is such that the most desired outcomes cannot be achieved by one organization or country operating alone, and also that the decision making process and/or outcomes have to be partially shared with others.

He noted that he was inspired by the pillars of the IAEA to state that the main purpose of nuclear industry governance is: “nuclear power for sustainable development under the guidance and constraints of safety and non-proliferation”. He thought that it would not be very difficult to get a consensus on this statement, but an exponential degree of difficulty appears as soon as one tries to go down the line of detailing what is meant by and what are the practical implications of this statement.

He suggested that with proper international collaboration, agreements and conventions a globally optimized multitier cycle could be feasible with the following attributes: (a) an optimal match between economies and resource conservation performance; (b) optimal, sensible material flow logistics; (c) an increased market size; and (d) significant improved safety and non-proliferation characteristics.

P.E. Juhn, Republic of Korea, noted that in addition to electricity production, the world needed to consider other energy issues, and in particular both production of fresh water and development of a hydrogen economy. He noted that the continuation of today’s policies will not be sufficient, owing to the limitation of resources, and this will provide one of the main challenges for institutional and infrastructure development in the future.

J. Ronaky, Hungary, noted the contrast between globalization and national responsibility and recognized that this is a major challenge to be met in the development of the nuclear industry. He referred to the informal cooperation of the regulators of four Central European countries, the Czech
Republic, Hungary, Slovakia and Slovenia, in which former bilateral cooperation agreements were developed in an efficient regional cooperation forum.

**A. Vidal-Quadras Roca, European Parliament**, noted that energy dependency on imports, controlling carbon dioxide emissions and financing decommissioning are major issues to be addressed on the international stage, but without interfering with the competences of individual nations or interfering with already existing international cooperation agreements.

He suggested that for the European Union (EU) the adoption of the proposals for directives on safety and radioactive waste management would continue to encourage the use of good practices in the nuclear sector while bringing a greater degree of transparency to the nuclear sector, contributing to a buildup of public confidence and establishing the basis for an objective non-emotional public debate on the future of nuclear energy.

**DISCUSSION**

This presents a direct report of the discussion and individual questions and responses.

**A. DJALOEIS (Indonesia):** I should like to see at future conferences of this kind more time allotted to general discussion in which all conference participants can join and thereby provide feedback.

My country is a developing country with a population of over 220 million that is still growing. It has hydrocarbon resources, but we believe that they should not be used only for energy production — that they should also be put to high value added uses such as the production of chemicals. We, therefore, need nuclear power in order to enjoy the benefits of electricity at an affordable price.

That being so, I would be interested in hearing the views of Mr. Ritch and other round table speakers about the following: how to efficiently address public concerns regarding nuclear power; how to establish a decision making process that will ensure that appropriate policies and strategies for a sustainable nuclear power programme are adopted; how to accelerate the development of the necessary scientific–technical, industrial and regulatory infrastructures; and how to obtain assistance in overcoming the financial and legal problems.

**J.B. RITCH (World Nuclear Association):** That enumeration of tasks facing the government of any country wishing to embark on nuclear power generation underscores a point which I made just now — namely, that there is a need to re-orient major international development institutions such as the World Bank and the United Nations Development Programme. In my view, the principal donor countries supporting those institutions should be pushing, and large developing countries like Indonesia should be pulling, in an effort to bring about a change of course in favour of the ‘clean energy revolution’. The World Nuclear Association stands ready to assist them in that effort.

**A. LAUVERGEON (France):** I agree with Mr. Ritch — the major international development institutions are still reluctant about supporting an expansion of nuclear power generation.

France is cooperating with a number of other countries in the nuclear power field, not only through the construction of reactors but also through the provision of safety and security related services and of training. Also, it is making the political authorities in developing countries aware of what is happening in other countries, in order to assist them in their decision making based on national concerns.

**R. CIRIMELLO (Argentina):** My country embarked on the development of a nuclear power programme in the 1950s, and the process of establishing the necessary infrastructures was a lengthy one. It is possible for a country to accelerate that process by learning from the experiences of other countries, much of which is reflected in documents published by the IAEA.

**A.C.O. BARROSO (Brazil):** Each country is entitled to choose its path to nuclear power, and in my view that path need not include the establishment of infrastructures as elaborate as those of countries like Argentina and Brazil, which wish to be international suppliers of nuclear power technology.

**Y. SOKOLOV (IAEA):** At the IAEA we consider that developing countries wishing to cross the nuclear power generation threshold must take at least the following steps: carry out an energy planning exercise that takes account of their real energy needs and their available resources, an exercise for
which the IAEA provides tools that have already been used by over 30 Member States; and establish the necessary regulatory and other infrastructures, which Member States can do with assistance provided through the IAEA’s Technical Cooperation Programme.

Knowledge sharing is very important in this connection, and the IAEA’s INPRO, in which 22 Member States are now participating, is a good example of knowledge sharing by technology holders and technology users.

S. SOENTONO (Indonesia): Ms. Lauvergeon referred in her presentation to the fact that nuclear power is not included in the Kyoto Protocol Clean Development Mechanism. I believe that it should be included.

A. LAUVERGEON (France): It should definitely be included. We cannot effectively combat climate change without large scale nuclear power.

J.B. RITCH (World Nuclear Association): In my view, the exclusion of nuclear power from the Clean Development Mechanism is symptomatic of what is wrong with the international process whereby climate change is being addressed — many of those involved in that process have an antinuclear bias.

The Clean Development Mechanism is part of a structure that is at present completely inadequate. Nuclear power should be included in it, and the major international development institutions should be persuaded to support the use of nuclear power.

Mr. Sokolov just mentioned the assistance provided by the IAEA with energy planning and the establishment of necessary infrastructures. Just imagine if the IAEA were part of a team of United Nations institutions offering both technical expertise and large scale financial support for nuclear power development. At present, unfortunately, we have compartmentalization — with some institutions virtually at war with others. The international community is fiddling while the Earth is warming.

E.A. JÖRLE (Sweden): As Director of Public Communication at the Swedish Nuclear Power Inspectorate, I could not help noticing that there has been a lot of talk at this conference about the benefits of nuclear power but very little about its vulnerability. It is absolutely certain that somewhere in the world a nuclear accident is at present waiting to happen, as a result of, say, a crack in a pipe or negligence on the part of an operator, but here people are talking as if nuclear accidents belong to a past age. We need to talk to the public about nuclear accidents not only after one has occurred but also before.

R. KONDO (Japan): You are right. That is a point which I make when talking with operators and regulators.

D. MAILLARD (France): I don’t think we have been displaying foolish optimism about the safety of nuclear power at this conference — the importance of nuclear safety culture has been strongly emphasized.

The nuclear industry has in recent years done more than any comparable industry to improve safety and increase transparency in the safety area, but that does not guarantee that no nuclear accidents will occur in the future. However, the risk is very low, as is the risk in air transport, and many participants in this conference have come to Paris by air and will return home by air. Certainly the risk of a nuclear accident is no reason for renouncing nuclear power, and I am amazed that nuclear power has been excluded from the Kyoto Protocol Clean Development Mechanism. In my view, its exclusion was due to the fact that the general public has not been provided with the information necessary in order to dispel the misconceptions about nuclear power.

A. LAUVERGEON (France): We in the nuclear industry are very conscious of the risks associated with nuclear power generation and take nothing for granted. That is the essence of nuclear safety culture.

When we design a reactor like the EPR, we draw on the experience of 50 years, and we even take into account the possibility of, for example, an aircraft crashing into the reactor. Our aim is to propose intrinsically safer and safer solutions, based on evolution rather than revolution. We believe in continuity and do not take ill considered risks.

A. VIDAL-QUADRAS ROCA (European Parliament): I believe that public confidence in nuclear power in Europe would be increased if the nuclear power issue were addressed within a
European framework, with a European regulatory regime based on European directives relating to nuclear safety and radioactive waste management.

E.A. JÖRLE (Sweden): My country has been rather reluctant about addressing issues within a European framework, perhaps because the EU countries of northern Europe have less confidence in the EU than those of southern Europe.

A. MOLIN (Austria): Nothing has been said here about regional cooperation in the area of emergency preparedness — something that is particularly important in regions such as central Europe, where there are many small countries.

I. RONAKY (Hungary): Some time ago the IAEA launched a project on the harmonization of emergency preparedness in central and eastern Europe, but I do not know whether Austria is participating in that project.

A. MOLIN (Austria): How does one reconcile the realities of liberalized energy markets with the need for long term planning in a stable environment without violating the rules of fair competition?

A. LAUVERGEON (France): When energy market liberalization began, many people believed that nuclear power would not be able to compete with other energy sources. Today we see that it can compete with all other energy sources, including fossil fuels, and that, for example, on Wall Street those electricity utilities which operate nuclear power plants have a better listing than those which do not, partly because there is less long term uncertainty about costs in the case of nuclear power.

L. XINGWANA (South Africa): As South Africa’s Deputy Minister for Minerals and Energy and a member of the South African Parliament, I believe that, in developing countries, parliamentarians could play an important role in informing the general public about nuclear power. Of course, in order to do so they would first have to inform themselves, and I believe that one way in which they could familiarize themselves with the issues involved in nuclear power generation would be to discuss them with European parliamentarians.

In speaking to the general public about nuclear power, we should, in my view, draw attention to success stories like the approximately 20 year accident free operation of South Africa’s Koeberg nuclear power station.

Although South Africa has been engaged in nuclear power generation for some time, it still needs international assistance with training, and the training needs of developing countries that have still to embark on nuclear power generation are at least as great.

TURKI BIN SAUD BIN MOHAMMED AL-SAUD (Saudi Arabia): I should like to draw attention to some concerns of my country — and of many other developing countries — regarding the utilization of nuclear energy. We are concerned about: the credibility of the nuclear non-proliferation regime, which we believe should be completely non-discriminatory; the absence of an international regime for monitoring nuclear installations in general; nuclear activities which are not totally transparent and not under international supervision, some being completely ignored by the IAEA; the export of nuclear waste to developing countries that are being used as dumping grounds; and discrimination among countries as regards participation in nuclear fuel cycle activities.

J. SHIER (Canada): I should like to emphasize the readiness of organized workers in the nuclear industry to participate in the public debate about the future of nuclear power. We look forward to the construction of many more nuclear power plants.

O. GHERMAN (Romania): Attending this conference, held in Paris, I am reminded that Madame de Pompadour, a favourite of Louis XV of France, is believed to have said “Après nous le déluge”. That has not been the motto of this conference, where there has been very strong emphasis on the role of nuclear power in sustainable development. I am very grateful to the French Government for hosting this conference.

D. MAILLARD (France): I thank Mr. Gherman for that comment, as some people say that nuclear power has no part to play in sustainable development. Nuclear power may not be the ideal energy source that humankind will be using in 200 to 300 years time, but it is unquestionably the energy source that can enable humankind to make the transition.
CONFERENCE CLOSURE

P. Devedjian, Minister of Industry, France, as Conference President, closed the conference by thanking the organizers and participants. He provided a comprehensive overview of the conference proceedings and presented the Final Statement, which had been prepared for him to reflect the broad convergence of views expressed at the conference by the vast majority of participants. Mr. Devedjian’s presentation and the Final Statement are provided in full later on the CD.
Conférence « Énergie nucléaire pour le 21ème siècle »

Discours d’ouverture

de M. Patrick DEVEDJIAN,
ministre délégué à
l’Industrie
Lundi 21 mars 2005

Messieurs les Ministres,
Monsieur le Directeur Général de l’Agence Internationale pour l’Énergie Atomique,
Mesdames, Messieurs,

C’est avec un grand plaisir que je vous accueille ici, aux côtés de Monsieur Mohammed EL BARADEI, directeur général de l’Agence internationale de l’Énergie atomique – AIEA. Monsieur Donald J.JOHNSTON, Secrétaire général de l’Organisation de Coopération et de Développement économiques – OCDE ne peut malheureusement pas être parmi nous aujourd’hui, mais nous aurons l’occasion d’écouter le message qu’il souhaitait nous communiquer.

Je suis heureux d’accueillir aujourd’hui 28 ministres, et au total des délégations de 74 États représentant toutes les régions du monde ainsi que 10 organisations internationales, pour une conférence à laquelle j’attache une importance particulière.

En effet, si l’initiative de cette conférence revient à l’AIEA et reçoit également le soutien de l’OCDE par son Agence pour l’Énergie nucléaire - l’AEN, ce n’est pas un hasard si la France a souhaité accueillir cette conférence et si elle a été choisie comme pays hôte.

Ce n’est pas un hasard car, vous le savez, la France a de longue date fait le choix de recourir à l’énergie nucléaire et depuis ces dernières années, nous avons entrepris une réflexion approfondie afin de préparer notre politique énergétique pour les prochaines décennies, dans la perspective d’une arrivée en fin de vie d’une grande partie de notre parc électronucléaire entre 2020 et 2040. J’y reviendrai plus en détail.

Mais bien entendu, au-delà de notre pays, les questions énergétiques présentent un enjeu essentiel pour l’humanité. Nous en sommes tous conscients comme en témoigne votre présence nombreuse aujourd’hui dans le cadre de cette conférence.
I. Permettez-moi d’évoquer brièvement les enjeux de cette conférence

1/ D’abord, je dois rappeler que nous vivons, en ce tournant de siècle, une évolution majeure du contexte énergétique

- D’une part, l’évolution démographique de la planète, le développement économique particulièrement marqué en Asie, impliquent une progression durable des besoins énergétiques. Et nous savons que les ressources d’origine fossile ne permettront pas indéfiniment de répondre à ces besoins : il faut trouver des modes de production énergétique qui permettent de diversifier les sources d’approvisionnement en matières premières.

- D’autre part, une préoccupation majeure est apparue au cours des dernières années, le réchauffement climatique dû aux émissions de gaz à effet de serre par les sources d’énergies fossiles.

Il me paraît essentiel, alors que de nombreux pays souhaitent pouvoir disposer d’une production d’énergie suffisante et économe et doivent éventuellement faire face à une réduction programmée de leurs capacités nucléaires, que nous puissions échanger nos réflexions, nos préoccupations et bien sûr nous faire l’écho de celles de nos compatriotes.

2. Il ne s’agit pas ici de faire la promotion d’une énergie nucléaire qui répondrait à l’ensemble des besoins, quelles que soient les régions du monde, mais plutôt d’un exercice de réévaluation de la place qui pourrait revenir à cette source d’énergie

La confrontation internationale d’expériences, les débats d’experts peuvent nous aider dans notre mission. Je souhaite que la France soit présente dans les forums où se débattent ces questions essentielles, et que nous le fassions de manière démocratique et transparente.

C’est bien l’objectif de cette conférence internationale qui se déroulera aujourd’hui et demain et au cours de laquelle alterneront des présentations, exposant la façon dont chaque pays aborde cette question, et des tables rondes d’experts internationaux dont les débats ont vocation à enrichir nos réflexions.

Car notre responsabilité est lourde et la problématique complexe. Certes, il nous revient d’assurer, pour nos pays, la mise à disposition d’une énergie en quantité suffisante et cela, à un horizon de 10 ans, 20 ans, voire 50 ans.

Nous avons la volonté de faire en sorte que cette énergie soit accessible à tous et que son prix ne constitue pas une entrave à la croissance de nos économies.

Nous savons que, dans ce but, il est indispensable qu’elle soit produite et puisse être offerte au moindre coût et que celui-ci soit le plus stable possible.

Mais notre responsabilité ne s’arrête pas à nos frontières. Tout d’abord parce que la libéralisation des marchés de l’énergie, pour lesquels les équilibres entre offre et demande doivent être trouvés, pose de nouvelles problématiques.

Mais aussi parce que les externalités liées à la production d’énergie, au premier rang desquelles les émissions de gaz à effet de serre, transcendent nos frontières.

Une première table ronde rassemblant des experts reconnus dans les domaines de l’énergie et du nucléaire viendra débattre de ces questions, cet après-midi.

Il s’agira ici de faire un état de la situation énergétique mondiale, de dessiner le cadre dans lequel la définition des stratégies énergétiques doit s’inscrire.
- dans une première partie, sera dressé un bilan des ressources et des besoins énergétiques –actuels et futurs- mondiaux,

- la seconde partie sera consacrée à l’analyse des grands défis environnementaux liés à l’énergie, qu’il s’agisse du changement climatique ou de la problématique, spécifique à l’énergie nucléaire, de la gestion des déchets radioactifs.

3. Si, pour nombre de pays, le nucléaire constitue une réponse à la problématique énergétique, celle-ci n’est pas la seule, ou tout du moins, il ne saurait répondre seul aux défis posés
Certaines énergies – dites énergies renouvelables - sont inépuisables, et il convient d’exploiter au mieux leur potentiel. 
Il convient également de poursuivre les recherches dans tous les domaines permettant de produire une énergie, et notamment de l’électricité, sans émettre de gaz à effets de serre. Enfin, concernant l’utilisation de l’énergie nucléaire, il convient de définir le cadre le plus adapté dans lequel elle peut s’inscrire. Les enjeux en termes de sûreté et de sécurité sont essentiels et doivent être maîtrisés. 
Par ailleurs, au regard des autres sources d’énergie, le coût global de production de l’énergie nucléaire est compétitif, la structure de ce coût est tout à fait particulière, impliquant des charges d’investissement élevées, et nécessitant la prévision, au cours de la vie des centrales, des charges dites de long termes, c’est-à-dire celles qui sont liées au démantèlement des installations et à la gestion des déchets radioactifs. 
Ainsi, demain matin, une seconde table ronde sera dédiée à un débat sur des stratégies pour une exploitation optimale du potentiel que présente l’énergie nucléaire tenant compte certes de ses atouts, mais également des contraintes qui lui sont attachées :

- tout d’abord, seront examinés les facteurs structurants des choix énergétiques, qu’il s’agisse de facteurs économiques, stratégiques ou sociaux ; l’intérêt et le cadre de la coopération internationale seront également analysés,

- enfin, un dernier débat permettra de discuter des moyens à mettre en œuvre pour assurer une utilisation du nucléaire dans des conditions optimales : il s’agira de définir le cadre indispensable et notamment le rôle de l’État et des organisations internationales pour asseoir un développement sûr et pérenne du nucléaire.

*          *

II. Je voudrais maintenant dire quelques mots sur la politique énergétique et la place du nucléaire en France
Notre pays est peu doté en ressources énergétiques naturelles. Sa vulnérabilité s’est manifestée avec acuité lors des chocs pétroliers des années 70, nous amenant à engager un programme nucléaire important. 
1/ Depuis trente années, la politique énergétique française est animée par quatre grandes préoccupations

- la sécurité d’approvisionnement, à court ou moyen terme, de façon à éviter toute rupture qui serait préjudiciable à la santé, au bien-être et à l’économie.
en matière d’électricité.

- le respect de l’environnement : il s’agit de combattre et de minimiser les dommages causés à l’environnement par la production et l’utilisation de l’énergie, avec des objectifs au moins aussi ambitieux que ceux fixés par la Commission européenne à l’horizon 2010 (émissions de CO₂, couche d’ozone, énergies renouvelables, etc.) ; alors que la France s’engage à rester d’ici 2010 au niveau des émissions de 1990 et à les diviser d’un facteur 4 d’ici 2050.

- la solidarité entre territoires et envers les personnes démunies.

Le programme nucléaire, engagé au cours des années 70, se traduit aujourd’hui par une place prépondérante du nucléaire dans la production d’électricité (78%) laissant cependant une part non négligeable à l’hydraulique (12%).
Il nous permet aujourd’hui de bénéficier :
- d’un taux d’indépendance énergétique de 50%, alors il s’élevait à 26% en 1973,
- d’une facture énergétique représentant 1,8% de notre produit intérieur brut versus 5% en 1981.

Enfin, le recours au nucléaire nous a permis d’éviter en 2004 la production de 36 Millions de tonne de carbone représentant un tiers de notre production annuelle. Pour nous, le nucléaire peut jouer un rôle essentiel dans un développement durable de l’énergie sous trois conditions sur lesquelles nous sommes vigilants : d’abord qu’un haut niveau de sûreté continue d’être maintenu par les industriels, ensuite que des solutions sûres et pérennes soient définies pour tous les types de déchets radioactifs et enfin que l’information et la participation du public soient assurées.

En Europe, l’énergie nucléaire, qui produit 33% de l’électricité, permet d’éviter une émission de gaz à effet de serre équivalente aux émissions de l’ensemble du parc automobile européen ! Au niveau mondial, le nucléaire existant permet déjà l’économie de 2,2 Milliards de tonnes de CO₂, comparés aux 24 milliards d’émissions totales. C’est plus de 2 fois la réduction demandée aux pays développés par le protocole de Kyoto pour la période 2008-2012.

2/ Notre parc de réacteurs est encore jeune (en moyenne 19 ans). Cependant, nous devons préparer l’avenir.
Dans ce but, nous avons lancé un débat national sur l’énergie en 2003, dont l’une des conclusions est le rôle central du nucléaire dans le bouquet énergétique français. Notre objectif a donc été de calibrer au mieux ce bouquet entre les énergies nouvelles, le nucléaire et les innovations technologiques attendues pour nous permettre de répondre, en interne, à l’échéance de 2020 pour le renouvellement de notre parc de production électrique.
Au printemps 2004, lors de la discussion du projet de loi d’orientation sur l’énergie, le Gouvernement français a proposé quatre axes d’orientations prioritaires et indissociables :

- relance de la maîtrise de l’énergie, avec des objectifs de baisse de l’intensité énergétique de -2% par an dès 2015 et -2,5% d’ici 2030, et, au-delà du respect du Protocole de Kyoto, de division par quatre des émissions de CO₂ de la France d’ici 2050;
- maintien de l’option nucléaire ouverte avec le lancement du réacteur nucléaire franco-allemand EPR (European Pressurized water Reactor) ;

- développement des énergies renouvelables, telles que les éoliennes ou les biocarburants.

- relance de la recherche sur les nouvelles technologies de l’énergie.

En complément à ce projet de loi, le Plan « Climat », publié en juillet 2004 par le gouvernement français dans le cadre de ses engagements de lutte contre l’effet de serre, regroupe des mesures dans tous les secteurs de l’économie et de la vie des ménages, en vue d’économiser près de 15 millions de tonnes d’équivalent carbone par an à l’horizon 2010. Une grande part de ces mesures concerne l’énergie qui représente en France environ 80% des émissions.

Afin de disposer de tous les éléments permettant de faire un choix éclairé pour préparer l’échéance 2020, la France a donc choisi de construire un réacteur démonstrateur de 3ème génération, l’EPR, dont la mise en service est prévue à l’horizon 2012.

Mais nous devons préparer l’avenir à plus long terme encore. La France participe ainsi au Forum International Génération IV qui vise à développer des systèmes nucléaires du futur qui pourraient être disponibles à l’horizon 2040, et au programme de fusion ITER qui s’inscrit à un horizon encore plus lointain dans le siècle.

Par ailleurs, nous accompagnons nos choix sur l’énergie nucléaire d’une réflexion plus large sur les conditions devant encadrer son développement.

Des réponses doivent notamment être apportées aux questions concernant la gestion de l’aval du cycle pour les déchets produits par les centrales existantes et a fortiori pour le maintien d’une option nucléaire ouverte à l’échéance du renouvellement du parc de production électrique actuel. C’est d’ailleurs une préoccupation forte pour les Français. Nous savons en effet que 28% d’entre eux estiment que « la production et le stockage de déchets radioactifs est l’inconvénient principal du choix du nucléaire ».

Dans ce domaine, la France a fait le choix du traitement et du recyclage du combustible usé. Ce choix s’inscrit dans une stratégie de développement durable. Il permet en effet de séparer les produits tels que le plutonium et l’uranium, dotés d’un potentiel énergétique considérable, du reste des déchets : cette technologie permet ainsi d’économiser de la matière première et de diminuer la quantité de déchets ultimes. Elle présente en outre un intérêt en termes de non-prolifération en réutilisant le plutonium résultant du passage en réacteur du combustible.

Nous nous sommes par ailleurs attachés à définir des solutions de gestion pour les déchets radioactifs de haute activité à vie longue.

Grâce à l’initiative de Monsieur BATAILLE, la France s’est engagée dans un vaste processus prescrit par la loi de 1991, connue sous le nom de « Loi Bataille ». Ce chantier va conduire le gouvernement à présenter en 2006 au Parlement les résultats de quinze années d’efforts alliant recherche scientifique et concertation démocratique. Je voudrais remercier Monsieur BATAILLE d’avoir permis à la France de s’atteler à cette difficile et longue tâche, suffisamment tôt pour que les décisions puissent être prises dans les meilleures conditions.

Par ailleurs, la France s’est dotée d’un cadre administratif et réglementaire qui lui permet d’atteindre, dans le domaine du nucléaire tout particulièrement, un très haut niveau de sûreté et de radioprotection.

Ce résultat est le fruit d’une réflexion continue, à la fois au niveau national et dans un cadre international. Ce processus nous a notamment amenés à redéfinir le statut et les missions de notre autorité de sûreté nucléaire, en 2002. Il justifie le soutien que nous avons apporté à
l’initiative lancée par Mme de PALACIO en 2002 également, visant à doter l’Union européenne d’instruments juridiques contraignants pour arriver à une harmonisation à la hausse du niveau de sûreté nucléaire.

Notre volonté de mettre à profit notre expérience, notamment dans le domaine de la sûreté nucléaire, nous a amené à développer nombre de coopérations bilatérales avec des pays souhaitant développer une industrie nucléaire civile. Sur ce dernier point, la France est particulièrement attachée à la définition d’un cadre clair et rigoureux permettant de répondre aux objectifs de non prolifération.

Pour notre pays, seuls les États qui ont accepté de placer leur secteur nucléaire intégralement sous le contrôle de l’Agence de Vienne et se conformant strictement à leurs engagements internationaux en matière de non-prolifération nucléaire, peuvent bénéficier des technologies nucléaires et développer cette énergie.

Notre pays souhaite échanger avec tous ceux qui le veulent, dans une attitude ouverte, sur les défis de l’énergie qui attendent notre siècle. J’espère que cette conférence en sera l’illustration et qu’elle nous permettra à tous d’avancer dans notre réflexion sur la place du nucléaire au 21 ème siècle.

Je passe maintenant passer la parole à M. Mohammed EL BARADEI, directeur général de l’AIEA.

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Nuclear Power for the 21st Century Conference

Opening speech
by Mr. Patrick Devedjian,
Minister Delegate for Industry
Monday, 21 March 2005

Mr. Ministers,
Mr. Director General of the International Atomic Energy Agency,
Ladies and Gentlemen,

Mr. Mohamed El Baradei, Director General of the International Atomic Energy Agency - the IAEA - and I take great pleasure in welcoming you here today.
Mr. Donald J. Johnston, Secretary-General of the OECD Nuclear Energy Agency, was unfortunately unable to be with us today but we will have an opportunity to hear his message to us.
I am pleased to welcome 28 ministers, 74 delegations from countries representing every region of the world and 10 international organizations for this particularly important conference.
It is no accident that France wanted and was selected to host this conference, organized at the initiative of the IAEA with the support of the OECD Nuclear Energy Agency (NEA).
As you know, France opted many years ago for nuclear power. Most of France's nuclear power plants will reach the end of their life between 2020 and 2040. In recent years, France has therefore conducted an in-depth review to prepare its energy policy for the decades ahead. I will come back to this in greater detail.
Looking beyond the French borders, energy issues are obviously a critical concern for the entire human race. We are all aware of this, as witness the presence of so many stakeholders.

I. I would like to begin by giving a rapid overview of the issues of this conference
1/ First, our energy environment has changed significantly at the dawn of the new century

- The global demographic trend and the strong economic growth in Asia are accompanied by a durable increase in energy needs. We know that fossil energy resources will not meet these needs indefinitely. We need to find energy production methods allowing us to diversify our sources of raw materials.

- A major concern has emerged in recent years, the global warming caused by the greenhouse gas emissions from fossil energy sources.
At a time when many countries want adequate, inexpensive energy production sources and may have to cope with programmed cuts in nuclear capacity, I consider it essential for us to be able to exchange our views and concerns and of course to express the sentiment of our fellow citizens.

2. The idea here is not to promote nuclear energy for all needs in all areas of the world but rather to review the role of this source of energy

The comparison of experiences and discussions between experts from different countries can help us accomplish this. I want France to participate in all forums where these key issues are discussed and I want such discussions to be democratic and transparent.

This is the objective of the international conference held today and tomorrow, during which country presentations on national solutions alternate with roundtables of international experts, whose debates are intended to enrich our review.

We shoulder a heavy responsibility and the issue is complex. It is our duty to make sure our countries have enough energy for the next 10 to 20 or even 50 years.

We want this energy to be accessible for everyone at a price which does not hamper economic growth.

As you know, this means that it must be produced and supplied at minimum cost with maximum stability.

But our responsibility does not stop at our borders. This is partly because the liberalization of the energy markets - for which a balance must be found between supply and demand - raises new problems.

But it is also because the externalities connected with energy production, particularly greenhouse gas emissions, transcend our borders.

A first roundtable of renowned energy and nuclear power experts will discuss these issues this afternoon.

The idea is to take stock of the global energy situation and to outline the framework within which to implement energy strategies:

- first, the roundtable will take stock of existing and future global energy resources and needs,

- next, discussions will focus on analysis of major environmental issues connected with energy, including climate change and the nuclear-specific problem of radioactive waste management.

3. While nuclear power is an answer to the energy problem for many countries, it is not the only one and it certainly cannot take care of all issues

Certain energies – known as renewable energies - are inexhaustible and need to be exploited to their maximum potential.

We must also continue research in all areas permitting the production of energy, particularly electricity, without greenhouse gas emissions. Lastly, we need to develop the most appropriate framework for the use of nuclear power. Safety and security are vital issues and need to be controlled.

The total production cost of nuclear power is competitive compared with other sources of energy. This cost has a particular structure, characterized by a high initial investment and so-called long-term charges - i.e. decommissioning and radioactive waste management charges - which need to be factored in throughout the working life of power plants.

A second roundtable will meet tomorrow morning to discuss a strategy for optimizing the use of our nuclear potential. This roundtable will not only look at strengths but also at constraints:
- first, it will examine the structural factors involved in energy choices - including economic, strategy and social factors - and analyze the interest and framework of international cooperation,

- the final debate will focus on the resources required to ensure optimum use of nuclear power. The objective is to outline an essential framework, particularly the role of the State and international organizations in providing strong foundations for the sustainable development of safe nuclear power.

* * *

II. I would now like to say a few words about France's energy policy and the role of nuclear power in France

France has limited natural energy sources. Its vulnerability became acutely obvious during the oil shocks in the seventies, which prompted it to embark on a major nuclear program. 

1/ During the last thirty years, France's energy policy has been driven by four main concerns

- supply security in the short and medium term in order to avoid breakdowns with a negative impact on health, well-being and the economy.

- competitive cost of energy for businesses and private citizens. The General Directorate for Energy and Raw Materials at the Ministry of the Economy, Finance and Industry regularly publishes a comparative analysis of power production costs. The most recent study dates from 2004 and shows that nuclear power is the least expensive source of electricity for France.

- environmental protection: the purpose is to combat and minimise environmental damage caused by the production and use of energy, pursuing objectives which are at least as ambitious as those set by the European Commission for 2010 (CO₂ emissions, ozone layer, renewable energies, etc.); France is committed to keeping emissions at the 1990 level until 2010 and to divide them by four out to 2050.

- solidarity between regions and towards the poor

Thanks to the nuclear program launched in the seventies, nuclear power now accounts for the lion's share of power production (78%), followed by hydro power, which accounts for a significant 12%.

This has generated the following benefits:

- an energy independence rate of 50%, up from 26% in 1973,
- an energy bill representing 1.8% of France's gross domestic product, down from 5% in 1981.

In 2004, the use of nuclear power allowed France to save 36 million tonnes of carbon, or one-third of annual carbon emissions. France believes that nuclear power can play a key role in sustainable energy development provided we pay close attention to three conditions. First, industrial operators need to continue to maintain a high level of safety. Secondly, safe long-term storage solutions must be worked out for all types of radioactive waste. And thirdly, the public must be informed and allowed to contribute input.

In Europe, nuclear power accounts for 33% of total electricity production. The greenhouse gas emissions avoided this way correspond to the emissions of the entire European car population! Worldwide, the existing nuclear power base already lowers CO₂ emissions by 2.2 billion tonnes, compared with total emissions of 24 billion tonnes. This is twice the reduction
which the Kyoto Protocol requires from the developed countries by 2008 and 2012 at the latest.

2/ France's installed base of nuclear reactors is still young (on average 19 years old). However, we need to prepare for the future

As part of initiatives to prepare ourselves for the future, we launched a national energy debate in 2003, which concluded inter alia that nuclear power plays a key role in the French energy mix. Our objective is therefore to optimize the balance between new energies, nuclear power and technological innovations in order to be prepared for 2020, the year when we will have to start replacing our installed base of nuclear power plants.

When the new energy bill was discussed in the spring of 2004, the French government proposed four indissociable priorities:

- Rekindling energy control efforts in order to reduce energy intensity by 2% per year until 2015 and by 2.5% out to 2030 and - going beyond compliance with the Kyoto Protocol - to divide France's CO₂ emissions by four by 2050;

- Keeping the nuclear option open with the launch of the European Pressurized water Reactor (EPR), a joint French-German project;

- Developing renewable energies such as wind energy and biofuels;

- Breathing new life in research into new energy technologies.

In addition to this bill the “Climate Plan”, published in July 2004 by the French Government as part of its commitments in the fight against greenhouse gas emissions, contains measures for all economic sectors and for households in order to save almost 15 million tonnes of carbon equivalent a year out to 2010. Most of these measures target energy, which accounts for about 80% of emissions in France.

France has therefore decided to build a 3rd-generation demonstration reactor, the EPR, in order to obtain the data needed to base preparations for the 2020 deadline on an informed choice. This reactor is scheduled to be commissioned in 2012.

But we need to prepare for an even remoter future. France is therefore a member of the Generation IV International Forum set up to develop future nuclear systems which could be available by 2040, and participates in ITER, a project with an even further horizon set up to explore controlled thermonuclear fusion.

France further supports its nuclear energy choices with a broader analysis of the conditions under which nuclear power must be developed.

We will particularly need to find answers to the nuclear waste management problems raised by existing power plants, especially to keep the nuclear option open when the time comes to replace the installed base of power plants. Indeed, this is a major concern for the French, 28% of whom feel that "the production and disposal of radioactive waste is the main drawback of nuclear power".

In this area, France has opted for processing and recycling spent nuclear fuel as part of its sustainable development strategy. This process makes it possible to separate such high-activity products as plutonium and uranium from other waste. Thus, this technology allows us to save raw materials and to diminish the quantity of final waste. Another advantage is that it helps fight proliferation by recycling the plutonium left after the fuel has passed through the reactor.

France is moreover committed to finding management solutions for high-level long-lived radioactive waste.
France is reviewing its entire nuclear strategy under the so-called Bataille Act, adopted in 1991 at Mr. Bataille's initiative. As part of this process, the government will present Parliament in 2006 with the combined results of fifteen years of scientific research and democratic dialogue. I want to thank Mr. Bataille for having given France an opportunity to carry out this **arduous and lengthy task** early enough to permit decisions to be taken on optimum conditions.

France has moreover adopted an administrative and regulatory framework allowing it to achieve, particularly in the area of nuclear power, a **very high level of safety and radiation protection**.

This result reflects **ongoing, concerted analysis** at both national and international level. As part of this process, we redefined the **status and missions** of our Nuclear Safety Authority in 2002, and supported the initiative taken that same year by Mrs. de Palacio to provide the European Union with **binding legal instruments** to align nuclear safety levels with the highest standard.

Our will to make the most of our experience, particularly in the area of nuclear safety, has prompted us to forge **bilateral cooperation programs** with many countries wishing to develop a civilian nuclear industry. In this context, France considers it extremely important to work out a **clear and strict framework to prevent proliferation**.

France offers its nuclear technologies and the possibility to use this energy only to those countries which have agreed to put their nuclear sector **entirely** under the control of the Vienna Agency and to comply **strictly** with their international nuclear non-proliferation commitments.

France wishes to **discuss the energy challenges** ahead with anyone who wants to do so in a spirit of frank and open exchange. I hope that this conference will set an example and will allow all of us to improve our understanding of the role of nuclear power in the 21st century. I would now like to give the floor to Mr. Mohamed El Baradei, Director General of the IAEA.

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ÉNERGIE NUCLÉAIRE : PRÉPARER L’AVENIR

Conférence ministérielle internationale
« L’énergie nucléaire pour le XXIᵉ siècle »
Paris, 21 mars 2005

Mohamed ElBaradei
Directeur général

AGENCE INTERNATIONALE DE L’ENERGIE ATOMIQUE
ÉNERGIE NUCLÉAIRE : PRÉPARER L’AVENIR

Je suis très heureux d’intervenir à l’occasion de cette conférence sur l’énergie nucléaire pour le XXIᵉ siècle. Aujourd’hui, je vais aborder certains aspects des perspectives mondiales, en pleine évolution, pour l’électronucléaire. Tous les indicateurs montrent que des questions telles que la forte croissance de la demande énergétique, la sécurité de l’approvisionnement en énergie et le risque de changement climatique sont de plus en plus au centre des préoccupations, ce qui incite certains milieux à réfléchir à l’opportunité d’accroître les investissements dans l’électronucléaire.

Les décisions qui seront prises à l’issue de ce débat auront des implications à long terme et nécessitent une programmation sur plusieurs décennies au moins. Ce matin, je voudrais examiner brièvement la situation actuelle et insister plus particulièrement sur les facteurs qui, à mon avis, détermineront dans une large mesure la part de l’électronucléaire dans le futur bouquet énergétique mondial.

LE DÉSÉQUILIBRE ÉNERGÉTIQUE MONDIAL

Dans un premier temps, je souhaiterais replacer ces questions dans leur contexte, à savoir le déséquilibre énergétique mondial que l’on peut observer aujourd’hui. Un récent voyage au Ghana et au Nigeria m’en a fait une nouvelle fois prendre conscience. Au Ghana, la consommation d’électricité annuelle par habitant ne s’élève qu’à 300 kW/h environ. Au Nigeria, elle est plus proche de 70 kW/h, ce qui équivaut à une disponibilité moyenne de 8 W (moins que la consommation d’une ampoule électrique ordinaire) pour chaque citoyen nigérian. En comparaison, la France consomme plus de 7 300 kW/h par an et par habitant, soit un rapport de 1 à 100.

La disponibilité inégale de l’énergie dans les pays développés et dans les pays en développement a des incidences majeures. Si l’on songe aux objectifs du millénaire pour le développement qui ont été proposés il y a tout juste cinq ans, tels que l’éradication de l’extrême pauvreté et de la faim, l’accès à l’eau potable pour tous et l’amélioration des soins de santé, on ne peut que se rendre à l’évidence : la capacité de la communauté internationale à atteindre ces objectifs dépendra en grande partie de la disponibilité de l’énergie en général et de l’électricité en particulier.

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Il existe une corrélation directe entre la diversité des situations en matière d’approvisionnement énergétique et les disparités de niveaux de vie, lesquelles entraînent à leur tour une inégalité des chances et des perspectives d’avenir et conduisent, selon mon analyse, au climat de désespoir et d’insécurité à l’origine des tensions qui agitent de nombreuses régions du monde en développement. Ici, à Paris, dans la « Ville Lumière », on aurait tendance à oublier qu’à travers le monde, environ 1,6 milliard de personnes, selon les estimations, n’ont pas accès aux services énergétiques modernes. Toutefois, à l’orée de ce nouveau siècle, le progrès implique d’abord de raccorder au réseau ceux qui ne le sont pas.

**FORTE CROISSANCE ATTENDUE DE LA DEMANDE D’ÉNERGIE**

Dans ce contexte, tout débat sur le secteur énergétique au XXIᵉ siècle doit commencer par prendre acte de la forte croissance de la demande d’énergie attendue dans les décennies à venir. Cette anticipation repose sur trois facteurs : l’aspiration à une amélioration des niveaux de vie dans les pays en développement, à laquelle j’ai déjà fait allusion, l’accroissement continu de la population et la multiplication des produits de consommation et des technologies qui, certes, améliorent la qualité de la vie mais sont aussi plus gourmands en énergie.

Laissez-moi illustrer mon propos : si le monde en développement rattrapait le taux de consommation énergétique mondial moyen (équivalent environ à la moitié du taux de consommation observé dans les pays d’Europe de l’Est), cela se traduirait par une augmentation nette de 35 % de la consommation mondiale d’énergie. Si l’on tient compte de l’accroissement de la population prévu d’ici 2020, cette augmentation serait même de 60 %. Il n’est donc pas surprenant que les estimations les plus prudentes prévoient au minimum une multiplication par deux de la consommation d’énergie d’ici 2050.

**SITUATION ACTUELLE : UN INTÉRÊT CROISSANT POUR L’ELECTRONUCLEAIRE**

Il est bien sûr difficile de déterminer quel rôle l’électronucléaire sera amené à jouer pour faire face à cette augmentation de la demande. Reste que si les perspectives actuelles sont toujours mitigées, il est incontestable que les espoirs placés dans l’électronucléaire vont croissant. La Chine envisage ainsi de faire passer sa capacité totale de production d’électricité
nucléaire de 6,5 GW à 36 GW d’ici à 2020. L’Inde prévoit de décupler la capacité de son parc nucléaire d’ici 2022 et de la centupler d’ici à 2050. La Fédération de Russie compte passer d’une production de 22 GW à une production comprise entre 40 et 45 GW d’ici à 2020.

Ailleurs, les projets sont plus modestes mais il n’en reste pas moins évident que la filière électronucléaire est de nouveau envisagée comme une option sérieuse. Le démarrage de la construction du réacteur Olkiluoto-3 en Finlande, vers la fin de l’année, marquera la première construction de centrale nucléaire en Europe de l’Ouest depuis 1991. Par ailleurs, Électricité de France a récemment choisi Flamanville comme site d’un réacteur EPR, dont la construction devrait débuter en 2007.

Une disponibilité améliorée, une sûreté accrue, une performance économique en progression

L’accroissement des capacités de production d’électricité nucléaire au cours de la dernière décennie est attribué pour une large part non pas à la construction de nouvelles centrales mais à l’amélioration de la disponibilité des centrales existantes, que l’on doit directement aux progrès réalisés en termes de sûreté à travers le monde. Il est important de comprendre cette tendance pour bien appréhender la situation actuelle.

L’accident de Tchernobyl, en 1986, a conduit à la création de l’Association mondiale des exploitants nucléaires (WANO) et bouleversé l’approche de l’AIEA en matière de sûreté des installations. Les deux organismes ont constitué des réseaux en vue d’effectuer des examens par les pairs, comparer les pratiques et échanger des données d’exploitation essentielles pour l’amélioration de la sûreté. L’AIEA a actualisé ses normes de sûreté afin de refléter les meilleures pratiques du secteur et instauré des normes contraignantes sous la forme de conventions internationales de sûreté. En outre, une analyse plus systématique des risques a été instaurée pour garantir que les modifications apportées l’étaient dans les domaines où le gain, en termes de sûreté, serait optimal.

Bien que ces initiatives internationales aient été axées sur l’amélioration de la sûreté, indirectement, elles ont aussi permis un accroissement continu de la disponibilité et de la productivité des installations nucléaires, même s’il est vrai que ces dernières ont également été favorisées par l’optimisation de la gestion et de la maintenance préventive ainsi que par les progrès techniques. Au final, les installations nucléaires d’ores et déjà exploitées de manière
rationnelle ont encore acquis de la valeur. Si l’investissement initial dans une centrale nucléaire reste élevé, les coûts d’exploitation sont désormais relativement faibles et stables. Ces progrès en matière de sûreté et de performance économique ont été déterminants dans la décision de prolonger les autorisations des centrales situées aux États-Unis et ailleurs et suscitent un regain d’intérêt pour la construction de nouvelles centrales.

Toutefois, il est évident que tous les pays ne sont pas d’avis que l’amélioration de la performance économique et de la sûreté justifie une relance de l’électronucléaire. Ici même, en Europe de l’Ouest, quatre pays ont adopté des politiques de sortie du nucléaire, tandis que d’autres se sont prononcés contre le recours à cette forme d’énergie. La construction de nouvelles centrales nucléaires reste la solution la plus intéressante dans les pays et les régions où la demande énergétique connaît une forte croissance, où les ressources alternatives sont limitées, où la sécurité d’approvisionnement en énergie est une priorité et où la contribution de l’électronucléaire à la réduction de la pollution atmosphérique et des émissions de gaz à effet de serre est importante.

QUESTIONS CRUCIALES POUR L’AVENIR


Émissions de carbone et croissance de la demande

Premier facteur : la priorité plus ou moins grande que la communauté internationale continuera d’accorder à la limitation des émissions de gaz à effet de serre et à la réduction du risque de changement climatique. Le recours massif aux combustibles fossiles pour faire face à la croissance prévue de la demande énergétique, que j’ai déjà évoquée, pourrait avoir des incidences extrêmement négatives sur l’environnement.

L’électronucléaire ne produit quasiment pas de gaz à effet de serre. La filière complète de production d’électricité nucléaire, de l’extraction de l’uranium au stockage définitif des
déchets, en passant par la construction des réacteurs et des installations, ne rejette que 2 à 6 grammes d'équivalent carbone par kilowattheure. Cette valeur est à peu près similaire à celle des énergies solaire et éolienne et est inférieure de un à deux ordres de grandeur à celles qui sont enregistrées pour le charbon, le pétrole et le gaz naturel. A l’échelle mondiale, si les centrales nucléaires actuellement en service étaient fermées et remplacées par un panachage de sources d’énergie non nucléaires, dans les mêmes proportions qu’aujourd’hui, les émissions annuelles de carbone augmenteraient de 600 millions de tonnes, soit environ le double des émissions qui devraient être évitées grâce au Protocole de Kyoto à l’horizon 2010.

L’électronucléaire ne devrait pas être considéré comme un concurrent des sources d’énergie dites renouvelables, comme l’éolien, le solaire et les centrales géothermiques. Mais le problème, c’est qu’aucune source d’énergie « renouvelable » n’a démontré sa capacité à fournir, en base, une quantité d’énergie suffisante pour pouvoir prétendre se substituer au grandes centrales fonctionnant avec des combustibles fossiles.

**Sécurité d’approvisionnement**

Deuxième facteur : la priorité accordée par plusieurs pays à la sécurité de l’approvisionnement énergétique. Le Livre vert de janvier 2004 sur la sécurité de l’approvisionnement énergétique de l’Europe a estimé que, si rien n’était fait, la dépendance vis-à-vis de l’énergie importée passerait des 50 % actuels à 70 % d’ici à 2030. C’est une préoccupation du même ordre qui a conduit l’Europe et l’Amérique du Nord à investir dans l’électronucléaire lors de la crise pétrolière des années 70. L’abondance de ressources en uranium dans un pays ou une région donnés ne constitue nullement une pré-condition pour s’assurer de la sécurité d’approvisionnement en énergie nucléaire, étant donné la diversité des producteurs stables d’uranium à travers le monde et la faible quantité d’espace requise pour le stockage de réserves de long terme en combustible nucléaire.

**Influence des perceptions et des idées fausses de l’opinion publique sur les choix nationaux**

Troisième facteur : l’influence exercée sur les choix énergétiques d’un pays par les perceptions de l’opinion publique, notamment quant aux risques. Depuis longtemps, l’électronucléaire suscite des sentiments d’inquiétude et des préoccupations concernant la sûreté et les déchets. L’accident tragique de Tchernobyl en 1986 a porté un rude coup à la
réputation de la filière, dont elle ne s’est jamais complètement relevée. Les médias et l’opinion publique ont eu tendance à faire l’amalgame entre les caractéristiques de conception du réacteur de Tchernobyl et celles des centaines d’autres types de réacteurs en exploitation dans le monde. Pour notre part, nous avons insuffisamment communiqué sur la vaste panoplie de mesures mises en place depuis Tchernobyl pour empêcher qu’un autre accident nucléaire grave ne se produise.

Il importe que les acteurs du nucléaire fassent tout ce qu’il est possible de faire pour mettre à disposition des informations intelligibles et précises sur le sujet afin de garantir que les risques et les avantages de la technologie nucléaire soient clairement perçus, sans partis pris. Dans ce cadre, l’AEIA effectue des évaluations comparatives de la situation de ses États membres dans le domaine de l’énergie et s’efforce de développer leurs capacités en matière d’analyse et de planification énergétiques.

**Capacité de répondre aux préoccupations fondamentales en matière de sûreté, de stockage des déchets et de sécurité**

Autre facteur extrêmement important, et sur lequel les acteurs du nucléaire ont une certaine prise : la capacité de l’industrie nucléaire à répondre aux principales préoccupations suscitées par cette forme d’énergie, à savoir la sûreté, le stockage des déchets et, plus récemment, la sécurité.

**Sûreté nucléaire**

Ainsi que je l’ai déjà indiqué, le développement de solides réseaux internationaux en matière de sûreté nucléaire au cours des deux dernières décennies a porté ses fruits, et j’affirme sans hésiter que la sûreté nucléaire s’est améliorée de manière significative. Mais nous ne pouvons nous endormir sur nos lauriers. Au moment où la technologie nucléaire s’étend à de nouveaux pays, où de nouvelles conceptions de réacteurs sont élaborées et mises en œuvre et où les autorisations de centrales existantes sont prolongées, il est essentiel que les normes de sûreté, les pratiques d’exploitation et la surveillance réglementaire actuelles soient adaptées – et, dans certains cas, rendues plus exigeantes – afin de garantir le maintien de niveaux de sûreté suffisants.
En termes de mise en œuvre effective, la gestion et le stockage définitif du combustible nucléaire usé continuent de représenter un véritable défi pour le secteur nucléaire. Si l’on compare le volume réel de combustibles nucléaires usés produit chaque année dans le monde – 12 000 tonnes – aux 25 milliards de tonnes de déchets de carbone, provenant des combustibles fossiles, rejetés directement dans l’atmosphère chaque année, le volume de déchets nucléaires paraît relativement modeste. Par ailleurs, la plupart des obstacles technologiques au stockage définitif ou au retraitement du combustible usé sont d’ores et déjà levés. Malgré cela, il y tout lieu de s’attendre que l’opinion publique reste sceptique – et que la question du stockage des déchets nucléaires reste controversée – tant que les premiers dépôts géologiques ne seront pas entrés en exploitation et que les technologies de stockage n’auront pas fait la pleine démonstration de leur efficacité.

À cet égard, les progrès les plus significatifs en matière de stockage géologique profond ont été réalisés par la Finlande, la Suède et les États-Unis. Le gouvernement et le parlement finlandais ont donné leur aval à la décision « de principe » de construire un site de stockage définitif du combustible usé près d’Olkiluoto. La construction devrait débuter en 2011 et la mise en service intervenir en 2020. Aux États-Unis, le Président et le Congrès ont approuvé en 2002 le choix du site de stockage de Yucca Mountain, dont l’entrée en fonction est prévue aux alentours de 2012.

Je préconise depuis un certain temps de réfléchir à une approche multinationale de la gestion et du stockage du combustible usé. En effet, plus de 50 pays ont du combustible nucléaire usé (y compris du combustible provenant de réacteurs de recherche) entreposé sur des sites provisoires, en attente de stockage ou de retraitement. Tous les pays ne disposent pas de la configuration géologique adéquate pour stocker des déchets dans le sous-sol et, pour de nombreux pays disposant de programmes électronucléaires de faible envergure, les coûts de ces installations seraient prohibitifs.

**Sécurité nucléaire**

La question de la sécurité nucléaire a elle aussi gagné en importance au cours de ces dernières années. Les attentats terroristes de septembre 2001 aux États-Unis ont logiquement
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entrainé une réévaluation de la sécurité dans tous les secteurs industriels, dont celui de l’électronucléaire. L’étendue et le volume des activités relevant de la sécurité nucléaire, que ce soit au niveau national ou international, se sont considérablement développés ; depuis deux ans, le personnel de l’AIEA s’emploie sur chaque continent à aider les pays à mieux contrôler leurs matières nucléaires et leurs sources de rayonnements, protéger leurs installations nucléaires et renforcer leurs contrôles aux frontières. Dans ce domaine également, la communauté internationale réalise des progrès satisfaisants. Même si beaucoup reste à faire, les installations nucléaires du monde entier ont renforcé leurs équipes de sécurité, ajouté des barrières de protection et pris d’autres mesures à la hauteur des risques et des vulnérabilités actuels en matière de sécurité.

**Innovations en matière de technologie et de politique énergétique**

Enfin, ne l’oublions pas, la part future du nucléaire dans le bouquet énergétique mondial dépendra pour beaucoup des innovations, en l’occurrence de la mise au point de nouvelles conceptions de réacteur et de nouvelles technologies du cycle du combustible. Afin d’être couronnées de succès, ces technologies innovantes devront répondre aux préoccupations liées à la sûreté nucléaire, à la prolifération et à la production de déchets, tout en permettant de produire de l’électricité à des prix compétitifs.

Les réacteurs de faible ou moyenne puissance permettent d’étaler davantage dans le temps les investissements, et sont mieux adaptés à la capacité du réseau dans les pays en développement, ainsi qu’aux différentes applications (chauffage urbain et dessalement d’eau de mer, par exemple) et aux différents contextes industriels. Ces réacteurs présentent un intérêt tout particulier pour un grand nombre de nos États membres situés dans le monde en développement, et ont pour cette raison toujours constitué un axe important des travaux de notre agence.

Plusieurs projets sont en passe d’être mis en œuvre un peu partout dans le monde. La Fédération de Russie dispose d’ores et déjà d’un concept ayant reçu une autorisation et prêt à être construit : le KLT-40, réacteur flottant de 60 MW pouvant être transporté par barge, tire parti de l’expérience acquise par la Russie en matière de brise-glace à propulsion nucléaire et de sous-marins nucléaires, et peut également être utilisé pour le chauffage urbain. La République de Corée a décidé de construire d’ici à 2008 un pilote de démonstration, à
l’échelle 1:5, de son réacteur à eau sous pression SMART d’une puissance de 330 MW, comprenant également une démonstration de l’unité de dessalement. Par ailleurs, l’Afrique du Sud a récemment approuvé le financement initial nécessaire au développement d’une unité de démonstration du réacteur modulaire à lit de boulets (PBMR) de 168 MW refroidi au gaz, dont la mise en service est prévue aux alentours de 2010.

CONCLUSION

S’il est difficile de prédire avec certitude ce que le XXIᵉ siècle réserve à l’électronucléaire, il est en revanche assez aisé de cerner les facteurs qui auront une influence sur son avenir. J’espère que nous aurons l’occasion, au cours de cette conférence, de réfléchir à la façon dont chacun de ces facteurs doit être traité afin de faire en sorte que l’énergie nucléaire demeure pour longtemps une source d’énergie sûre et respectueuse de l’environnement.
NUCLEAR POWER: PREPARING FOR THE FUTURE

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Director General

CHECK AGAINST DELIVERY

INTERNATIONAL ATOMIC ENERGY AGENCY
NUCLEAR POWER: PREPARING FOR THE FUTURE

It is a pleasure for me to address this conference on nuclear power for the 21st Century. Today I will discuss a few aspects of the evolving global scenario for nuclear power. All indicators show that an increased level of emphasis on subjects such as fast growing energy demands, security of energy supply, and the risk of climate change are driving a re-consideration, in some quarters, of the need for greater investment in nuclear power.

The decisions that emerge from this debate will have long range implications, and require a degree of planning that looks at least several decades into the future. This morning I would like to offer a brief review of the current picture, and to outline a number of issues that, in my view, will be crucial in determining the contribution of nuclear power to the future global energy mix.

THE GLOBAL ENERGY IMBALANCE

But I would like to begin by placing these topics in context — the context of our current global energy imbalance. I was personally reminded of this imbalance on a recent trip to Ghana and Nigeria. Per capita electricity consumption in Ghana is only about 300 kilowatt-hours per year, and in Nigeria it’s closer to 70 kilowatt-hours per year. That translates to an average availability of 8 watts — less than a normal light bulb — for each Nigerian citizen.

Contrast that with France, where per capita consumption is over 7300 kilowatt-hours per year — a factor of 100 times greater — slightly less than the OECD average of 8000 kilowatt hours per year, and well below the consumption rates, for example, in Scandinavian countries.

The imbalance in energy availability in developed versus developing countries is a matter of great impact. When we consider the Millennium Development Goals proposed just five years ago — such as the eradication of poverty and hunger, universal access to fresh water, and improved health care — it is quickly evident that the availability of energy overall, and electricity in particular, is central to our ability as an international community to deliver on each of those goals.
The disparity in energy supply is directly related to the disparity in standards of living, which in turn creates disparities in opportunity and hope — and, I would contend, leads to the sort of despair and insecurity that give rise to tensions in many regions of the developing world. Here, in the “City of Light”, it might be easy to forget the common estimate that approximately 1.6 billion people around the world lack access to modern energy services; but as we look to the century that lies before us, “connecting the unconnected” will be a key to progress.

THE EXPECTED SUBSTANTIAL GROWTH IN ENERGY DEMAND

Given this context, any discussion of the energy sector in the 21st century must begin by acknowledging the expected substantial growth in energy demand in the coming decades. This expectation is based on three factors: the drive to raise living standards in the developing world to which I have already alluded, continued population growth, and the never-ceasing expansion in consumer products and technologies that increase the quality of life but consume additional energy.

Let me illustrate. If the developing world were raised to the global average energy consumption rate — about half the standard of Eastern Europe — the net result would be a 35% increase in global energy use. If we account for the population growth predicted by 2020, the net increase would be 60%. So it should be no surprise that even the most conservative estimates predict at least a doubling of energy usage by mid-century.

THE CURRENT PICTURE: AN EMERGING FOCUS ON NUCLEAR POWER

What remains unclear, of course, is what role nuclear energy will play in meeting this increased demand. While the current outlook remains mixed, there is clearly a sense of rising expectations for nuclear power. The near term projections released in 2004 by both the IAEA and the OECD International Energy Agency are markedly different from those of just four years ago. The IAEA’s low projection — based on the most conservative assumptions — predicts 427 gigawatts of global nuclear capacity in 2020, the equivalent of 127 more 1000 megawatt nuclear plants than previous projections.

This change of expectation is rooted in specific plans and actions in a number of countries to expand nuclear power. The new expectations regarding nuclear power, particularly over the longer term, have also been strengthened by the entry into force of the Kyoto Protocol. In the past, the virtual absence of restrictions or taxes on greenhouse gas
emissions has meant that nuclear power's advantage — of low emissions — has had no tangible economic value. The widespread, coordinated emission restrictions of the Kyoto Protocol will likely change that over the longer term.

New Construction

China plans to raise its total installed nuclear electricity generating capacity from the current 6.5 gigawatts to 36 gigawatts by 2020. India plans to expand its nuclear capacity 10-fold by 2022, and 100-fold by mid-century. The Russian Federation plans to raise its nuclear capacity from the current 22 gigawatts to 40–45 gigawatts by 2020.

Elsewhere, plans remain more moderate, but it is clear that nuclear energy is regaining stature as a serious option. When Finland pours the concrete for Olkiluoto-3 later this year, it will be the first new nuclear construction in Western Europe since 1991 — and Electricité de France has recently selected Flamanville as the site of a European Pressurized Water Reactor, with construction set for 2007. The new European Union accession countries, as well as other Eastern European countries with nuclear power, have expressed a determination to retain and expand the nuclear option. Even in Poland, where nuclear development was halted by Parliamentary decision in 1990, the Council of Ministers earlier this year approved a draft energy policy that explicitly includes nuclear power.

In the United States, the Nuclear Regulatory Commission by the end of last year had approved 30 extensions of nuclear plant licences of 20 years each. To date, about three quarters of the USA’s 104 nuclear power plants have applied or stated their intention to apply for licence extensions. The US Department of Energy has also approved financial assistance to two industry consortia for nuclear power plant licensing demonstration projects, which would make new nuclear construction in the USA a near-term possibility.

Increased Availability, Sustained Safety Performance, Improved Economics

Much of the increase in nuclear generating capacity over the past decade has been credited not to new construction, but to the increased availability of existing plants — a change tied directly to improvements in global safety performance. To understand the current picture, it is important to understand this trend.

The accident at Chernobyl in 1986 prompted the creation of the World Association of Nuclear Operators (WANO), and revolutionized the IAEA approach to nuclear power plant safety. Both organizations created networks to conduct peer reviews, compare safety
practices, and exchange vital operating information to improve safety performance. The IAEA updated its body of safety standards to reflect best industry practices, and put in place legally binding norms in the form of international safety conventions. And a more systematic analysis of risk has been used to ensure that changes made were in areas that would bring the greatest safety return.

Although the focus of this international effort was on improving safety, the secondary benefit was a steady increase in nuclear plant availability and productivity — an increase also supported by improved management, better preventive maintenance practices and technological enhancements. In 1990, nuclear plants on average were generating electricity 71% of the time. As of 2003, that figure stood at 81% — an improvement in productivity equal to adding more than 25 new 1000 megawatt nuclear plants — all at relatively minimal cost.

The result is that existing well-run nuclear power plants have become increasingly valuable assets. Although the initial capital cost of a nuclear plant is high, the operating costs have become relatively low and stable. These improvements to safety and economics have not escaped the notice of investors. They have been a strong factor in decisions to extend the licences of existing plants in the United States and elsewhere, and they are providing impetus for renewed consideration of new nuclear construction.

Clearly, however, not every country shares the view that improved economics and safety performance warrant a revival of nuclear power. For example, here in Western Europe, four countries — Belgium, Germany, the Netherlands and Sweden — currently have nuclear phase-out policies in place; and a number of others, including Austria, Denmark and Ireland, have stated policies against nuclear power. This divergence of opinion is to be expected; each country and region faces a different set of variables when choosing its energy strategy, and energy decisions cannot be made on a “one-size-fits-all” basis.

New nuclear power plants remain the most attractive in countries and regions where energy demand growth is rapid, alternative resources are scarce, energy supply security is a priority, and nuclear power is important for reducing air pollution and greenhouse gas emissions.
SHAPING THE FUTURE: CRITICAL ISSUES

Overall, the current picture remains mixed, and projections for the future of nuclear power vary widely depending on what assumptions are made. In my view, the primary value of these projections is that they highlight the factors that will influence the future of nuclear power. I would like to examine a few such issues.

Carbon Emissions and the Growth in Demand

The first issue is the degree to which global attention remains focused on limiting greenhouse gas emissions and reducing the risk of climate change. With the projected growth in energy demand I have already mentioned, the degree to which fossil fuels are tapped to meet this demand could have a major negative environmental impact.

Nuclear power emits virtually no greenhouse gases. The complete nuclear power chain, from uranium mining to waste disposal, and including reactor and facility construction, emits only 2–6 grams of carbon per kilowatt-hour. This is about the same as wind and solar power, and one to two orders of magnitude below coal, oil and even natural gas. Worldwide, if the existing nuclear power plants were shut down and replaced with a mix of non-nuclear sources proportionate to what now exists, the result would be an increase of 600 million tonnes of carbon per year. That is approximately twice the total amount that we estimate will be avoided by the Kyoto Protocol in 2010.

Nuclear should not be viewed as being in competition with ‘renewable’ sources of energy, such as wind, solar and geothermal plants. In fact, nuclear energy is not in competition, per se, with any technology. But with the reduction of carbon emissions becoming a top priority, both nuclear and these renewable sources could have much larger roles to play. The problem is that no ‘renewable’ source has been demonstrated to have the capacity to provide the ‘baseload’ amounts of power needed to replace large fossil fuel plants. Wind power, for example, may be an excellent choice for sparsely populated rural economies, particularly if they lack modern electrical infrastructure; on the other hand, it seems unlikely that wind power will be able to support the electricity needs of tomorrow’s mega-cities.
Security of Supply

A second factor is the current emphasis for many countries on ensuring the security of energy supply. The January 2004 Green Paper on Europe’s supply security estimated that business-as-usual would increase dependency on imported energy from its current 50% to about 70% in 2030. A similar concern drove nuclear power investment in Europe and North America during the oil crisis of the 1970s. Large uranium resources in a given country or region are not a necessary pre-condition for nuclear energy security, given the diverse global roster of stable uranium producers, and the small storage space required for a long term nuclear fuel supply.

Public Perceptions and Misconceptions: shaping national choices

A third factor concerns the influence that public perceptions — including perceptions of risk — have on a country’s energy choices. Nuclear energy has long been marked by feelings of unease and concerns about safety and waste. Nuclear power was dealt a heavy blow by the tragedy of the 1986 Chernobyl accident (a blow from which the reputation of the nuclear industry has never fully recovered). Little distinction has been made, in the media or in public understanding, between the design characteristics of the Chernobyl reactor and the hundreds of other reactors in operation around the world — nor have we properly publicized the array of measures put in place since Chernobyl to offset the possibility of another severe nuclear accident.

The failure of the nuclear community — both scientists and technical experts, operators and regulators — to effectively ‘market’ the strength of nuclear power in comparison with other sources, has contributed to a lack of public understanding regarding risks and benefits of nuclear energy. Common misconceptions can be of great influence in shaping public acceptance of nuclear power. How a given nation balances the risk of a nuclear accident against other factors — such as air pollution, dammed rivers, mining accidents, or dependency on foreign fuel supplies — is already a matter of complexity and legitimate debate. It is important for the nuclear community to make every effort to provide comprehensible, accurate information to support that debate, to ensure that the risks and benefits of nuclear technology are clearly and fairly understood.
Performance in Addressing Key Concerns: safety, waste disposal and security

An extremely important factor — and one over which the nuclear community has some degree of control — is the ongoing performance of the nuclear industry in addressing key concerns related to nuclear power: namely, safety, waste disposal and, more recently, security.

Nuclear Safety

As I have already mentioned, the development of strong international nuclear safety networks over the past two decades has paid off, and I feel confident in saying that nuclear safety has significantly improved. But we should not rest on our laurels. As nuclear power technology continues to spread to new countries, as new reactor designs are developed and put to use, and as the licences of existing plants are extended, it is essential that existing safety standards, operational practices and regulatory oversight are adapted — and in some cases strengthened — to ensure acceptable levels of safety into the future.

Management and Disposal of Spent Nuclear Fuel

In terms of actual implementation, the management and disposal of spent nuclear fuel remains a challenge for the nuclear power industry. When the actual amount of spent nuclear fuel produced globally every year — 12 000 tonnes — is contrasted with the 25 billion tonnes of carbon waste released directly into the atmosphere every year from fossil fuels, the amount of nuclear waste seems relatively small. In addition, most technological hurdles to spent fuel disposal or reprocessing have already been solved. But public opinion will likely remain skeptical — and nuclear waste disposal will likely remain controversial — until the first geological repositories are operational and the disposal technologies fully demonstrated.

In this regard, the greatest progress on deep geological disposal has been made in Finland, Sweden and the USA. Finland’s Government and Parliament have approved a decision ‘in principle’ to build a final repository for spent fuel near Olkiluoto. Construction should start in 2011 and operation in 2020. Sweden has begun detailed geological investigations at two candidate sites, and hopes to make a final site proposal by about 2007. In the US, the President and Congress in 2002 approved proceeding with the disposal site at Yucca Mountain, where operations are planned to begin by about 2012.
For some time, I have been advocating the consideration of multinational approaches to spent fuel management and disposal. More than 50 countries have spent nuclear fuel, including fuel from research reactors, stored in temporary sites, awaiting disposal or reprocessing. Not all countries have the right geology to store waste underground and, for many countries with small nuclear programmes, the costs of such a facility would be prohibitive.

**Nuclear Security**

Nuclear security has also gained importance in recent years. The September 2001 terrorist attacks in the United States naturally led to the re-evaluation of security in every industrial sector, including nuclear power. Both national and international nuclear security activities have greatly expanded in scope and volume; in the past two years, we in the IAEA have worked on every continent to help countries better control their nuclear material and radiological sources, protect their nuclear facilities and strengthen border controls. Here, too, the international community is making good progress; while much remains to be done, nuclear installations around the world have strengthened security forces, added protective barriers, and taken other measures commensurate with current security risks and vulnerabilities.

**Technological and Policy Innovation**

Last but by no means least, the future contribution of nuclear power will be greatly impacted by innovation — the development of new reactor and fuel cycle technologies. To be successful, these innovative technologies should address concerns related to nuclear safety, proliferation and waste generation — and must be able to generate electricity at competitive prices. From a technical standpoint, this implies a greater reliance on passive safety features, enhanced control of nuclear materials through new fuel configurations, and design features that allow reduced construction times and lower operating costs. And the innovation must be more than purely technical: policy approaches must be put in place that enable reliable construction schedules, licensing review procedures, and other factors affecting cost and consumer confidence.

As I have already said, when considering energy options, a “one-size-fits-all” approach is not feasible. For example, during a recent trip to India I noted that, of the nine Indian nuclear power plants currently under construction, seven fall within the Agency’s
definition of small and medium-sized reactors. Four are “small” (less than 300 megawatts), and three are “medium-sized” (between 300 and 700 megawatts).

Small and medium-sized reactors allow a more incremental investment, provide a better match to grid capacity in developing countries, and are more easily adapted to a broad range of industrial settings and applications – such as district heating and seawater desalination. They are of particular interest to many of our developing country Member States, and have thus been a consistent focus of Agency work.

Several projects around the world are moving towards implementation. The Russian Federation already has a licensed design available for construction: the KLT-40, a 60 megawatt reactor design that can be floated and transported by barge, takes advantage of Russian experience with nuclear powered ice-breakers and submarines, and can also be used for district heating. The Republic of Korea has decided to construct by 2008 a one-fifth-scale demonstration plant of its 330 megawatt SMART pressurized water reactor, which will also include a demonstration desalination facility. And South Africa recently approved initial funding for developing a demonstration unit of the 168 megawatt gas cooled Pebble Bed Modular Reactor (PBMR), due to be commissioned around 2010.

IAEA ENERGY ASSESSMENTS AND TECHNOLOGY TRANSFER

One of the IAEA’s lesser known contributions to energy development is our effort to build our Member States capacities for national energy analysis and energy planning. The Agency helps developing countries – and economies in transition – to build their energy planning capabilities with respect to all three aspects of sustainable development – economic, environmental and social. We develop and transfer planning models tailored to their special circumstances. We transfer the latest data on technologies, resources and economics. We train local experts. We help with the analysis of national options for meeting energy demands. And we help to establish the continuing local planning expertise. IAEA energy planning tools are now used in more than 100 countries around the world.

Our energy assessment models treat all energy supply options equally. Each country or region faces a different array of resources, alternatives and priorities when choosing its energy strategy. For some rural poor, the best promise may be that offered by off-grid renewables. But there is also a persistent migration around the world to cities, and for the urban poor and the needs of growing mega-cities the energy mix needs to include large centralized power generation to match large centralized power demand.
CONCLUSION

While it is difficult to predict with any confidence what the 21st century holds for nuclear power, the factors that will shape its future are relatively evident. It is my hope that, during this conference, we can consider how each of these factors can be addressed, to ensure that nuclear energy remains a viable source of safe, secure and environmentally benign energy.
Lorsque je vois la multitude des défis que nous devons relever dans la première moitié du 21ème siècle, je me dis que le changement climatique doit figurer en très bonne place sur cette liste. Cependant, il est fortement concurrencé par le développement et la réduction de la pauvreté, deux thèmes dans lesquels l’OCDE s’investit beaucoup et pour lesquels nos pays membres ont à cœur de trouver des solutions.

C’est donc maintenant, avec sérieux et en toute objectivité, que les pays développés et le monde en développement doivent se saisir de la question du changement climatique.

En novembre dernier, un groupe d’ONG responsables a publié un rapport selon lequel ce sont les pays pauvres qui souffriront le plus du réchauffement mondial. Ce rapport, qui s’inspire des projections de l’ONU sur les effets du changement climatique à un horizon de 50 ans, conclut que les pays pauvres subiront davantage d’inondations et qu’ils connaîtront une baisse de leur production agricole, une recrudescence des maladies et la dégradation, voire l’extinction d’écosystèmes entiers dont dépendent un grand nombre de populations défavorisées dans le monde.

Toutefois, si les pays pauvres seront les plus durement frappés, aucun des pays développés ne sera épargné.

Dans quelle mesure l’accélération du réchauffement de la planète est-il dû aux activités humaines, en l’occurrence aux émissions de gaz à effet de serre, en particulier de CO₂, dans l’environnement ?

À la lecture de la littérature, spécialisée ou non, je crois comprendre que nous savons certaines choses, que nous en ignorons d’autres, et que dans de nombreux domaines, nos connaissances ne sont pas des certitudes.

Permettez-moi de vous faire part d’un petit nombre d’observations générales tirées de ce que nous savons.

Nous savons que les émissions de gaz à effet de serre, en particulier de CO₂, contribuent au réchauffement climatique. Si d’aucuns ont contesté ce fait dans le passé, il semble que ce ne soit plus de mise aujourd’hui.

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1 Mes observations d’aujourd’hui n’engagent que moi-même et ne reflètent pas nécessairement les vues de l’OCDE ni celles de ses pays Membres.
Nous savons, par exemple, que le protocole de Kyoto n’enrayera pas le changement climatique, même s’il est ratifié et appliqué par tous les pays, États-Unis y compris.

Nous savons qu’avant l’ère industrielle, la concentration de CO₂ dans l’atmosphère était d’environ 280 parties par million (ppm) et qu’elle était de 368 ppm en 1997, au moment de la conférence de Kyoto. Sept ans plus tard, nous savons qu’elle atteint 379 ppm. Nous savons que le protocole de Kyoto n’est pas à la mesure de l’enjeu puisqu’il ne sollicite qu’une très modeste réduction de 5.2 % de la part des pays industrialisés et que la contribution demandée au reste du monde est encore plus faible.

Les données fournies par l’analyse des carottes prélevées dans la calotte glaciaire de l’Antarctique nous apprennent que la Terre a connu cinq pics de réchauffement climatique dans les 400 000 dernières années. Pourtant, pendant chacun de ces épisodes, les niveaux de CO₂ n’ont dépassé qu’une fois, et de très peu, le seuil des 300 ppm. Le reflux rapide de ces pics de température dans le passé serait dû au faible niveau des concentrations de CO₂. Nous sommes à nouveau confrontés à une forte augmentation des températures mais il se pourrait, cette fois, qu’il ne s’agisse pas d’un simple pic parce que les concentrations atmosphériques de CO₂ sont plus élevées. Les conséquences de cette tendance continue à la hausse des concentrations de CO₂ pourraient être considérables, voire catastrophiques !

Nous savons que beaucoup d’experts, comme David King, conseiller scientifique en chef du gouvernement britannique, pensent qu’un niveau de 550 ppm ne devrait pas être dépassé. Le Groupe d’experts intergouvernemental sur l’évolution du climat nous apprend que si un accord sur des quotas d’émission pouvait être conclu, il faudrait que les émissions mondiales culminent au plus tard à l’horizon 2025 pour pouvoir stabiliser les concentrations de CO₂ à 550 ppm. Nous savons que nombreux sont ceux, et ils sont probablement majoritaires, qui souhaiteraient que les concentrations de CO₂ soient maintenues en-deça de 450 ppm, mais cela ne paraît guère réaliste au vu des tendances récentes.

Même si nous parvenons à stabiliser les concentrations de CO₂ à 550 ppm, nous pensons que nous connaitrons un changement climatique sensible, caractérisé par une augmentation de température de 2 à 5°C selon les régions du monde et par une élévation du niveau des océans de 0,3 à 0,8 m d’ici la fin du siècle et de 7 à 13 m d’ici le prochain millénaire. Mais pour réussir à stabiliser les concentrations de CO₂ à ce niveau, nous savons qu’il faut faire davantage et qu’en particulier l’industrie énergétique mondiale doit se transformer. Nous savons que des changements profonds sont nécessaires dans toute une série de secteurs allant des transports à la production d’électricité, non seulement pour, au moins, stabiliser l’effet de serre, mais aussi pour s’adapter à la diminution des ressources de pétrole, de gaz et même de charbon à plus long terme. Si nous ne réagissons pas, nous nous heurterons à la réalité des projections déconcertantes de l’Agence internationale de l’énergie (AIE) qui indique, dans la dernière édition de ses perspectives énergétiques mondiales, qu’à structure énergétique identique, il faudra investir, au cours la période 2003-2030, quelque 16 000 milliards de dollars américains en infrastructures pour assurer les approvisionnements énergétiques mondiaux !

Que peut-on faire ? Quelles sont les options réalistes ?

Nombreux sont ceux, en particulier les écologistes, qui préconisent le recours aux énergies renouvelables comme le solaire et l’éolien. C’est une option magnifique mais est-elle réaliste ? Que savons-nous ou, tout au moins, que nous dit-on ?
Les perspectives énergétiques mondiales de l'AIE nous apprennent que la consommation mondiale d'énergies renouvelables représentait 14 % de la demande totale d'énergie en 2002 et qu'elle n'en représentera toujours que 14 % en 2030. Si l'on en croit ces projections, on ne peut guère s'en remettre aux énergies renouvelables pour lutter efficacement contre les émissions de gaz à effet de serre.

Etant donné que l'AIE évalue à 60 % l'augmentation de la demande mondiale d'énergie primaire entre 2002 et 2030, les énergies renouvelables nécessiteront d'énormes investissements, même si leur part ne dépasse pas 14 % de la demande totale. Est-il concevable qu'une concentration encore plus forte d'investissements dans ce type d'énergies permette d'augmenter leur part substantiellement ? C'est peu probable.

Si la filière renouvelable n'est pas une solution raisonnable pour modifier profondément notre structure énergétique, quels sont les choix qui s'offrent à nous ?

Bien sûr, on continue de miser sur la fusion que le projet ITER vient de relancer. Mais là encore, quelles que soient les perspectives, elles se situent à très long terme et bien trop loin pour contribuer à résoudre un problème immédiat.

Enfin, mais c'est loin d'être la seule option, il y a la filière nucléaire (fission) à la technologie éprouvée. Nombreux sont ceux, dont l'éminent scientifique James Lovelock, auteur de l'hypothèse Gaia, qui déplorent l'abandon de cette filière par beaucoup de pays. Je crois savoir qu'il va intervenir dans cette conférence par liaison vidéo. Je n'ai donc pas besoin d'exposer son point de vue dans le détail.

Il me suffira de dire qu'il voit dans l'énergie nucléaire un moyen essentiel pour enrayer un emballement du réchauffement climatique qui pourrait avoir des conséquences catastrophiques.

Je suis plus porté à croire Lovelock que ceux qui se satisfont de vœux pieux et ne veulent pas voir la dure réalité à laquelle notre planète doit faire face.

Le climat changera probablement, quoi que nous fassions maintenant, mais nous nous devons à tout le moins de faire tout ce qui est possible pour ralentir ce phénomène et permettre au monde de s'y adapter. L'énergie nucléaire est un élément essentiel de ce processus. Nous méconnaissons son importance à nos risques et périls.

A côté du changement climatique, d'autres raisons commandent de développer l'énergie nucléaire. Comment satisfaire une augmentation de la demande mondiale d'énergie de 60 % d'ici 2030, principalement destinée à répondre aux besoins du monde en développement ? Comment assurer les approvisionnements énergétiques ? A l'heure actuelle, environ 1,5 milliard d'être humains n'ont pas accès à l'électricité. Il est peu probable que ce chiffre change dans les 25 prochaines années si l'on renonce à la filière nucléaire.

Pour accélérer le développement dans beaucoup de pays non membres de l'OCDE, il sera essentiel de disposer de sources d'énergie sûres et l'énergie nucléaire pourrait être un important facteur de succès dans la lutte contre la pauvreté et dans le développement à long terme des zones défavorisées de la planète.
Remarks by the Honourable Donald J. Johnston
Secretary-General of the OECD

International Conference on Nuclear Energy for the 21st Century
Bercy, 21 – 22 March 2005

When I look at the enormous number of challenges we must address in the first part of the 21st century, climate change must be high on the list. But it is also in stiff competition with development and poverty reduction, all areas where the OECD is much involved and where our Members are deeply committed to finding solutions.

Climate change must be addressed quickly, seriously and objectively by the developed and the developing world.

Last November a group of responsible NGOs published a report which alleged that global warming will hit the poor countries hardest. The report, drawing upon UN predictions of the effects of climate change for the next 50 years, concludes that poor countries will experience more flooding, declining food production, more disease and the deterioration or extinction of entire ecosystems upon which many of the world’s poorest people depend.

However, while poor countries will be hit the hardest, none of us will be spared.

To what extent is this accelerated increase in global warming due to human activities, namely the release of greenhouse gases into the atmosphere, especially CO2?

My reading of the literature, expert and non-expert, suggests to me there are certain things we know, certain things we do not know, and a broad area where we think we know, but are not certain.

Let me offer a few general observations drawn from this knowledge.

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1 My comments today are based on my own personal views rather than those of the OECD or its Member countries.
We know that greenhouse gas emissions, especially CO2, are contributing to global warming. A fact once disputed by some, this argument now seems to be behind us.

We know, for example, that Kyoto, if ratified and applied by all countries including the United States, will not stop climate change.

We know that before the industrial age, the CO2 level in the atmosphere was steady at around 280 parts per million (ppm). We know that at the time of Kyoto, in 1997, that level had reached 368 ppm. Seven years later, we know it is at 379 ppm. We know that Kyoto is not the answer because it requires only a very modest reduction of 5.2 per cent for industrialised countries and an even more modest response from the rest of the world.

From Antarctic Ice Core Data we know that there have been five spikes of global temperatures during the past 400,000 years. But during each of these spikes, CO2 levels have only once, and then barely, exceeded 300 ppm. It is argued that the rapid fall from these high temperatures in the past was because of low levels of CO2 concentrations. Now we are headed for another sharp rise in temperatures, but this time it may be more than a spike because of the increased levels of CO2 in the atmosphere. The consequences of the continuing rising trend of CO2 levels are likely to be dramatic, maybe catastrophic!

We know that many experts, such as David King, chief scientist adviser with the UK Government, believe that 550 ppm should not be exceeded. We know from the Intergovernmental Panel on Climate Change that if some agreement could be reached on emission quotas, stabilising at 550 ppm would require us to ensure that global emissions peak no later than 2025. We know that many, and probably most, would like to see CO2 concentrations kept below 450 ppm; however, given current trends, this does not appear realistic.

Even if CO2 emissions are stabilised at 550 ppm, we think that substantial climate changes will still take place, with the global temperature rising from between 2 to 5 degrees, depending upon the area; and the sea level rising by 0.3 to 0.8 metres by the end of the century, and by 7 to 13 metres over the next millennium. But even to stabilise at 550 ppm, we know that more must be done, and specifically the global energy industry must change. From transportation to electricity generation, we know that major changes must take place, not only to at least stabilise the greenhouse effect, but to adapt to the dwindling supplies of oil, gas and even coal in the longer term. Otherwise, we will be faced with the reality of the discouraging projections of the International Energy Agency (IEA) in its last world energy outlook, namely, that from 2003-2030 global energy supply will require an infrastructure investment of $ 16 trillion, assuming no change in the energy mix!

What can be done? What are the realistic options?
Many, especially the Green movement, look to renewable energy sources such as wind and solar power. A wonderful option, but is it realistic? What do we know or, at least, what are we told?

The IEA’s Outlook tells us that world renewable energy consumption represented 14% of total demand in 2002, and will still represent just 14% of total demand in 2030. On those projections we can hardly look to renewable energy as a means of effectively addressing greenhouse gas emissions.

Given that the IEA projects a 60% increase in world primary energy demand between 2002 and 2030, renewables, even remaining at 14% of total energy demand, represents still a very major investment. Is it conceivable that an even greater concentration of investment in renewables would raise that percentage substantially? Very doubtful.

If renewable energy is not a reasonable option through which to effect major changes in energy consumption, what other choices do we have?

There is of course the continuing prospect of fusion which has now been resurrected with the ITER proposal. Again, no matter how promising, it is many years away – too far to impact on the immediacy of the problem at hand.

Last, but far from least, there is the proven technology of nuclear energy (fission). Many, including the renowned scientist James Lovelock, originator of the Gaia hypothesis, deplore the fact that this technology has been abandoned by many countries. I understand that he will be addressing this conference by video link so there is no point in my quoting his views in detail.

Suffice it to say that he appears to see nuclear energy as critical to check runaway global warming, which would have potential catastrophic consequences.

I am inclined to accept Lovelock’s opinion over those who seem to indulge in wishful thinking rather than facing the harsh reality of what is happening to our planet.

The climate will probably change no matter what we now do, but we should, at the very least, make every effort to slow it down so as to permit the world to adapt. Nuclear energy is a critical element of that process. We ignore its importance at our peril.

But there are other compelling reasons to proceed with nuclear energy besides climate change. With the world requiring 60% more energy by the year 2030, and with most demand coming from the developing world, how is it to be supplied? What could be the security of supply? At the moment some 1.5 billion people do not have access to electricity. Without the nuclear option, that figure is unlikely to change over the next 25 years.

To accelerate development in much of the non-OECD world, access to secure sources of energy will be essential and nuclear energy could be a critical element of success in achieving poverty reduction and the long term development goals of the deprived areas of the planet.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Myung Oh
Deputy Prime Minister and
Minister of Science and Technology (MOST)

REPUBLIC OF KOREA
International Ministerial Conference of Nuclear Power for the 21st Century

March 21, 2005

By Honorable Myung Oh
Deputy Prime Minister & Minister of Science and Technology
The Republic of Korea
I. Opening Remarks

Your Excellencies,
Conference President, Mr. Patrick Devedjian,
Director General of the IAEA, Mr. Mohamed ElBaradei,
and the Secretary General of OECD, Mr. Donald Johnston,
Distinguished delegates,
Ladies and gentlemen.

On behalf of the Government of the Republic of Korea, I would like to extend our warm congratulations to Mr. Patrick Devedjian on his appointment as the President of the International Ministerial Conference of Nuclear Power for the 21st Century.

It's a great honor for me to have this opportunity to present Korea's initiative on Nuclear Power in the 21st Century.

It cannot be denied that the peaceful use of nuclear energy has contributed greatly to a sustainable and stable supply of energy over the last fifty years. It has also contributed to considerable economic developments and an enhanced level of human welfare around the globe.

However, many challenges are still lying ahead for the international nuclear society in the 21st Century.
In this regard, I believe this conference bears a great significance, which provides forum for discussions among the world leaders in the field of nuclear energy.

I’m sure that this conference will provide a great opportunity to derive solutions and answers about the global energy challenges of the 21st Century.

Now, let me take this moment in time to convey to the conference, how Korea has dealt with some of these issues, and how we intend to address the future challenges to a global nuclear energy supply.

II. Present and Future of the Korean Energy

Over the last two decades, the energy and electrical consumption in Korea has increased more than five-fold and seven-fold, respectively.

It has brought out Korea as one of the top ten energy consuming economies. Furthermore, it is expected that the consumption of energy and electricity will continue to rise by 50% and 70% by 2020, respectively.

It is also anticipated to increase additional 50% by the 2020’s. Due to its lack of energy resources, this will place an enormous burden on the Korean economy, with its overseas energy dependency reaching 97%.

Given these scarce indigenous energy resources in Korea, we believe firmly that the application of nuclear energy is inevitable for our future economic development.

Since the construction of our first nuclear power plant in 1978, a total of 19 power plants including seven 1,000 MWe Korea Standardized Nuclear Power Plants are currently in operation. It generates 40% of the national electricity demand.
Nuclear power generation will gain more importance in Korea, with additional 8 new nuclear power plants under way including two 1,400 MWe nuclear power plants so-called APR-1400, to be constructed by year 2015.

Based on the aforementioned expansion of nuclear energy in Korea, we are of the opinion, that future policy direction for development of nuclear energy will be centered around such issues as:

- enhancement of nuclear safety;
- the safe management of nuclear wastes;
- the nuclear non-proliferation;
- the competitiveness of nuclear power in the energy market;
- and international cooperation toward nuclear technology innovation for wider use of nuclear energy.

We can assure you that nuclear safety and safe management of nuclear waste are pre-requisite for the use of nuclear energy in Korea, and they mark the highest priority during the implementation of Korea’s national nuclear program.

In particular, a social consensus is an essential element during the national policy making process in Korea, so that the national policy reflects the public concerns for safe operation of the nuclear power plants and for safe management of nuclear wastes.

To deal with these challenges, we believe that more emphasis should be placed on public acceptance and confidence building than ever before. Ultimately it is for gaining full support from the general public.

Korea appreciates the international nuclear society’s efforts in strengthening the nonproliferation regime. There have been various measures including reinforcement of
an export control and the IAEA safeguard measures.

In order to enforce the international mandates and to implement the international NPT regime faithfully, Korea is constructing a legal and social framework, that coincides with the international standards for nuclear non-proliferation such as amendments of the Korean Atomic Energy Act, implementation of the IAEA additional protocol and so forth.

We believe that these active measures are essential elements for ensuring national transparency and confidence within the international society.

We have concluded that we should strengthen the competitiveness in the nuclear energy industry markets. In particular, greater emphasis should be placed on the technological and economical innovations as well as environmental friendliness of nuclear energy.

Recently we expanded our Nuclear Research and Development activities for the innovation of nuclear technologies and enhanced international cooperation by joining the international nuclear co-operation projects, such as GIF (Generation IV International Forum) and the IAEA's INPRO.

Specifically, in an effort to build a basis for a hydrogen energy economy in the near future, Korea has recently launched national R&D projects to develop VHTR (very high temperature reactor), which can produce high temperature for hydrogen production by nuclear power.

Ladies and gentlemen,

As you are already aware of, the Kyoto protocol entered into force with ratification of 141 countries as of February 16, 2005. It requires world economies to reduce greenhouse gas emissions, which have increased twice since the 1990's.
I am confident that nuclear energy will contribute in preventing global warming, resolving world energy problems, promoting human welfare, and progressing the world economy.

I believe another nuclear renaissance will take place in the future. For this, the global community should assign a larger role to the nuclear energy such as space heating, hydrogen production, vehicle propulsion and sea water desalination, and expand the application of radio-isotopes to various industries.

While bearing all the aforementioned in mind, we are of the strong opinion that coordinated international efforts are crucial for strengthening the international regimes of nuclear security and nonproliferation. I am confident that such efforts will ultimately make a contribution to the world peace and security. At the same time, we believe that international cooperation is essential to ensure the highest standards of nuclear safety and the safe management of the radioactive wastes for a continuous use of nuclear energy.

III. Closing Remarks

It has been more than 50 years since nuclear energy was first introduced to the world. However, the international nuclear community is facing many issues that need to be resolved through joint international efforts.

I would like to confirm that the peaceful uses of nuclear energy are inevitable and indispensable options for reduction of greenhouse gas emission and the future welfare of our respective nations.
Finally, Korea reaffirms its commitment to the international nuclear community, and promises to make contributions in resolving complex issues that are facing us in the decades to come.

Thank you very much.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris, 21 and 22 March 2005-04-08

Ministerial Presentation

Mr. Alexander Rumyantsev
Head
Russian Federal Atomic Energy Agency (ROSATOM)

RUSSIAN FEDERATION
Уважаемый господин Председатель, уважаемые участники конференции,

Сегодня мировая ситуация с энергопотреблением характеризуется его неравномерностью в различных регионах мира. Две трети энергии потребляется в промышленно развитых странах с населением несколько более миллиарда человек, а одна треть производства энергии приходится на четыре миллиарда остальных жителей планеты. В то же время известно, что энергетическое обеспечение жизнедеятельности человека является ключевым фактором его благополучия. Таким образом, очевидно, что в 21 веке мировым сообществом будут прилагаться усилия, направленные на выравнивание потребления энергии в различных регионах мира.

Даже в случае консервативного подхода потребуется увеличить мировое производство энергии к 2050 году более, чем в два раза.

Поскольку энергетические потребности мирового сообщества могут быть удовлетворены за счет различных источников (уголь, природный газ, нефть, гидроэнергия, ядерная энергия, а в перспективе, солнечная и геотермальная энергия, энергия биомассы и др.), то выбор конкретных путей развития энергетики зависит от ряда факторов. Определяющими из них являются: ресурсные ограничения, экологическая и технологическая безопасность, себестоимость и степени различных рисков при использовании энергии.
Принимая во внимание инновационный потенциал ядерной энергетики, можно сказать, что ее использование может стать основой построения энергетической системы, обеспечивающей устойчивое, экономически выгодное и социально приемлемое развитие и совершенствование во всех областях человеческой деятельности в XXI веке.

2004 год стал во многом показательным для атомной отрасли России. Была выполнена основная задача года: пуск энергоблока №3 Калининской атомной станции. В том же году атомная отрасль России отметила свой полувековой юбилей. В приветствии Президента Российской Федерации В.В. Путина участникам юбилейной конференции говорилось: «сегодня атомная энергетика – это растущая отрасль … и ее будущее во многом зависит от плодотворного международного сотрудничества…»

Безопасность атомной энергетики является обязательным условием её развития. На протяжении последних десяти лет в России предпринимались целенаправленные усилия по повышению уровня безопасности атомной энергетики и промышленности. При этом особое внимание уделялось как традиционным видам деятельности - обеспечению ядерной и радиационной безопасности, так и повышению уровня экологической безопасности, охране окружающей среды и реализации природоохранных мероприятий. В 2004 году нарушений, классифицируемых в пределах международной шкалы INES, не было, а само число нарушений по сравнению с прошлым годом уменьшилось. Радиационный фон на АЭС и прилегающих территория, как и в прошлые годы, стабильно соответствовал показателям нормальной эксплуатации энергоблоков и не превышал естественных природных значений. Следует отметить, что при опережающем росте объемов производства выбросы вредных химических веществ в атмосферу от предприятий атомной отрасли в последние годы не превышали 0,6 % от валовых промышленных выбросов в России, а выбросы радиоактивных веществ на АЭС не превышали 20% от установленных допустимых значений, а сбросы радиоактивных веществ – не более 6% от разрешенных.
Атомная энергетика обеспечивает существенное сокращение выбросов вредных продуктов сгорания органического топлива в окружающую среду, в том числе парниковых газов, что способствует выполнению Киотского протокола, ратифицированного Россией в ноябре 2004 года. Таким образом, на долю стран, ратифицировавших конвенцию, теперь приходится более 55% уровня выброса двуокиси углерода, и таким образом, мы вплотную подошли к вступлению протокола в силу.

Полагаю, это событие – вступление Киотского протокола в силу – должно оказать непосредственное воздействие на расширение использования атомной энергетики.

Большое внимание в России уделяется также обеспечению безопасности международных, транзитных и внутри российских перевозок радиоактивных и ядерных материалов. Эта система полностью отвечает техническим требованиям соответствующих современных международных норм и правил как в отношении ядерной и радиационной безопасности, так и в отношении физической защиты перевозимых материалов.

В ближайшей перспективе Россия должна стать членом Всемирной торговой организации (ВТО) и принять правила и стандарты, в том числе в области технического регулирования безопасности. В 2003 году вступил в действие федеральный закон Российской Федерации «О техническом регулировании», согласно которому к 2010 году должна быть завершена работа по созданию правовой базы в области технического регулирования при использовании атомной энергии. Принципиальным в реализации указанной деятельности является сохранение всех необходимых составляющих системы управления и регулирования безопасности атомной энергетики и промышленности, имеющейся в России.

В настоящее время доля АЭС в установленной мощности всех электростанций России составляет 11,5%, а в производстве электроэнергии – до 16,5%. Доля АЭС в выработке электроэнергии в европейской части России
– 21%, в том числе Северо-запад – 42%, Центр и Поволжье 30%, Северный Кавказ – 16%.

Выработка электроэнергии на российских АЭС и средний коэффициент использования установленной мощности составили в 2002 г. – 141,6 млрд кВт.ч, КИУМ=71,7%; в 2003 г. – 148,6 млрд. кВт.ч, КИУМ=76,3%; в 2004 году – 142,96 млрд кВт.ч, КИУМ 73,2%.

Согласно Энергетической стратегии России даже при умеренном варианте развития экономики потребность в производстве электроэнергии на атомных станциях в 2020 году может составить не менее 230 млрд кВтч. Для обеспечения же прогнозируемых уровней электро- и теплопотребления в максимальном варианте спроса потребуется ввод генерирующих мощностей атомных станций до 5 ГВт к 2011 году и не менее 18 ГВт до 2020 года (с учетом воспроизводства энергоблоков I поколения), в том числе до 2 ГВт АТЭЦ. В результате чего суммарная установленная мощность российских атомных станций должна достигнуть порядка 40 ГВт, при коэффициенте использования установленной мощности (КИУМ) более 83%.

При этом потенциал роста производства электроэнергии на атомных станциях России на указанный период обеспечивается отечественным атомно-энергетическим комплексом, который обладает достаточной базой проектно-конструкторских организаций, промышленностью, способной поставить необходимое оборудование и материалы, квалифицированными кадрами, возрождающимся строительно-монтажным комплексом и площадками АЭС со значительной частью инфраструктуры.

Концепция развития атомной энергетики России в XXI-м веке исходит из идей устойчивого развития и положений методологии, разработанной в рамках проекта МАГАТЭ по инновационным ядерным реакторам и их топливным циклам (проект ИНПРО) и базируется на двух директивных документах: «Энергетической стратегией России на период до 2020 года» (утверждена Правительством Российской Федерации 28.08.2003) и Федеральной целевой программой «Энергоэффективная экономика». 
В соответствии с этими документами в России с 2011 г. по 2020 г. предполагается построить и ввести в эксплуатацию 10,38 ГВт электрической мощности. Развитие атомной энергетики будет реализовываться за счет разработки и внедрения перспективных проектов, среди которых: проекты АЭС на основе энергоблоков с реакторами ВВЭР-1000 и ВВЭР-1500, проекты АГЭЦ на основе энергоблоков с реакторами ВК-300, ВБЭР-300 для комбинированного производства электроэнергии и тепла для регионов России.

Будут развиваться также и инновационные технологии, основанные на реакторах на быстрых нейтронах и технологии замкнутого топливного цикла с технологической поддержкой режима нераспространения. В рамках этого направления в период 2005-2010 гг. предполагается обоснование технического проекта активной зоны РУ БН-800 с нитридным топливом, НИОКР по созданию коммерческой АЭС с быстрым реактором БН. Достоинством этой технологии является экологически безопасное производство электроэнергии, высокий КПД, утилизацию отходов за счет замыкания топливного цикла; высоко эффективное использование природного урана и экономическую конкурентоспособность за счет низкой удельной стоимости воспроизводства топлива.

Отдельным направлением является разработка инновационных технологий, основанных на управляемом термоядерном синтезе. Под эгидой МАГАТЭ с участием России ведется проработка экспериментального термоядерного реактора (проект ИТЭР). Основная цель проекта - демонстрация возможности получения управляемого зажигания и продолжительного горения дейтериево-тритиевой плазмы и обеспечение ее устойчивого состояния, а также комплексная проверка компонентов реактора, необходимых для использования энергии реактора в практических целях. Надеемся, что проект преодолеет имеющиеся сегодня трудности и перейдет в фазу сооружения экспериментального термоядерного реактора.
Как показывает практика проведение масштабных научно-
исследовательских и опытно-конструкторских работ, которые должны
обеспечить создание новой атомной энергетики XXI века, наиболее
эффективно осуществлять в рамках международного сотрудничества,
объединяющего ресурсы участвующих государств. В этой ситуации
усиливается роль и ответственность международных организаций, прежде
всего МАГАТЭ. Координация исследований в области ядерной энергетики и
консолидация усилий стран-членов Агентства, направленных на развитие
инновационной атомной энергетики, видится нам ключевым элементом
такого сотрудничества.

Уже сегодня объединение ряда государств-членов Агентства
реализовано в международном проекте инновационных реакторов и их
tопливных циклов (ИНПРО).

Проект ИНПРО активно поддерживается. Это нашло отражение в
резолюциях Генеральных конференций МАГАТЭ, а также резолюциях,
принятыми на 56-ой и 57-ой Генеральных ассамблеях ООН.

Свидетельством роста международного признания проекта является
постоянное увеличение числа его членов (в настоящее время это 21 страна-
член МАГАТЭ и Европейская Комиссия, а также ряд стран-наблюдателей). Повышение
роли этого проекта, участие в нем ряда государств, одновременно являющихся
участницами другого международного проекта, инициированного США – форум “Четвертое
поколение” (GIF-IV), ставят на повестку дня более тесное сотрудничество и сближение этих
проектов.

Необходимо отметить также, что создание крупномасштабной ядерной
энергетики XXI века требует от всех стран сохранения и использования всей
совокупности накопленных в ходе ее развития знаний, образующих собой
основу ядерных технологий и определяющих культуру безопасности ядерной
энергетики. Популяризация ядерной энергетики как технологии будущего,
создание более широких возможностей по получению и совершенствованию
своих знаний для специалистов, работающих в этой отрасли – наша общая задача.

Первая атомная электростанция в России, в г. Обнинске мощностью 5 МВт стала символом новой эры в энергетике и мирный атом начал свое триумфальное шествие по странам и континентам, ознаменовав начало развития атомной энергетики. Задача специалистов, работающих в атомной энергетике создать ядерный топливный цикл естественной безопасности, свободный от недостатков существующей ядерной энергетики, обеспечивая устойчивое, экологически безопасное, экономически выгодное и социально приемлемое развитие и совершенствование во всех областях человеческой деятельности в XXI веке.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris, 21 and 22 March 2005-04-08

Ministerial Presentation

Mr. Alexander Rumyantsev
Head
Russian Federal Atomic Energy Agency (ROSATOM)

RUSSIAN FEDERATION
Presentation

by the Director of the Federal Atomic Energy Agency, Mr. A.Yu. Rumyantsev, at the IAEA
International Conference “Nuclear Power for the 21st Century”
(Paris, France, 21–22 March 2005)

Mr. President, conference participants,

Today’s global energy consumption situation is marked by unevenness in different parts of the world. Two thirds of the energy is consumed in the industrially developed countries with a population of just over a billion, while a third of energy produced falls to the planet’s remaining four billion inhabitants. At the same time we know that ensuring an energy supply for human activity is a key factor for prosperity. Thus it is clear that, in the 21st century, the world community will be focusing its efforts on making energy consumption in the different parts of the world more equitable.

Even if a conservative approach is taken, global energy production will have to increase more than twofold by 2050.

As various sources (coal, natural gas, oil, hydroelectricity, nuclear energy, and in the future solar, geothermal, biomass energy and so forth) could be used to meet the world community’s energy requirements, the choice of which power development avenues to take depends on a number of factors. The deciding factors are resource limitations, environmental and technological safety, production costs and the level of the various energy utilization risks.

In view of its innovative potential, nuclear power could become the basic building block in an energy system ensuring sustainable, economically advantageous and socially acceptable development and improvement in all fields of human activity in the 21st century.

In many ways, 2004 was a significant year for Russia’s nuclear industry. The year’s main objective was met, namely the start-up of Unit No. 3 of the Kalinin nuclear power plant. It was also the year in which Russia’s nuclear industry celebrated its golden jubilee. In his speech of welcome to the jubilee conference participants, President Putin of the Russian Federation said: “Today nuclear power is a growing industry ... and in many ways its future depends on fruitful international cooperation ...”
The safety of nuclear power is a mandatory condition for its development. Over the past ten years, concerted efforts have been made in Russia to increase the safety levels for nuclear power and the nuclear industry. Particular attention has also been paid not only to traditional areas of activity — ensuring nuclear and radiation safety — but also to raising environmental safety levels, protection of the environment and the implementation of environmental protection measures. In 2004, there were no incidents which were classifiable under the international INES scale, and the actual number of incidents fell in comparison with the previous year. The background radiation at nuclear power plants and on adjacent land was, as in previous years, consistently in line with normal unit operating values and did not exceed natural environmental levels. I should point out that with runaway growth in manufacturing, harmful chemical emissions into the atmosphere from enterprises in the nuclear sector have not exceeded 0.6% of total industrial emissions in Russia over the past few years, that emissions of radioactive substances from nuclear power plants have not exceeded 20% of the established maximum permissible levels and that radioactive waste has not exceeded 6% of the permissible levels.

Nuclear power substantially reduces the emission of harmful fossil fuel combustion products into the atmosphere, including greenhouse gases, thereby promoting compliance with the Kyoto Protocol, which was ratified by Russia in November 2004. Those countries which have ratified the convention now account for 55% of carbon dioxide emissions, and so we are very close to the Protocol’s entry into force.

I believe that this event — the entry into force of the Kyoto Protocol — is bound to impact directly on the expansion of nuclear power.

In Russia, great attention is also paid to ensuring the safety of international, transit and domestic transport of radioactive and nuclear materials. This system fully meets the technical requirements of the relevant, current international standards and regulations in relation to not only nuclear and radiation safety but also the physical protection of material during transport.

In the near future, Russia is due to become a member of the World Trade Organization (WTO) and will adopt regulations and standards, including in the field of technical safety regulation. In 2003, a federal law of the Russian Federation on technical regulations entered into force, pursuant to which all of the work to establish a legal infrastructure in the field of technical regulations for the utilization of nuclear energy will have to be completed by 2010. Central to this activity is maintaining all the necessary components of the safety control and regulation system for nuclear power and the nuclear industry in Russia.

Currently, nuclear power plants constitute 11.5% of the installed capacity of all power plants in Russia, and they generate up to 16.5% of the electricity. Nuclear power plants’ share of electricity output in the European part of Russia is 21%, of which 42% in the North west, 30% in the Centre and Middle Volga regions and 16% in the North Caucasus.

The electricity output of Russian nuclear power plants and the average load factor were, respectively, 141.6 billion kWh and 71.7% in 2002, 148.6 billion kWh and 76.3% in 2003, and 142.96 billion kWh and 73.2% in 2004.

According to Russia’s energy strategy, even assuming moderate economic growth, the nuclear power plant electricity generating requirement in 2020 will be at least 230 billion kWh. Meeting the levels of electricity and heat consumption forecast under the maximum demand scenario will require an additional nuclear power plant generating capacity of up to 5 GW by 2011 and at least 18 GW by 2020 (taking the use of first generation units into account), including up to 2 GW from nuclear heat and power plants. As a result, the total installed capacity of Russia’s nuclear power plants should attain the order of 40 GW, with a load factor of over 83%.

The electricity generation growth potential of Russia’s nuclear power plants for this period is assured by a national nuclear power infrastructure that has sufficient resources in terms of development organizations, by a production sector that can supply all the necessary equipment and materials, by qualified staff, by the recovering construction sector and by nuclear power plant sites which have a significant proportion of the infrastructure.
Russia’s strategy for nuclear power development in the 21st century rests on the idea of sustainable development and the assumptions underlying the methodology developed under the IAEA’s International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO), and is based on two guidance documents: “Russia’s energy strategy up to 2020” (approved by the Government of the Russian Federation on 28 August 2003) and the Federal special programme “An Energy-Efficient Economy”.

Pursuant to these documents, it is planned to construct and bring into operation 10.38 GW of electrical capacity in Russia from 2011 to 2020. Advances in nuclear power will be achieved through the development and introduction of advanced designs, including: and nuclear power plant designs based on units with WWER-1000 and WWER-1500 reactors, and nuclear heat and power plant designs based on units with VK-300 and VBER-300 reactors for combined electricity and heat generation for Russia’s regions.

Also, innovative technologies will be developed on the basis of fast neutron reactors and closed fuel cycle technology with technological support of the non-proliferation regime. In this connection, from 2005–2010 there are plans to validate the specifications for a BN-800 reactor core with nitride fuel, and for R&D aimed at creating a commercial nuclear power plant with a fast BN reactor. The advantage of this technology is environmentally safe electricity generation, a high efficiency factor, waste reprocessing because the fuel cycle is closed, highly efficient use of natural uranium and economic competitiveness owing to the low unit cost of fuel breeding.

Another approach is to develop innovative technologies based on controlled thermonuclear fusion. Under the auspices of the IAEA and with Russia’s participation, a thermonuclear experimental reactor is under study (the ITER project). The main aim of the project is to demonstrate the possibility of obtaining controlled ignition and extended burn of deuterium-tritium plasma and to attain steady state, and also integrated testing of the reactor components required for practical applications of the reactor’s energy. We hope that the project’s current difficulties will be overcome and that it will progress to the thermonuclear experimental reactor construction phase.

Practice shows that the large-scale research and development work needed for the establishment of the new nuclear power of the 21st century is most effectively conducted in the context of international cooperation, which pools participating countries’ resources. In these circumstances, the role and responsibility of international organizations, above all the IAEA, is strengthened. We view coordinated research in the field of nuclear power and consolidated efforts on the part of Agency Member States aimed at the development of innovative nuclear power as key components of such cooperation.

A number of Agency Member States have already joined forces under the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO).

The INPRO project enjoys active support. This has been reflected in IAEA General Conference resolutions, and also in resolutions adopted by the 56th and 57th sessions of the United Nations General Assembly.

The ever-increasing number of members (currently there are 21 IAEA Member States plus the European Commission, as well as many observer countries) is proof of the project’s growing international recognition. The increased role of this project and the fact that a number of participating countries are also involved in another international project initiated by the United States of America, the “Generation IV” (GIF-IV) international forum, mean that greater cooperation and closer links between these projects are on the agenda.

I should also point out that establishing large-scale nuclear power for the 21st century requires all countries to preserve and use the entire stock of knowledge accumulated during its development; it is the basis of nuclear technologies and defines the nuclear power safety culture. Promoting nuclear power as the technology of the future and creating more opportunities for experts working in this industry to obtain and improve their knowledge are our common goal.
Russia’s first nuclear power plant, in Obninsk, with a 5 MW capacity, has become the symbol of a new energy era, and the start of the peaceful atom’s triumphant procession through countries and continents, marking the beginning of the development of nuclear power. The goal for experts working in the nuclear power sector is to establish a nuclear fuel cycle which is inherently safe, free of the current shortcomings of nuclear power, and which ensures sustainable, environmentally safe, economically advantageous and socially acceptable development and improvement in all areas of human activity in the 21st century.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Antonio Marzano
Minister of Productive Activities

ITALY
Colleagues, Director General, Secretary General, Ladies, Gentlemen

Italy's energy policy is currently driven by market liberalisation, transfer of relevant political and administrative decision-making powers to the regional authorities, diversification of supply sources, energy security, efficiency improvements and environmental protection.

Italy has made significant progress in implementing electricity and gas market reforms and in restructuring its energy industry. The European Commission directives for electricity and gas market liberalisation have been transposed into legislation. Large state-owned energy companies began to be privatised and the government reduced its shares in both Enel (electricity) and Eni (oil and gas). New institutions, including an energy sector regulator, are now fully operational, which will ensure a much more market-oriented energy economy. Italy ratified the Kyoto Protocol in June 2002. In December 2002, released the first national action plan for the reduction of greenhouse gas emissions and the Revised Guidelines for National Policies and Measures Regarding the Reduction of Greenhouse Gas Emissions. During the year 2004 the European directive establishing a
scheme for greenhouse gas emission allowance trading has been adopted and a national allocation plan prepared.

In Italy, as in other OECD Member countries, the simultaneous achievement of energy security market liberalisation and climate change mitigation is not easy, given the sometimes contradictory nature of these objectives.

Diversification of energy sources is particularly challenging in this respect.

Italy’s energy mix is shifting from oil to more use of natural gas, with little probability of rapidly diversifying much further owing to the limited growth of renewable energy, local resistance to coal and the fact that the nuclear option was abandoned after a national antinuclear referendum of 1987. Significant reliance on oil and natural gas, including from external supply sources, raises concerns about security of supply and the risk of high energy costs.

Timely investment in energy production, transportation and interconnection is essential to secure energy supply and more active competition. Italy’s high level of local resistance to new infrastructure became increasingly serious in the context of the transfer of power to local authorities. Uncertainties regarding responsibilities for clearing new energy projects and complexity in the authorisation procedures are consequences of the legal changes initiated to enable decentralisation. From April 2002, the Government has introduced a fast track procedure for new electricity generating plants thereby streamlining the decision-making process.

Under the new authorisation regime, permits for power plant construction have been granted to 22,000 MW (electric megawatts). Today more than 12,000 MW of new power plants are under construction while the national power generating capacity is about 72,000 MW. Electric grid
expansion is also foreseen and construction of new gas pipelines and LNG terminals is planned.

Most of the new power plants are gas combined cycles with some coal-fired units. It can be noted that Italy is importing about 16 percent of its electricity supply. Most of it has nuclear origin.

Due to the shut-down of any nuclear power generating activity since the early '90s in the Country, a significant commitment is under way for the decommissioning of those nuclear power plants which were in operation and the facilities of the nuclear fuel cycle. Plans are being defined for the reprocessing of nuclear fuel abroad and for the identification of a national repository for the disposal of nuclear fuel and waste.

**Commitment has been maintained** by national research centres and universities on the development of nuclear technology and advanced nuclear reactor systems, while participating into international collaboration agreements. Particularly, a substantial effort is continuing on international programmes for nuclear fusion technology and power demonstration experiments.

Regarding nuclear power, we perceive a clear change in the public opinion, notably by the young generations. The construction of new nuclear power plants in the Country is not on our present agenda, though **we support strengthened international co-operation and participation of interested parties from Italy into new European and international nuclear technology programmes and projects.**

Italy, like other European Member States, is moving towards the integration of the national electricity market into the single European electricity market. We assume that strategies regarding diversification of energy sources and power production technologies should be evaluated
along this perspective of construction of a large multiregional electric system.

We believe indeed that the nuclear power should be proposed and maintained as a key element for energy source diversification, supply security and environmental protection in the single European market. The challenges raised by climate change, increased energy demand by the newly industrialising economies and possible depletion of oil and gas resources are apparent and nuclear energy represents a viable option. Should the European electricity market be organised as a single market, a single nuclear market could also be advocated which might be characterised by harmonised technical safety standards, shared criteria for physical safeguards and enhanced co-operation on nuclear waste and decommissioning.

This approach, should it be agreed by other European Member countries, would benefit from economies of scale and existing institutions and eventually lead to a more coherent European nuclear policy and long-term strategy regarding our energy future.

During the last several years, it became clear that nuclear energy is an energy source that is deployable and which we know how to manage, how to develop and to deliver to meet our energy needs while coping with the changing world energy outlook.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

Mr. Huazhu Zhang
Chairman
China Atomic Energy Authority

CHINA
Nuclear Energy Development in China

-From the Prospective of National Energy Strategy

Zhang Huazhu, Chairman of CAEA

March 21, 2005, Paris, France

Mr. President, Director General ElBaradei, Ladies and Gentlemen,

I am glad to have the opportunity to meet friends of the nuclear energy sector from all over the world in the Conference on Nuclear Power for the 21st Century. I would like to, on behalf of the China Atomic Energy Authority, extend warm congratulations on the successful convening of the conference and appreciation to the French Industry Ministry for its meticulous arrangement.

The peaceful use of nuclear energy, one of the most significant achievements in the 20th century, has obtained its due important status in the world's energy supply, after 50 years of development. Nuclear energy provides 16% of the world's total electricity, and contributes greatly to social and economic development, promotion of people's living standard and improvement of quality of environment.

The social and economic development in the 21st century demands continuous growth of the total volume of energy supply on the one hand, and requires expedited adjustment to energy mix on the other to effectively relieve harmful effects on the ecological environment. They are the two challenges the energy industries are facing with in the new century. In such circumstances, an objective evaluation of nuclear energy and its role in the energy development and application in the future have become the focus of the nuclear energy sector across the world. It is of great significance that people of the nuclear energy sector gathered here in this conference with a theme of Nuclear Power for the 21st Century to exchange information, discuss issues of common interest and share experience. This conference will play an important role in further promoting the development and application of nuclear energy.

China, the largest developing country in the world, has achieved rapid economic growth and steady social progress since the policy of reform and opening was adopted. The Chinese Government takes maintaining sustained moderate high growth rate of the economy and continuous improvement of people's living standard its strategic target in next 15 years. China's GDP will quadruple that of 2000 by 2020, and the output of energy will increase considerably in correspondence. China's consumption of primary energy in 2004 was about 1.8 billion tons of standard coal, and the total installed capacity of power generation reached 440 GWe with a total electricity output of 2.187 TWh. If the goal of social economic development to 2020 is obtained, the energy production shall double that of the year 2000. According to the strategic energy study, China's annual consumption of primary energy will be around 3 billion tons of standard coal, and the installed capacity of power generation will reach 900 GWe by 2020. China
has become a big energy producer and consumer.

Determined by the country’s resources structure, coal has been, and will continue to be the major energy used in China. Coal thermal power plants are producing increasing harmful effects on ecological environment, which has caught high attention of the Chinese Government and the public. An energy mix over-dependent on coal does not bring the advantage of rational uses of resources, and places a heavy burden on transportation. Economizing energy and optimizing energy mix have become the key of China’s energy development strategy in the new century. In the future development of energy, a series of policies and measures will be implemented, including giving equal emphasis to construction and economization with economization taking the precedence; optimizing electricity structure, speeding up the development of hydropower, actively promoting nuclear power and encouraging development of new energy.

Nuclear power has been taken into the national electricity development planning as an integral component of China’s national energy strategy. The portion of nuclear in energy supply will progressively increase through phased development. Nuclear power will become an important pillar in the power supply of the coastal area where economy is developed and demand on electricity high. According to preliminary plan, the installed capacity of nuclear power will reach 36-40GW, accounting for about 4% of the total of the country. Nuclear power is going to play a more important role in China’s power generation in years to come. And developing nuclear power is an important step toward optimizing energy mix, protecting the environment and achieving sustainable development.

The objective of nuclear power development plan the Chinese Government defined is positive and practicable. With 50 years of development, a fairly complete nuclear industrial system has been formed in China, ranging from geological prospecting, uranium ore mining and metallurgy, uranium conversion and separation, fuel element fabrication to reprocessing. Substantial technology progress was achieved in major links of nuclear fuel cycle in the last more than 20 years, in particular, driven by nuclear power construction. Fabrication of NPP fuel assembly has been completely localized. Pilot project of spent fuel reprocessing moves on smoothly. Waste management facilities were put into operation, disposal of medium and low level radioactive waste are in industrial use, and studies on deep geological disposal of radioactive solid waste are in positive progress. Capabilities for nuclear basic studies and application studies have been strengthened comprehensively, which provided conditions of R&D capability and industrial infrastructure for accelerated development of nuclear power.

China has accumulated fairly rich experience in nuclear power construction. There are so far 9 nuclear power units in operation in the mainland of China, and another 2 are going to be put into use. The units in operation are in good safety conditions with management level and operation record improving continuously. At the meanwhile, teams of engineers and management personnel with rich practical experience have been cultivated in the R&D of nuclear power technology, engineering design, equipment manufacture, construction and operation management. We are now able to independently design, construct and operate 300MW and 600MW PWR units, and construct 1000 MW PWR units with our own efforts combined with introduced technology. Difficulties caused by technologies and management methods coming from different sources have been overcome in the process of construction. A nuclear power development is taking shape that
absorbed advanced experience of other countries and is in conformity with China's national situation. In nuclear power construction in the future, we will continue to depend mainly on our own efforts while carrying out international cooperation to introduce advanced and proven nuclear power technology, and actively promote self-reliance in designing and localization in equipment manufacture, to attain the planned objective. The research and technology development in the nuclear energy sector is going to be strengthened. Through combining the self-reliant R&D work and introduced technologies, capabilities will be established to independently construct G-2 improved PWR by 2010 and G-3 PWR thereafter. Nuclear power construction in China will move toward standardization and serialization. At the meanwhile, we will continue bilateral and multilateral cooperation; follow closely or participate in the research and development of the next generation advanced nuclear power technology to get ready for applying latest technology in the future; and actively take part in the international program of ITER to explore technology for fusion energy application.

Mr. Chairman, the Chinese Government has always paid great attention to the issue of safety in nuclear energy development and stick to the principle of "quality and safety come first". With years of efforts, the nuclear safety regulation system and supervision and management system have been set up in China. The Chinese Government issued the Regulations on Safety Supervision and Management of Civil Nuclear Facilities and the Regulations on NPP Nuclear Accidents Emergency Management in the last two decades. Based upon these regulations, related government departments issued a series of rules, guidance, standards and technological documents in compliance with international practice. An independent nuclear safety regulatory institution was established in the early days of nuclear power development in China to carry out independent supervision on safety of civil nuclear facilities. It takes safety licensing management throughout the whole process from siting, design, construction to operation of NPPs and other civil nuclear facilities. The rigid, effective and independent supervision of the regulatory institution ensured the construction quality and safety conditions of nuclear facilities that have maintained a good record of operation safety.

Human resources are an important factor supporting the healthy and sustainable development of nuclear energy. In the whole world, however, lack of sufficient human resources has become one of the key factors restraining further development of nuclear energy. The Chinese Government has always paid great attention to the training and use of personnel for nuclear energy since the 1950s. A university education system including undergraduate basic science education and graduate education and a vocational training system combining on-job training and school training have been established. At present, there are more than a dozen universities in China with nuclear-related speciality which provide hundreds of graduates to nuclear energy R&D institutions and enterprises every year. Enterprises also train their staff through practice, training on contract with universities and regular training. China's authorities for higher learning are making plans of strengthening or building nuclear energy speciality and expanding enrollment to meet the human resources requirement in the process of nuclear power development. And enterprises are devoting more efforts in training and recruiting to expand human resources reserve.

Ladies and Gentlemen,
China's nuclear power has gone through more than 20 years of development. In the new century, the Chinese Government made a decision to positively promote the development of nuclear power, which is the requirement of the harmonious development of economy, society and ecological environment and the demand of sustainable development. China will, as always, actively participate in international discussions on the role of nuclear energy in sustainable development and the status of nuclear energy in energy development in the 21st century, which can enhance communications, understanding and consensus. The Kyoto Protocol to the United Nations Framework Convention on Climate Change that has caught world-wide attention came into effect recently, representing an important step in human society's response to climate changes. We are glad to see the progress of the international community's joint efforts in relieving climate changes and will make due contribution to further achievement.

Ladies and Gentlemen,

Nuclear energy played an important and irreplaceable role in the global economic prosperity and social development in the past half a century. It is foreseeable that in the new century, nuclear energy will continue playing its role and make further contribution to the sustainable development of human society.

Thank you.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Mohammed Boutaleb
Minister of Energy and Mining

MOROCCO
Royaume du Maroc
Ministère de l’Énergie et des Mines

SITUATION DES APPLICATIONS NUCLEAIRES AU MAROC

par
Mohammed BOUTALEB
Ministre de l’Énergie et des Mines

Conférence ministérielle internationale
« l’énergie nucléaire pour le 21ème siècle »
Paris, les 21 & 22 mars 2005
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- La Coopération Internationale
- Les Études relatives au développement de l’électronucléaire
- Conclusion
Introduction

* Le Royaume du Maroc est engagé à défendre le noble objectif fixé par le statut de l’AIEA « l’atome pour la paix ».

* Il réitère sa conviction que cet objectif est tributaire des efforts déployés par la Communauté Internationale pour la mise en œuvre des trois piliers de l’Agence:
  - la vérification,
  - la sûreté et la sécurité,
  - le transfert de technologie.
Adhésion aux Conventions et Accords internationaux

Le Royaume du Maroc a adhéré à l’ensemble des accords et conventions, dont notamment:

- Traité sur la Non Prolifération des armes nucléaires (TNP);
- Accords de garanties généralisées avec l’AIEA;
- Traité d’Interdiction Complète des Essais Nucléaires;
- Convention sur la Protection Physique des Matières Nucléaires;
- Traité de Pélindaba, instituant une zone exempte d’armes nucléaires en Afrique;
- Protocole Additionnel aux Accords de garanties avec l’Agence (septembre 2004).
Aperçu sur le Développement des applications nucléaires
Aperçu sur le Développement des applications nucléaires

♀ Formation et recherche:

♀ Près de 300 chercheurs, une vingtaine de Laboratoires et une dizaine d’Unités de Formation (Enseignement Supérieur, Agriculture, Santé, Énergie et Mines);
♀ Formation des centaines d’étudiants et organisation de stages ciblés pour techniciens.

♀ Utilisations sectorielles des techniques nucléaires:
♀ rayonnements ionisants dans le domaine médical;
♀ études et analyses (agriculture, recherche minière, hydrologie…);
♀ contrôle qualité dans l’industrie et contrôle non destructif par radiographie et gammagraphie…
Principales Infrastructures scientifiques et Techniques
Centre d’Études Nucléaires de la Maâmora (CENM)

Le CENM, devant abriter un réacteur TRIGA Mark II de 2 MW, est placé sous la responsabilité du Centre National de l’Énergie, des Sciences et Techniques Nucléaires (CNESTEN);

Les installations scientifiques/techniques et de support confiées au groupement d’entreprises françaises (Technicatome & Spie Batignolles TP) sont achevées;

La mise en service du réacteur en cours de construction par General Atomics est prévue pour cette année (Août 2005);


Paris, 21 & 22 mars 2005
Laboratoires de recherche, Centres médicaux et Centre National de Radioprotection (CNRP)

- Accélérateurs de neutrons et Laboratoires de physique nucléaire (formation, recherche appliquée);
- Laboratoires du CNESTEN (radio pharmacie, contrôles non destructifs, radiotraceurs, instrumentation nucléaire…);
- Irradiateur pilote (INRA Tanger): études relatives à la technique de conservation des aliments par irradiation;
- Centres Nationaux d’Oncologie (Rabat et Casablanca) et Centres de médecine nucléaire pour le diagnostic;
- CNRP: contrôle et mise en application de la réglementation nationale en matière de radioprotection; Centre collaborateur de l’OMS.
L’encadrement réglementaire
L’encadrement réglementaire

- Les textes législatifs et réglementaires sont élaborés dans le cadre du Conseil National de l’Énergie Nucléaire (CNEM) et dans le strict respect des engagements internationaux souscrits par notre pays.

- Les textes en vigueur concernent principalement la protection contre les rayonnements ionisants, l’autorisation et contrôle des installations nucléaires, la responsabilité civile en matière de dommages nucléaires.

- Les textes en projet ont trait à la gestion des déchets radioactifs, au transport des matières radioactives, à l’organisation de secours en cas d’urgence radiologique, à la protection physique et au traitement des aliments par ionisation.
La coopération internationale
**Coopération internationale**

- **Coopération avec l’AIEA:**
  - Le Maroc bénéficie d’une contribution de près d’un million de Dollars US par an au titre de la coopération technique (santé, agriculture, ressources en eau, énergie, contrôle réglementaire, recherche).

- **Coopération bilatérale:**
  - Accord de coopération avec le Commissariat Français à l’Énergie Atomique (CEA);
  - Arrangement de coopération avec la Direction Générale de la Sûreté Nucléaire et de la Radioprotection (France);
  - Accord Maroc-USA relatif aux utilisations pacifiques de l’énergie nucléaire.
Les études relatives au développement de l’électronucléaire
Les études relatives au développement de l’électronucléaire

- Étude sur le dessalement de l’eau de mer :
  Étude de pré-faisabilité pour le dessalement de l’eau de mer réalisée sous les auspices de l’AIEA.

- Études de sites et de faisabilité technico-économique d’une première centrale nucléaire (1984 –1996) :
  - Réalisées avec l’appui d’une société filiale d’EDF et du CEA et l’assistance technique de l’AIEA;
  - Possibilité technique d’introduction d’une unité de 900 MW à l’horizon 2015-2016.
Conclusion

- Mobilisation de la coopération bilatérale, multilatérale et régionale pour le développement des applications des techniques nucléaires dans diverses activités socio-économiques.

- Promotion de la recherche au niveau du CENM de la Maâmora pour la maîtrise du savoir-faire en matière de technologie nucléaire, conservation des aliments, stérilisation des produits industriels…

Merci de votre attention
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Janos Koka
Minister of Economics and Transportation

HUNGARY
Mr. Chairman, Excellencies, Ministers, Ladies and Gentlemen,

First of all, allow me to express my sincere gratitude to the French Government for hosting this conference and congratulating the Director General, Dr. El Baradei of the International Atomic Energy Agency and his colleagues in the Secretariat, and also to the OECD Secretariat for organizing this very actual and important conference.

At the dawn of 21st century we have new type energy related challenges, where the stake is the future prosperity of the mankind, and the human environment. The energy future has an unquestionable eminent role in this issue.

In line with the IEA study on the World Energy Outlook, where the time horizon is 2030, there will be a great energy demand increase, and in parallel there will be a tremendous CO2 emission increase (more than 70 %).

Furthermore, realizing that much more energy, notably electric energy, will be needed by a growing world population, it is equally rational to work for a low carbon intensive energy future, as the basis of sustainable development.
Reducing the carbon intensity is the essential requisite and condition of the success of our fight on global warming. This is an enormous challenge, because the global warming is approaching the point of no return. My strong opinion is clear it is on the favour of nuclear option. I hope we can agree, difficult to see how the world could pursue sustainable development on a large scale, without a much expanded reliance on nuclear energy.

No one denies the high and underlined importance of energy saving, and renewable energy sources, they have their niches in which they make welcome contributions.

The inevitable conclusion is that at the present time and in the next decades the nuclear power is the only viable potential source of vast amounts of additional energy that is sustainable.

These facts and thoughts are not unfamiliar to you. It is also well known to all of us that nuclear power is becoming more competitive in many places.

Given the relatively low fuel prices that have prevailed in recent years, new fossil-fired power plants generally provide cheaper electricity than new nuclear plants. But the existing sharp rise in fossil fuel prices, restrictions and taxes on carbon-dioxide, and the reduction in nuclear capital cost could tip the economic balance in favour of new nuclear plants. A long term commitment to reduce carbon dioxide emissions could provide a new impetus to nuclear power over the coming decades.

In politics, as in business, timing is of crucial importance. When the timing is right, there must be a readiness to use the nuclear opportunity. Some OECD and non-OECD countries have recognised that the moment of step forward has arrived, and they have started the preparation of new facilities. They have made not only political, but economical decisions, with the competitiveness as a key factor in the focus.

Beyond the environmental and economic benefits the nuclear power may provide an attractive option in the search for greater energy security, which is the one of the main pillars of the energy strategy.
Mr. Chairman, Ministers, Ladies and Gentlemen,

These aforementioned global trends and challenges have reflected also in the Hungarian energy and nuclear policy. Now allow me to concentrate on the Hungarian domestic issues.

The capacity structure of the Hungarian electricity system is presently well balanced, with a dominant 39% nuclear share.

The Hungarian energy supply is about 70% energy import dependent, therefore the security of energy supply is a crucial priority of the national energy strategy.

The safe, successful and profitable operation of the state owned Paks Nuclear Power Plant greatly contributes to meeting this challenge. The obligatory stockpiling of nuclear fuel for two years is also an essential element in ensuring the stability of supply in case of any disturbances in import.

The security of energy supply cannot be maintained without nuclear power in Hungary. This fact is not debated in the country.

At the same time we are well aware that not only the security of supply but nuclear safety is also a national responsibility with the highest priority, therefore our first strategic goal is to make sure that the NPP maintains a vigilant approach to nuclear safety.

Safety has been considered as the highest priority of the operation of the Paks NPP. The first safety improvements were already implemented at the plant during the early years of operation. The first state of the art safety review were made in early nineties. Between 1995 and 1999 the first Periodic Safety Review of Paks NPP was performed. The Final Safety Analysis Report was complied in 2000 in accordance with best international practice, like the US Nuclear Regulatory Commission Guidelines.

The most important outcome of these analyses was the definition of a comprehensive safety upgrading programme, which had been implemented
in the period of time 1996-2002. In 2004 the Final Safety Analysis Report was renewed, which includes the reconstitution of the design base information and also the assessment of effects of the implemented safety upgrading programme.

The safety level achieved is shown in the figure below where the core-damage frequency is plotted versus time demonstrating the improvement achieved year by year. The safety level of the Paks Nuclear Power Plant today is about the same or even higher as the same vintage units in OECD countries. Several review missions of competent international organisations (International Atomic Energy Agency, Western European Nuclear Regulators’ Association, World Association of Nuclear Operators, etc.) acknowledged the effort of Paks NPP in improving of safety. Safety is always in the focus of the operators and authority attention. Further improvements are to be expected from the level two probability safety assessment and from the upcoming periodic safety review.

![Core Damage Probability Chart](image_url)

Fig 1. Decreasing the core damage probability with implementation of safety upgrading measures

Hungary is a state party to the Nuclear Safety Convention and on the two review meetings of the convention Hungary gave a full picture on the safety of the Paks Nuclear Power Plant and the activities related to that. The third
report prepared to the review meeting to be held in April this year contains the detailed description of the serious incident of April 2003.

These reports can be downloaded from the HAEA’s website (www.oah.hu/web/portal.nsf/download). Based on the experience gained from the incident and as a result of the investigations several measures, recommendations and suggestions were formulated to improve the operating and regulatory activities. An IAEA’s mission held in February this year reviewed the activities of the plant and the regulatory body addressing the recommendations and suggestions of the previous IAEA’s mission. Considerable progress has been achieved in all issues as it is shown on the press release of the mission which can also be found on the website.

Hungary naturally has ratified the Kyoto protocol. The existing fuel mix of power generation and its expected short to medium term changes allow the fulfillment of our Kyoto commitment. Although growing use of renewable energy sources and also the better energy efficiency will play an increasing role in the reduction of emissions, the essential contributor to the limitation of emissions is the nuclear power generation. The nuclear power generation with near zero green house gas emission, allows us to keep the emission within limits. Nuclear power production is the cheapest way of emission reduction for us.

The power generation sector in Hungary provides the solid basis of functioning of the economy and ensures the public use of electricity. The recent and expected market deregulations give the frame both for the liberalized trade and for coverage of public needs.

The energy prices are not adverse today to the economic growth of our country. It has to be mentioned that the average electricity production price is essentially influenced, limited by the cheapest and one of the largest producers, the Paks Nuclear Power Plant, which is the dominating producer for public needs.

Mr. Chairman, Ladies and Gentlemen,

This convenient situation described above could change significantly after 2012, if the units of Nuclear Power Plant Paks would be shut down with the expiry of their operational licenses.
Based on the present tendencies and market conditions, the prediction says that either we have to cover the lack of electricity or the growth of demand with gas fired power plants that produce energy more expensively compared to the nuclear power plants, or we have to import electricity which will further increase our import-dependency.

The only feasible solution to this problem is the long term operation of the Paks Nuclear Power Plant. It helps us to avoid strategically unfavorable structural changes in the Hungarian energy mix.

In line with that on behalf of the Hungarian Government I would like to announce that my government is ready to provide the necessary political support for ensuring the long time operation of the plant.

The design lifetime of the VVER-440/213 Units at Paks equals to 30 years, the operational license is formally limited in time by the planned operational lifetime. Like in other countries, the current Hungarian legislation for nuclear energy allows the renewal of the operation license, if the safety of the continuation of the operation can be demonstrated, and approved by the responsible authorities.

In the last five years intensive and systematic work has been done for preparing of the decision on the extension of operational license of the Paks Nuclear Power Plant.

An expert team has elaborated a study include a detailed assessment of the plant status, ageing and lifetime prognosis of plant structures, systems and components, definition of necessary reconstructions. This study demonstrates that the condition of the plant is excellent, and the continuation of safe operation for other 20 years after expiry the actual operational license is feasible.

The most important, life-time limiting equipment, e.g. reactor pressure vessels and steam-generators allow 50 years safe operation.
A preliminary environmental study shows the acceptability of continuation of the operation as well as the adverse effect on the amount of the emissions of the power industry if the nuclear power plant is replaced by fossil capacities. A detailed business analysis supports the decision on the extension of operation lifetime.

The extensive decision-making process ended up with the owner’s decision to prepare the formal license renewal of Paks Nuclear Power Plant as required by the Hungarian legislation.

Obviously, the renewal of the operational license of the Paks NPP is a strategic decision, which takes into account all possible and necessary circumstances, those mentioned already and also the social aspects and public acceptance.

The public acceptance of nuclear power generation in Hungary has been continuously over 70% for many years.

The Hungarian legislation for nuclear energy in relation to the extension of operational license was developed adapting the international best practice.

Because of its high importance we turned to the international community and the International Atomic Energy Agency for assistance and now I would like to take this opportunity to express our appreciation and gratitude for the timely and high value assistance we received.

We are particularly thankful for the assistance received from the Agency and the US NRC. The safety of the plant is an unambiguous condition of the operation. It is considered as a precondition of the license renewal and long term operation.

An other high priority condition of the long-term operation of the plant is the solution of final disposal of radioactive waste and spent fuel. The intermediate storage of spent fuel is feasible at the site extending the already existing storage capacities, while the optimal back-end solution will be developed.
The preparatory work for the high level waste repository has already started. Construction of a low-level waste depository would be feasible within a relatively short time, if the political consensus is reached and the licensing process is not delayed.

Mr. Chairman, Ladies and Gentlemen,

The nuclear option, particularly the long-term safe operation of the Paks Nuclear Power Plant is an invariable element of the Hungarian energy strategy for the next 20 years period. Without this Kyoto targets and the targets beyond Kyoto can not be met. The extension of operational license – under the highest safety condition – is the most cost effective way to keep the emission within our Kyoto commitment.

Nuclear power also contributes significantly to Hungary’s security of supply, due to the availability of alternative fuel supply, lack of any significant fuel price risk and the easy to reserve-feature of fresh nuclear fuel.

Concluding, we are all here because we have much in common. We all seek a peaceful world with sustainable development. We all seek a clean, healthy environment together with the prosperity of mankind. And we all know that nuclear energy can help us in achieving these goals. It is my conviction and it is my main message to this conference.

Thank you very much for your kind attention.
International Ministerial Conference:
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21 - 22 March 2005

Ministerial Presentation

Mr. Sergio Ajuria Garza

on behalf of

H.E. Mr. Jose Alberto Acevedo Monroy
Vice Minister in charge of Electricity

MEXICO
Situación global de la industria eléctrica nacional

- El Sistema Eléctrico Nacional tiene una capacidad de generación total instalada de 45,922 MWe
- La capacidad nuclear de generación es de 1,365 MWe
- La generación eléctrica total (incluyendo la nuclear) en 2003 fue 200,940 GWh(e) de los cuales 10,509 GWh(e) fueron de origen nuclear
- La mezcla energética utilizada para generar esta cantidad de electricidad es:
  - Combustóleo 49.8%
  - Gas natural 22.3%
  - Hidro 12.4%
  - Carbón 8.0%
  - Nuclear 4.8%
  - Geotermia y eólica 2.7%
- Se estima que el consumo nacional de energía eléctrica tendrá una tasa anual de crecimiento de 5.6% entre 2003 y 2012
- Entre 2005 y 2012 se espera incrementar la capacidad de generación en 21,475 MWe

Generación nuclear existente

La Comisión Federal de Electricidad (CFE) opera la Central Nucleoeléctrica de Laguna Verde (CNLV), en Laguna Verde, Veracruz.

La CNLV cuenta con dos reactores de agua en ebullición (BWR) General Electric Mark V, con una potencia combinada de 1,365 MW(e).

- Laguna Verde I comenzó su operación comercial el 29 de julio de 1990
- Laguna Verde II comenzó su operación comercial el 10 de abril de 1995

La experiencia operacional con Laguna Verde ha sido muy positiva. La electricidad generada por la CNLV es la más barata del sistema. Adicionalmente, la alta confiabilidad de la Central Laguna Verde ha sido un factor importante para estabilizar el Sistema Eléctrico Nacional.

- Durante su vida operacional, la CNLV tiene un factor acumulado de disponibilidad de energía de 80.3% (superior al promedio mundial de 76%)
El futuro de Laguna Verde

La vida de diseño de las dos Unidades es de 40 años. No obstante, la Comisión Nacional de Seguridad Nuclear y Salvaguardias (CNSNS), órgano regulador nacional, otorgó licencias de operación por solamente 30 años.

- Laguna Verde I está licenciada hasta 2020
- Laguna Verde II está licenciada hasta 2025
- Es la intención de CFE operar los dos reactores hasta la expiración de sus licencias.
- La CFE, en colaboración con el Instituto Nacional de Investigaciones Nucleares (ININ), y con el apoyo del Organismo Internacional de Energía Atómica (OIEA), está llevando a cabo estudios que permitan eventualmente solicitar al órgano regulador una extensión de las licencias.
- En los Estados Unidos, la Nuclear Regulatory Comisión (NRC) ya ha extendido las licencias de más de 10 reactores de agua en ebullición (BWR), del mismo tipo que los de Laguna Verde. La extensión que puede conceder la NRC es hasta de 20 años, dependiendo de las circunstancias específicas de cada reactor.
- Es de suponerse que, previo cumplimiento de los requisitos reglamentarios, la CNSNS podría extender las licencias de los reactores de Laguna Verde por 20 años más, hasta 2040 y 2045 para las Unidades I y II respectivamente.

Opinión pública

La opinión pública es cada vez un factor más importante para el desarrollo de las actividades nucleares. Tanto en México como en otros países la opinión pública desfavorable está influyendo negativamente en el desarrollo de las actividades nucleares.

La Secretaría de Energía, en colaboración con el Organismo Internacional de Energía Atómica, está trabajando en un programa integral de opinión pública con el objetivo global de mejorar la opinión del público respecto a la tecnología nuclear, incluyendo la generación de electricidad, y disminuir la oposición a esta tecnología.
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Mr. Sergio Ajuria Garza

on behalf of

H.E. Mr. Jose Alberto Acevedo Monroy
Vice Minister in charge of Electricity

MEXICO
EL PAPEL DE LA ENERGÍA NUCLEAR EN MÉXICO EN EL SIGLO 21

Sergio Ajuria
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El Instituto Nacional de Investigaciones Nucleares pertenece al Consorcio IRIS (International Reactor Innovative and Secure), encabezado por la Westinghouse Electric Company e integrado por 21 organizaciones de 10 países.
El objetivo del consorcio es desarrollar un reactor avanzado de agua ligera a presión que pueda estar listo para su uso en 2012. IRIS es un reactor integral (todos los componentes del sistema primario están dentro de la vasija), modular, de mediana potencia (335 Mwe), con un grado de seguridad mejorado y económicamente competitivo.
La Comisión Federal de Electricidad (CFE), el Instituto Nacional de Investigaciones Nucleares (ININ) y la Secretaría de Energía (SENER) siguen de cerca los estudios que realizan la Agencia de Energía Nuclear (AEN) y el Organismo Internacional de Energía Atómica (OIEA) sobre los futuros reactores de potencia de cuarta generación (GEN –IV).
La opinión pública es cada vez un factor más importante para el desarrollo de las actividades nucleares. Tanto en México como en otros países la opinión pública desfavorable está influyendo negativamente en el desarrollo de las actividades nucleares.

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21 - 22 March 2005

Ministerial Presentation

Mr. Turki bin Saud bin Mohammed Al-Saud
Vice President
King Abdulaziz City for Science and Technology

SAUDI ARABIA
كلمة رئيس وفد المملكة العربية السعودية
إلى المؤتمر الدولي المعني بمستقبل الطاقة النووية
في القرن الواحد والعشرين
باريس: 21-22 مارس 2005

الدكتور تركي بن سعواد بن محمد آل سعود
نائب رئيس مدينة الملك عبدالعزيز للعلوم والتكنولوجيا
لمعاهد البحوث
السيد الرئيس

إن أمامنا فرصة تاريخية لاستشراف دور الطاقة النووية في القرن الجديد، وإلقاء المزيد من الضوء على دور الطاقة النووية في الإسهام في توفير الطلب المتزايد على الطاقة ومن ثم الإسهام في تحقيق مخططات التنمية في العديد من الدول.

وحفظاً على الوقت لن أنطلق إلى أي تفاصيل فنية حيث ستحظى بالقدر الكاف من العناية والمناقشة في جلسات المؤتمر، بل سأكتفي بإبداء الملاحظة التالية.

جاء في تقارير الوكالة الدولية للطاقة الذرية أن حكومات عدد من الدول المتقدمة قد تراجعت عن مخططاتها للاستخدام خيار الطاقة النووية،
وعنعتد أن اتخاذ مثل هذه القرارات السياسية يرجع في المقام الأول إلى المخاوف من المخاطر المقترنة بتشغيل المنشآت النووية والتصرف في النفايات المشعة وخاصة بعد حادث تشيرنوبيل الذي تعددت آثاره كل الحدود.

ونرى في سياق ذلك أن على الوكالة الدولية للطاقة الذرية مواصلة مهامها المتعلقة بتزويج الأمن العالمي للطاقة النووية من أجل الحفاظ على مصداقيتها.. وأنه يتعين على الوكالة أيضاً استثارة أعمال المقارنة والتقويم ل đánhنيات وسلبيات مختلف مصادر الطاقة بشكل موضوعي ومنصف ومحايد، قبل أن تقدم على الحديث بشكل قاطع عن دور وإسهام الطاقة النووية في تحقيق التنمية المستدامة.

السيد الرئيس

عكفت الوكالة الدولية للطاقة الذرية في السنوات الأخيرة على تعزيز وتكامل نظام الضمانات.. ودعت إلى التطبيق العالمي له، فاستجاب الكثير من الدول لذلك بينما امتنع البعض عن قبول تلك الدعوة.

ولما كانت المملكة العربية السعودية تكن إدراكاً متقدماً لأهمية شمولية أنشطة الرقابة والتحقيق، وضرورة أنها تعزز الأمن المادي للمرافق والمواد النووية، والمساعدة على منع الاتجار غير المشروع بالمواد النووية، والتصرف والتخلص المأمون منها، والتصدي والمنع لاحتمالات الإرهاب النووي .. فإن المملكة مع من يؤدى إن كل ذلك في مجمله لا يلغي المسؤولية الأولية التي تقع على كاهل الدول فيما يتعلق ببعض أمن الدولة وحماية أراضيها ورعاياها، وتلزمهما إلى جوار ما سبق بأن تعمل فرادي ومتعاوناً على توطيد دباؤهم الأمن والأمن النووي على كافة
الأصدامة الوطنية والإقليمية والعالمية. كما تؤكد على موقف المملكة
الثابت يجعل منطقة الشرق الأوسط خالية من الأسلحة النووية.
السيد الرئيس

لقد بنبت سياسات المملكة البترولية على أساس التوازن بين مصالحها
الاقتصادية في المدى القصير والطويل، والتعاون مع كافة الدول المنتجة
والمستهلكة للبترول. وتتمثل السياسة البترولية للمملكة من موقعها في
السوق البترولية باعتبارها تملك أكبر احتياطي ثابت وجوده في العالم
حيث يشكل أكثر من نصف الاحتياطي العالمي وباعتبارها أكبر منتج
ومصدر للبترول، ومن المتوقع أن يكون الاحتياطي أكثر من ما هو عليه
مع استمرار الاكتشافات الجيدة والتطور التكنولوجي والإحتياطي الحالي
وحسب معدلات الإنتاج الحالية، من المفترض أن يستمر لمدة قد تصل
إلى حوالي المائة عام بإذن الله.

إن ركائز السياسة البترولية السعودية تقوم على:

- استقرار أسواق البترول.
- التعاون مع الدول المنتجة والمستهلكة.
- استمرار نمو الطلب على البترول متوافقاً مع النمو الاقتصادي
  العالمي.
- بناء صناعة بترولية وطنية ذات كفاءة وقدره على المنافسة.
- بناء قنوات للحوار مع جميع الدول في موضوعات الطاقة والبيئة
  والتقنيات التي تساعد على التوافق بينهما.
ومن هنا، فإن المملكة، يهمها استمرار البترول كمصدر أساسي للطاقة، بل والعمل على زيادة الطلب عليه. ولا شك إن استقرار السوق، وتوفر الإمدادات يساهم في الإعتماد على البترول كمصدر أساسي للطاقة. كما أن المملكة تركز على أهمية وجود سوق حرة للبترول دون تدخل في أو تعارض مع قوى العرض والطلب. ولهذا السبب، فإن المملكة توضح ذلك للعالم دائمًا، وتعارض التمييز ضد البترول من قبل بعض الدول المستهلكة، والتمثيل في فرض ضرائب عالية على المنتجات البترولية تصل في بعض الأحيان إلى حوالي 80%، كما أن المملكة تقف ضد السياسات التي تقدم الإعانات المالية لبعض مصادر الطاقة دون غيرها مثل الفحم والطاقة النووية، بينما تجعل البترول عرضة للضرائب الباهظة. ولكون المملكة في سياساتها العامة وأهدافها الأساسية، تسعى دائمًا نحو التعاون والإستقرار الدولي في كافة المجالات، كما تسعى على زيادة الرخاء الاجتماعي والتطور الاقتصادي العالمي، فإنها تهدف كذلك إلى تسخير ثرواتها البترولية من أجل تحقيق هذه الأهداف البالغة. وتحقق هذا بالطبع بتوفر الإمدادات عند الحاجة، مما يسهل في استقرار السوق، ليس فقط في جانب العرض والطلب، بل كذلك في استقرار الأسعار، وما يعود بالفائدة على الدول المنتجة والصناعة البترولية والدول المستهلكة.

وقد عملت المملكة على إمكانيات الدول المستهلكة باستمرار الإمدادات عن طريق التدخل للتوعيم أي انقطاع طارئ في الإمدادات وقامت من أجل ذلك ببناء طاقة إنتاجية عالية منها أكثر من مليوني برميل يوميًا غير مستغله لغرض مقابلة ذلك الاحتمال. وقامت أيضًا بالمشاركة في محطات تكرير البترول في الأسواق الرئيسية وبناء أسطول ناقلات ضخم لغرض
ضمان استمرار تدفق الزيت إلى تلك الأسواق. وتدعو المملكة إلى إنهاء المعاملة التمييزية للبترول في الأسواق الرئيسية عن طريق خفض العبء الضريبي على المنتجات لكي ينمو الطلب بشكل طبيعي وتنمو تجارة البترول بين الدول بما فيه سلامة الاقتصاد العالمي.

السيد الرئيس

إن هناك علاقة وثيقة بين الطاقة والبيئة، إذ يؤثر إنتاج الطاقة واستهلاكها، كما هو الحال مع الأنشطة الأخرى التي يمارسها الإنسان، في البيئات المحلية والإقليمية والعالمية. ومن الأمثلة عليها انبعاث الغازات والجسمات الدقيقة في حالة الوقود الإحفوري والأنشطة ونفايات الطاقة النووية. وعلى مر السنين، ساهمت التقنية والإبداع الإنساني والخطي الهائلة التي تم تحقيقها في مجال زيادة كفاءة استخدام الطاقة في التخفيف من أثارها البيئية. ففي صناعة البترول ساعد استخدام المحولات التحفيزية والمنتجات البترولية الأنظف وتحسين مواصفات الناقلات وخطوط الأنابيب وإرشادات تخفيف الإنبعاثات في عمليات الإنتاج على تقليل تلوث الهواء والماء. وقد أثبتت صناعة البترول الدولية بأنها على مستوى التحدي وأستمرت بلا-fin الدولارات لجعل عمليات الإنتاج وأنواع المنتجات غير ضارة بالبيئة.

وإنه من المؤسف أن نشير هنا أنه بالرغم من وجود هذه التحسينات في جودة المنتجات البترولية، إلا أن الدول الصناعية قد بادرت بسن سياسات وبرامج أخرى للتقليل من استخدام النفط وبخاصة في مجال توليد الكهرباء وذلك لصالح الفحم الأكثر تلوثاً للبيئة أو الطاقة النووية التي يكتنفها الكثير من المخاطر.
وتتفرخ المملكة بأنها من الدول النامية الريادية في مجال حماية البيئة من خلال مراقبتها التامة لإعتبارات البيئة في جميع القطاعات الإقتصادية، وقد أصدرت مؤخرًا النظام العام للبيئة والذي يحكم العلاقة بين النشاط الإقتصادي والبيئة. كما تسعى المملكة من خلال العمل الجماعي الدولي المشترك على المساهمة في جهود حماية البيئة العالمية، فهي من الأطراف في إتفاقية الأمم المتحدة للتغير المناخي وأيضاً بروتوكول كيتوتو.

وفي الوقت الذي تحرص فيه المملكة على تطبيق إلتزاماتها في إطار هذه الإتفاقية والبروتوكول لاحقاً فإن المملكة تطالب جميع الدول والدول الصناعية منها على وجه الخصوص، بتطبيق هذه الإلتزامات بشكل متكامل وليس على أساس إنتقائي.
السيد الرئيس

يطيب لي أن اختتم حديثي بالإعراب عن عميق الشكر والتقدير لحكومة وشعب جمهورية فرنسا على استضافة هذا المؤتمر.

شكراً السيد الرئيس.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

Mr. Constance Morella
Ambassador
US Permanent Representative to the OECD

on
behalf
of

US Secretary of Energy
U.S. Secretary of Energy Remarks for the March 21 & 22 Ministerial on
Nuclear Power in the 21st Century, Paris, France

To Be Delivered By the Honorable Constance Morella, U.S. Ambassador
to the Organization for Economic Cooperation & Development
(Suggested length: a 5-7 minute read)

[Short intro sentence or two by Amb. Morella and then she should proceed to read S-1’s
Statement.]

United States Secretary of Energy Sam Bodman extends to all of you his best wishes for
a successful meeting, and has asked that I read the following statement on his behalf.
Distinguished delegates of the nuclear power ministerial:

I appreciate your invitation to participate in this important Ministerial. I applaud the government of France for hosting this conference - and the International Atomic Energy Agency and the Nuclear Energy Agency for organizing it.

We, in the United States, believe that in our Nation and in other countries throughout the world, nuclear energy is a key component of a balanced portfolio mix. The President of the United States and I are committed to policies that encourage the deployment of current nuclear energy technologies. And, we are committed to the research and development needed for the next generation of nuclear power.

Today’s nuclear power plants are operated more safely and efficiently and are more economic than at any time in history. In the United States, this record of success has set the stage for building new nuclear power plants for the first time in many years. A recent study by the University of Chicago concludes that U.S. nuclear power plants can become cost-competitive with electricity produced by coal and natural gas — once the additional costs associated with building the first plants are absorbed.

On the occasion of this conference, “Nuclear Power in the 21st Century,” I would like to stress that U.S. interest in, and support of, nuclear energy has never been stronger. President Bush, in his February 2, 2005, State of the Union Address, affirmed that the United States would benefit by expanding its use of nuclear energy. In fact, just two weeks ago, in a public discussion on energy policy, President Bush stated:

“To ensure a diverse energy supply, we need to promote safe, clean nuclear power. Nuclear power can generate huge amounts of electricity without ever emitting air pollution or greenhouse gases. America hasn't ordered a nuclear power plant since the 1970s, and it's time to start building again...yet, decades of experience and advances in technology have proven that nuclear power is reliable and secure. We're taking early steps toward licensing the construction of nuclear power plants, because a secure energy future must include nuclear power.”

Under the President’s leadership, my Government has launched new programs that encourage industry to take critical steps toward the construction of new plants. For example, we are well under way with the Nuclear Power 2010 program. This program utilizes partnerships between our Government and industry to license new plants and develop the world’s most advanced nuclear power plant designs for use in the United States. The U.S. Government will invest over $500 million over the next six years to license the construction of at least two or three new plants.

For the longer term, we are working with many of the countries represented here today in the Generation-IV International Forum or GIF. GIF is an international initiative to develop the next generation of nuclear energy systems. On February 28, 2005, at the French Embassy, I joined with France’s Ambassador to the United States, His Excellency
Jean-David Levitte, and Ambassadors and senior representatives from the United Kingdom, Japan and Canada. At this meeting we signed the GIF Framework Agreement for the development of next generation nuclear energy technologies. This is the first multilateral agreement in history aimed at the development of next generation nuclear energy systems, and I was very proud to be a part of this event.

Each of the 11 participating GIF member nations recognizes that new nuclear power technologies must be developed if we are to meet our growing energy needs and sustain economic growth. The research agreement accelerated an international effort to develop Generation-IV nuclear energy systems – advancing nuclear energy technology that will be safer, more reliable, cost effective, proliferation resistant and environmentally responsible.

As technology advances and populations grow, the worldwide demand for energy will also increase at a rapid pace. The International Energy Agency predicts that global demand for energy will rise by about 60 percent over the next 25 years, and that two-thirds of the increase will come from developing countries.

Utilization of nuclear power as an energy source to meet the growing demands for energy brings many important benefits. Because of its long-term potential to bring clean and cost-effective energy to the developing world, and to help industrialized nations increase their energy security, and to help all nations deal with some of our most pressing environmental challenges, the advantages of nuclear power are strikingly clear. This is especially true as next generation nuclear energy technologies demonstrate their ability to produce clean-burning hydrogen, as well as electricity to help free our economies from imported petroleum.

The pursuit of civil nuclear power carries with it a great responsibility. We must ensure that this benefit to humankind is not diverted to activities that increase the risk of nuclear weapons proliferation. In the words of President Bush, “The world must create a safe, orderly system to field nuclear plants without adding to the danger of weapons proliferation.” The IAEA’s safeguards system is crucial in this regard, and must be given the tools it needs, including universal adherence to the Additional Protocol. We must also enact and implement the strongest possible export controls and protect nuclear facilities and materials from theft and sabotage. Progress in these areas will preserve nuclear power’s peaceful use and long-term benefits as an energy source.

As international partners united by a common goal, we can work together to expand the use of safe, economic, environmentally sustainable and proliferation resistant nuclear power. We can assure that the citizens of all our countries have access to the energy they will need in the future. Together, we can usher in a new age of energy and economic security that enhances the quality of life for people around the world. To advance our collective nuclear energy policy objectives, I support the creation of a joint statement summarizing the message of this Ministerial.

Best regards for a successful Ministerial.

Very Sincerely,
Samuel Bodman
U.S. Secretary of Energy
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Pavol Rusko
Minister of Economy

SLOVAK REPUBLIC
Slovakia is well aware of the challenges to be tackled in the 21st century in the face of a steady growth in energy demand. After sweeping economic reforms and the arrival of large foreign investors, Slovakia is expected to see heavier industrialization and urbanization, which will come hand in hand with higher energy consumption even in regions where, at present, the per-capita consumption is fairly low. As seen in the most recent draft of the new energy policy that deals primarily with these sets of issues, all major steps in the energy sector were taken with this forward-looking approach in mind.

Since the year 2000, all major Slovak utilities have undergone a fairly extensive reorganization which allowed reaching better economic efficiency by spinning off non-core businesses, introducing new ownership structures and downsizing the labor force across the entire energy sector. The objective underlying the privatization and reorganization of the energy sector is the development of the electricity and gas market in compliance with the requirements for liberalization, diversification of energy sources, creation of a competitive environment, influx of capital and foreign investment and the use of privatization proceeds for the compensation of costs associated with the introduction of electricity and gas into municipalities.

All power distribution companies are currently in private hands, delivering services across the whole territory of Slovakia. The market was also liberalized.

The privatization of Slovenské elektrárne (Slovak Power Company) – the dominant electricity producer - will be completed in late 2005. The selected strategic partner – Italian-based ENEL – will continue developing the company and consolidating its financial situation in compliance with the strategic objectives of Slovakia’s energy policy.

In the light of its importance and character, Slovenská elektrizačná a prenosová sústava (the Slovak Grid Company) is not foreseen to be privatized.

Slovakia imports close to 90% of its primary energy sources (including nuclear fuel). Domestic energy sources are limited to renewable energy sources and brown coal. Gas and oil production in Slovakia is marginal.

The Economic Strategy of the Slovak Republic defines sustainable economic growth as its primary objective. However, in the light of the domestic situation that I mentioned before, attaining this objective turns on the security and reliability of the supply of energy, which, however, must be produced with an optimized cost base, in an environmentally aware manner and with an emphasis on maximizing self-sufficiency in electricity production.

The energy policy objectives give rise to several priorities, such as the effort to scale back fossil fuel imports, which is a direct consequence of the effort to mitigate environmental impacts of energy production.
The principles relevant for this priority are as follows:
- nuclear energy is to be treated as a diversified, economical and, from the environmental perspective, as a clearly "green" electricity production method
- domestic primary energy sources are to be used in compliance with the Raw Material Policy
- the use of renewable energy sources is to be promoted
- the deployment of CHPs is to be supported

In the light of the adverse environmental aspects of certain energy sources, the Slovak Republic laid down its 2020 green-house gas emission targets in the Kyoto Compliance Strategy.

However, the only way for Slovakia to meet these targets is to bring down fossil-based energy production, whereby, in view of the unreliability of renewable energy sources, the only match for and real alternative to fossil fuels is nuclear energy, because Slovakia has already fully harnessed its hydro power potential.

Slovakia is ready to support the further development of nuclear power, which — provided that all international standards are met — represents the best and most effective way of mitigating the green-house effect. We see nuclear energy as green energy which may, in the foreseeable future, become a viable substitute for fossil sources which delivers the reliability needed to satisfy the growing demand for energy.

This is why we fully support the completion of blocks 3 and 4 in Mochovce to make up for the blocks in Jaslovské Bohunice that are decommissioned before the end of their useful life. And this is all the more true after the strategic investor made a commitment to complete both blocks without a government guarantee.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Raimonds Vejonis
Minister for Environment

LATVIA
Mr. Conference President,
I am pleased to join others in discussions on the development of nuclear power technologies and related environmental protection questions during the Conference. My delegation is convinced that the Conference will have successful outcomes. I would like also to express my greetings and best wishes to Director General Doctor ElBaradei and Secretary General Mr. Johnston in further promoting the peaceful use of nuclear technologies for development goals especially in relations to human life and environment.

A further developing of economy of Latvia is connected with increasing demand for energy. The Government of Latvia investigates the possibilities to increase the energy production on site to promote improving of living standards of the population of Latvia. The main suppliers of electrical power in Latvia are thermo electrical power stations and hydro electrical power stations. One of the most important options for energy increase is the developing the sources of renewable energy. Latvia has not any nuclear power station and experience in the nuclear technologies of Latvia is connected with Salaspils research reactor, which is under decommissioning from July 1998. Near surface radioactive wastes disposal site is in operation in our country.

In my presentation I will focus only on some important issues for my country as well as on ways how to improve our joint efforts and continue working together for the benefits of international community.

Firstly, I will talk about very challenging question, which was discussed during several last years, namely nuclear knowledge management. Secondly, I will focus on some
environmental issues, important for Latvia. In the final part of my speech, I would like to highlight some insights on security aspects.

Knowledge management

We are well aware about difficulties encountered today for many technical sciences and applications. These issues are of particular importance for countries like Latvia experiencing fast changes in many fields and trends for the young generation to find their interests in non-technical fields. We are conscious that the nuclear science, technology and applications contribute to many means of human socio-economic development. For our country at present, most important nuclear applications are in fields of health care, natural sciences and environmental protection. Unfortunately, the number of graduates from technical universities as well as competition among applicants has a decreasing trend. Thus, there is no other option left as to cooperate with other countries in order to maintain the knowledge.

We recognize that preserving and enhancing of nuclear knowledge is very important to ensure the availability of qualified experts, which are vital to the safe and secure utilization of nuclear technologies. Therefore we are promoting the networking among relevant establishments and institutions; our experts and potential experts have participated in international activities in the past and we will continue encouraging the enhancement of knowledge by means available, such as trainings, expert group meetings etc. also in future.

Environment protection issues

The Government of Latvia has no plans for the development of nuclear technologies in the energy production field. The policy of the Government is concentrated on the development of renewable natural resources and increasing of efficiency of energy consumption. We believe, that such policy ensures more reasonable protection of environment, since production of energy is connected with pollution of environment – emissions of carbon dioxide and toxic chemical compositions. The increase of price for fossil fuel has an important influence on the economical development of country. The increase the number of transport vehicles gives an additional stress on the environment,
especially for large cities with developed economy. The Government of Latvia elaborated the programme for developing of renewable natural resources in energy and fuel production industries. The utilization of local renewable natural resources can facilitate the local economy growth; can reduce the fuel price and thefts for environment.

On the another hand, we understand, that the ecological problems are global and the same for all countries. Therefore, we are interested in international co-operation in the protection of environment, also in reduction of the contamination of environment with radionuclides from nuclear and radiation facilities, including disposal sites of radioactive wastes. The key points for increasing of radiation safety of population in Latvia are safe decommissioning of Salaspils research reactor and radiation safety upgrades in the disposal site of radioactive wastes. Latvia is working on implementation of our first Radioactive Waste Management Strategy. Among several challenging tasks is disposal for long-lived radiation sources, which could well be an international undertaking. Therefore, we joined other countries, which work on these issues under EU auspices, but we believe that there is also space for wider activities leaded by the Agency in this respect.

Scientific activities for protection of environment from radioactive materials are connected with elaboration of new compositions for cementation of radioactive wastes. The basic goal of such investigations is to reduce the migration of radionuclides in environment and reduce the irradiation doses of population. These investigations promote the development of radioactive wastes management systems, which are friendlier to the environment and can be suitable for the further development of nuclear technologies in future.

Latvia submitted the full scope implementation project for cyclotron facility to the Agency last year. It will be major TC project for us and many activities will be accomplished together. This project will contribute greatly for the developments in nuclear science and applications as well, including environmental protection studies. As the cyclotron facility will be installed at research reactor site, which is in early stage of decommissioning, it will help to preserve working places for scientists and will provide alternatives for further activities.
Security aspects

One of the key aspects for nuclear facilities utilization is safety. I believe, there is no need to convince others in this room that safety is indissolubly linked with security, especially for high activity sources and nuclear facilities. Terrorism thefts to the nuclear objects and nuclear materials significantly influences on the development of nuclear energy technologies. The security demands for such objects increases, which results in increase of nuclear energy expenses. Security and protection must be carefully balanced versus proliferation and terrorism possibilities. Such approach significantly reduces attractiveness of nuclear energy as a perspective energy source in future. This is not only problem for each nuclear site, but it is also a problem at national and international level. Analysing the situation with respect to prevent proliferation and development of weapons of mass destruction, we find that situation needs to be improved. There are only few tens of countries, which participate in regimes for import, export and transit control of dual use nuclear items. The Comprehensive Nuclear-Test-Ban Treaty has not come into force – around 80 countries have not ratified it as yet, including a dozen of Annex 2 countries. We believe that global implementation of an effective system for safety and security of nuclear facilities delivers universal security benefits and therefore can promote the further development of nuclear energy technologies in future.

In conclusion, I can stress, that despite the fact, that Latvia has not infrastructure for utilization of nuclear energy facility, the Government of Latvia will continue to support the development of technologies and will execute the measures for protection of environment, including decommissioning of Salaspils research reactor and upgrading of radioactive wastes management system. We look forward to working with the EU, Agency and another international institutions to meet the new challenges that lie ahead in coming months and years.

Thank you, Mr. Conference President!
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

Mr. Ion Codrut Seres
Minister of Economy and Commerce

ROMANIA
GOVERNMENT OF ROMANIA
MINISTRY OF ECONOMY AND COMMERCE

THE ROLE OF NUCLEAR POWER IN
THE ROMANIAN ENERGY STRATEGY

Ioan Codrut SERES
Minister

International Conference
“Nuclear Power for the 21-st Century”
21-22 March 2005 Paris France
GROSS POWER GENERATION STRUCTURE IN 2004

TOTAL - 56.9 GWh (gross)

Oil & Gas
11,200 GWh

Hydro
16,500 GWh

Nuclear
5,550 GWh

Coal
23,650 GWh
Based on the restructuring process started in 1998, the actual energy sector is based on the electricity market, open 55%, regulated by the National Agency for Electricity Regulation (ANRE).

The hydro, nuclear and thermal independent producers supplied the electricity to eligible and captive Romanian consumers.

TRANSELECTRICA, the national electricity transmission company, is also a system and commercial operator of the Romanian electricity market.

Electrical distribution company with 8 regional subsidies started the privatization in 2004.

The current annual electricity consumption per capita is about 2 500 kWh.
THE ROMANIAN ENERGY STRATEGY

- The Romanian energy strategy approved by the Romanian Government in 2003 established the main objectives of power sector, including the expansion of power capacities, for the next 15 years.

- The strategy considers the importance of improving the energy efficiency, environment protection and the optimum utilization of natural resources.

- Romania produces today more electricity than needs but in the next years, without investment there will be an energy deficit (4 000 MW in 2010).

- The gross electricity generation is forecasted to increase from 56.9 TWh in 2004 up to 72.9 TWh in 2015.
THE ROMANIAN ENERGY STRATEGY
OBJECTIVES:

- Development of the new unit for power generation based on the environmental protection technologies, privatization and levelized unit cost analysis.
- Privatization of the entire electrical and natural gases distribution sectors by the end of 2006.
- Reduction of the energy intensity by 30-50% in 2015 and improvement of the energy efficiency.
- Promotion of the new “green-field” technologies for thermal power production.
- Liberalized the electricity market up to 80% by 2005, July 1-st and totally by 2007, January 1-st.
- Security of electricity supply and flexibility assurance by optimum utilization of the hydro, coal, nuclear and others natural and renewable resources.
WHY NUCLEAR POWER IN ROMANIA?

- Nuclear power plays an important role in meeting our energy needs without damaging the environment.
- Nuclear Power Plants have a proven record of energy cost stability.
- Romania is self-sufficient in uranium and heavy water and developed the required national infrastructure for management and supervision of nuclear facilities.

Romania has in operation the Unit 1 of Cernavoda NPP since 1996, December 2nd, based on the western technologies (CANDU 6 nuclear reactor, designed by AECL Canada), similar with nuclear units operating in Canada, Republic of Korea, Argentina and China. The Romanian operator “Nuclearelectrica” obtains very good performance in Cernavoda Unit 1 operation.
CERNAVODA NPP - UNIT #1
STATUS OF NUCLEAR POWER IN ROMANIA

- Based on the long-term commitment to nuclear energy of the Romanian Government, the finalization of Cernavoda Unit 2 started in 2003 March.

- The contract between AECL Canada, ANSALDO Italy and “Nuclearelectrica” Romania provides that in 2006 last quarter Cernavoda Unit 2 will be connected to the national grid and in 2007 March its commercial operation will start.

- With two units in operation in Cernavoda NPP in 2007, the nuclear power shall produce around 18% of Romania gross electricity production.

Cernavoda NPP will have an important role in Romania for energy security, sustainability and improved environmental protection.
NATIONAL INFRASTRUCTURE FOR NUCLEAR POWER

- The Ministry of Economy and Commerce is responsible for the national strategy in the energy field and for NPP project implementation and NPP operation, as well for technical support (research & engineering), nuclear fuel and heavy water.

- The Romanian Nuclear Agency has the responsibilities for promotion of nuclear energy in Romania and to issue the strategy for development of nuclear field in Romania.

- The Romanian Nuclear Safety Regulatory Body—CNCAN has the responsibility of up-dating the nuclear safety norms and to control the nuclear facilities operation.

- The Romanian National Agency for Radioactive Waste Management (ANDRAD) is operational since 2004 and it is developing the secondary legislation related to waste management, final disposal and decommissioning of nuclear facilities.
FUTURE OF NUCLEAR POWER IN ROMANIA

- Cernavoda Unit 3 will be completed, based on decision of the Romanian Government, through a partnership with local or foreign private investors, without state guarantees.
- This solution tray to demonstrate the efficiency of such partnership structure for major investment power project in Romania.
- Cernavoda Unit 3 project was already presented to the potential investors in 2004 and seven of them are in negotiations for setting up the Project Company and to develop the feasibility study.
- Tentative schedule provides the starting of completion of Cernavoda Unit 3 at the beginning of 2007, some progress work being planned in 2005.
CERNAVODA NPP - UNIT #3
CONCLUSIONS

- The Government of Romania is continuing its policy to support nuclear energy as part of the sustainable development of the country.
- Romania developed the national infrastructure for development, management and supervision of the nuclear facilities.
- The nuclear power will reduce the Romania’s dependence on external suppliers of primary resources.
- Cernavoda NPP is a real necessity for Romania and it contributes to increase the security of supply.
- The implementation of Romanian Nuclear Power Program represents an excellent example of cooperation with partners from Europe, Canada, USA and members states of the IAEA Vienna.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

Mr. Samodra Sriwidjaja
Ambassador
Permanent Representative to the UN and International Organizations
in Vienna

on
behalf
of

the Minister of Energy and Mineral Resources

INDONESIA
Mr. Chairman,
Excellencies,
Ladies and Gentlemen,

It is indeed a great pleasure and an honour for me to speak before and participate in this distinguished and prestigious Conference. This conference is truly important for Indonesia since we are in the stage to embark on NPP, hopefully by the next decade of this century. Therefore, in this occasion I would like to share Indonesia's views on several aspects relating to Nuclear Power for the 21st century.

In terms of energy demand and consumption, Indonesia demonstrates the typical characteristics of a developing country. Despite the low annual energy consumption per capita, Indonesia experiences high growth of energy demand due to its high population growth, dynamic economic activities and rapid industrialization process. In fact, even during the worst period of the economic crisis (1997-1998), the growth rate of energy demand especially as final energy forms was still immensely high.

Unfortunately, although Indonesia is one of the exporters of fossil energy in the world, Indonesia is having difficulties to meet its own national energy demand. The oil and gas reserves in Indonesia are insufficient to balance the rapidly increasing demand for energy, particularly in the form of electricity. For quite some times, oil and gas are of primary contributors to the national economic and social development. These energy resources have provided essential support for the national budget through exports of crude, refined products and LNG. For many years, the oil and gas industries have provided substantial part of the government revenues. And,
Nowadays, the fossil energy is still the major contributors to the nation’s public capital formation.

This situation creates one of the most important issues of security of energy supply that needs to be addressed appropriately. These circumstances urgently call for the development of alternative sources of energy.

One of the measures taken to deal with this problem of energy shortage in Indonesia was the study of long term energy and electricity planning. The project called the Comprehensive Assessment of Different Energy Sources for Electricity Generation in Indonesia was carried out by the Indonesian team and supported by IAEA (under IAEA Project INS/0/016) in 2001 - 2002. The study recommends that the energy mix policy should be applied; in which contribution of the oil should be reduced and replaced by gas, coal, renewable energy, and other alternative energy, including nuclear energy. Subsequently, the introduction of NPP on Java-Bali electricity grid is technoeconomically feasible and could be fully operated by 2016. The study also shows a possible earlier introduction of nuclear power plant if the externalities and other environmental constraints are taken into account.

Certainly, the introduction of nuclear power programme by the Indonesian government, would not only serve as a solution to the rising demands of electricity, but is also expected to help save and prolong fossil energy for other purposes, as well as a part of global efforts to reduce global warming effects.

Closely related to this issue is the Clean Development Mechanism (CDM). We are of the view that CDM is of particular interest to be used for capital-intensive nuclear power, instead of less costly coal-fired or any other electricity generation. It will eventually lead to a more significant reduction in green-house gas (GHG) emissions. Due to the fact that many developing countries may not be able to afford the higher investments associated with a nuclear power project, or it may simply not be the least-cost generation option for a certain country, CDM, in this case, offers an opportunity for capital and technology transfer in exchange for GHG emission credits.
Although, under Kyoto Protocol, Indonesia is not subjected to emission limitations, we give our full support to any efforts in promoting nuclear power to be included as a CDM option.

Mr. Chairman,

Over the past few years, Indonesia has been preparing for the NPP programme. The proposed sites have been selected among several potential sites available in Java island. The site-related data necessary for licensing purposes have been gathered and continuously up-dated as required. Our nuclear research facilities, together with some universities in Indonesia have also conducted R&D, education and training activities to advance our human resources development to support the NPP programme. However, recognizing the rapid nuclear technology development in the last few years, and considering the fact that Indonesia has a limited experience in the implementation of the NPP programme, we are actively seeking supports from developed countries with more experience in the NPP programme, especially in the forms of technology, investment, and also the HRD programme.

Our experience has so far indicated that public acceptance on nuclear power programme should be constantly and adequately taken care of. Global network of anti-nuclear movement has to be balanced with and anticipated by global nuclear society through the provision of more public information, education and better understanding on nuclear energy benefit for the society. Information and experience exchanges on public information among global nuclear society are indeed indispensable, especially from countries which have experiences in handling the obstacles related to the process of embarking the NPP programme. In this respect, my delegation is of the view that research and study on environmentally friendly nuclear technology should be further conducted by the IAEA to assure public confidence concerning the increasing use of nuclear energy as part of the energy mix.

As Indonesia is preparing to operate NPP by most likely in the next decade, there are several issues which we feel still need supports from the developed countries. Among these issues are as follows: Joint Study on the Preparation of NPP Construction; Joint Research
Another major issue is the preparedness of the regulatory infrastructures. The underlying rationale of this idea is that Indonesia should be able to establish the regulatory infrastructure needed in timely and effective manners. Again, in this respect, Indonesia calls for closer cooperation with developed countries.

Mr. Chairman,

Over the past few years, Indonesia has fully engaged both to the comprehensive safeguards agreement and the additional protocol for all of the existing nuclear facilities. We have been participating in the development of the international safeguards to strengthen non-proliferation of the nuclear material. We have also played an active role in the NPT review as well as other efforts to strengthen implementation of non-proliferation regime. These activities only prove that Indonesia supports the utilization of nuclear for peaceful uses.

Indonesia is also aware of the real and tangible danger in which terrorist groups may resort to the use of nuclear and other weapons of mass destruction. In this view, Indonesia has taken the necessary measures to minimize any possible threat to its own nuclear facilities. Indonesia has also improved and strengthened the physical protection of the existing nuclear facilities in accordance with the international standard requirements.

Having said that, on the other hand, pertinent to the issue, it is also my delegation’s expectation that this Conference can address the concern of Indonesia, and I believe for other developing countries, that non-proliferation control arrangements on nuclear materials and technology should be transparent and open to participation of all states and should ensure that they do not impose restrictions on access to material, equipment and technology for peaceful purposes required by developing countries for their continued development.
Mr. Chairman, Excellencies, Ladies and Gentleman,

Please allow me to conclude that, in short, nuclear power in the 21st century will be included in one of Indonesia’s energy mix schemes. It is expected to meet our high demand on electricity, prolong the role of fossil energy as a source of national public capital formations for our development. Last but not least, it will contribute towards the global-warming reduction efforts. We share the expectation of developing countries that the role of nuclear power in the 21st century shall not only for generating electricity but also for other peaceful purposes, such as hydrogen production and desalination, to mention some. Furthermore, Indonesia would like to underscore the need to strike a delicate balance between verification, promotional activities and technical cooperation with regard to the utilization of nuclear energy.

Let me express our genuine hope that the industrial countries will lend their support and cooperation in materializing our nuclear power programme in Indonesia. Lastly, I would also like to take this opportunity to express our sincere gratitude and appreciation to the host of the Conference, the government of the Republic of France. Our appreciation also goes to the IAEA and OECD that have successfully organized this Conference.

Thank you very much,
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Angel Minev
Deputy Minister of Energy

BULGARIA
Check against delivery

STATEMENT

by Mr. Angel Minev
Deputy Minister of Energy and Energy Resources of the Republic of Bulgaria
at the International Ministerial Conference “Nuclear Power for the 21st Century”
Paris, 21-22 March 2005

Mr. President,

On behalf of the Government of the Republic of Bulgaria I would like to extend to you sincere congratulations on your election to the high and responsible post as President of the International Ministerial Conference on Nuclear Power for the 21st century. I would like to assure you of the full support and co-operation of the Bulgarian delegation in performing your important and responsible task. I am confident that under your guidance we will be able to reach a desirable conclusion through our deliberations and the conference will contribute to the achievement of the main objectives: to review the role of nuclear power and to define the potential benefits in terms of energy security, sustainability and improved environmental protection that expanding nuclear power offers to meet the increasing energy needs of the world.

I would also like to express my appreciation to the Director General of the IAEA Mr. El Baradei and to Secretary General of the OECD Mr. Johnston for their comprehensive statement on the role of nuclear power and its future perspectives.
Mr. President,
Distinguished delegates,

The last year marked the 50th anniversary of civilian nuclear power. With 439 power reactors worldwide, nuclear energy continues to account for about 16% of the world’s electricity production, keeping pace with the steady growth in the global electricity market.

Near-term growth in nuclear capacity remains centred in Asia and Eastern Europe, due to a combination of factors — including the rise in electricity demand, the existence of a well developed industrial infrastructure in these regions, and the lack of indigenous alternatives in some countries.

Over the longer term, it is clear that the need for sustained human development will require a substantial investment in energy generation in the coming decades. Given its capacity for emissions-free electricity generation, nuclear energy has strong potential as a reliable baseline energy source.

Nuclear power in Bulgaria contributes significantly to satisfying the need of electric power of the economy and the population of the country, as well as in the region. For the last 10 years the Kozloduy NPP has been providing 40-47% of the average annual electricity produced in the Republic of Bulgaria.

The nuclear safety and security of nuclear activities remain key elements. The Bulgarian Government stresses that national responsibility for the safety of nuclear installations is the fundamental principle on which the regulation of nuclear safety and of radioactive waste management has been developed by the international community as endorsed by the Convention on Nuclear Safety and its Parties including the European Atomic Energy Community and reflected in the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, and acknowledges that International Atomic Energy Agency’s standards and approaches, as reflected notably in the IAEA Safety Fundamentals and Safety Requirements Series, constitute an internationally recognised framework which national safety requirements use as a reference level.

The Ministry of Energy and Energy Resources, the Kozloduy NPP and the Nuclear Regulatory Agency have adequately addressed and implemented all recommendations contained in the 2001 Reports on Nuclear Safety in the
Context of Enlargement and 2002 Peer Review Status Report. The AQG/WPNS does not consider further monitoring activities to be necessary.

In the end of 2002 the Bulgarian Council of Ministers took a decision to perform feasibility study for renewing the construction of the second Bulgarian NPP at the Belenе site. Up to this moment considerable amount of work has been done for justification of the future activities on this project, including Environmental Impact Assessment Report and Feasibility Study Report.

In April 2004 the Bulgarian Government approved in principle the continuation of the construction activities at the Belene site. The decision is based on the conclusion that nuclear energy is the main and most efficient way to meet our future electricity needs. It also provides high reliability, relatively low cost and carbon free electricity generation with regard to least cost plan for the Bulgarian energy sector development, security of supply as well as implementing the Bulgarian commitments on environmental protection.

After the public discussion on the Environmental Impact Assessment Report taken place in May 2004 and the public discussion on the Feasibility Study results held in January 2005 it was concluded that the construction of the second NPP in Bulgaria has very strong political and public support at local and national level. More than 97% of the local community, and more than 72% of the Bulgarians strongly support the plans for a new nuclear facility.

According to the implementation schedules, the project will commence in 2005 and Belene NPP Unit 1 commercial operation is planned for 2011.

Taking into account the already established good relations between the Republic of Bulgaria and the IAEA and with expectations for strengthening our cooperation in the future activities, I would like to use the opportunity to announce the intentions of the Republic of Bulgaria to start the construction of our second nuclear power plant.

Thank you, Mr. President.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

Mr. Koishi Hirata
Parliamentary Secretary for Economy, Trade and Industry

JAPAN
議長、ありがとうございます。

【はじめに】
○我が国は、1966年に原子力発電の商業利用を始め、今では発電電力量の約3分の1を原子力により供給しています。
また、53基の原子力発電所が稼働しています。
○我が国は一貫して原子力の平和利用を進めてまいりましたが、引き続き、フロントランナーとして、他の非核兵器国の範を示していきたいと考えています。
○我が国は、2002年6月に制定された、エネルギー政策基本法の下、①エネルギーの安定供給の確保を図ること、及び②地球温暖化防止を図ること、の２点を中核的な政策目標として位置付けています。
【1. エネルギーの安定供給の確保（資源制約）】

○まず、エネルギーの安定供給の確保について申し上げたいと思います。エネルギーの安定供給の確保は、我が国としても重要な課題です。

○原子力発電は、高速増殖炉サイクルが実現されれば半永久的に資源確保が可能となるといった、資源制約を克服できる大きな可能性があります。

○このため我が国では、核燃料サイクルの確立に向かって、着実に歩みを進めています。

○核燃料サイクル政策については、昨年、公開の議論の下、種々のシナリオについて、経済性やエネルギーシキュリティ等10項目の視点から総合的な評価を行いました。その結果、我が国としては引き続き核燃料サイクル政策を推進することを基本とするとの取りまとめを行いました。

○現在、六ヶ所村では再処理施設の本格運転に向けたウラン試
験が実施されているところであり、高速増殖原型炉もんじゅも、その再開に向け始動するところです。
〇いずれも、適切な情報開示を行い国民の理解を得つつ進めてまいりたいと思っております。

【2．地球温暖化の防止】
〇次に、地球温暖化の防止の観点から申し上げます。
〇CO₂の削減に向けて、省エネの推進、新エネルギーの導入等様々な方策が講じられてきております。
〇我が国が目指すべき国家戦略の方向性としては、第一に、現在でも世界有数の省エネ技術に更に磨きをかけ、エネルギー需要全体を抑えていくことです。
〇第二に、その上で必要となるエネルギー需要に対しては、地球温暖化防止の視点も踏まえつつ、原子力も新エネルギーも共に活用していくことが不可欠です。特に、原子力は、エネ
ルギー供給面からみて、地球温暖化防止の効果、その経済性の観点からも、益々その重要性は増しているといえましょう。

【3．原子力の推進にあたっての今後の課題】

○もちろん、原子力を引き続き積極的に推進していくにあたり、克服すべき課題もあります。

○推進にあたっては、当然のことながら安全の確保が不可欠です。我が国では、新潟、九州と、相次いで電源周辺地域に大きな地震が起きています。しかし、我が国の耐震技術をはじめとした安全技術により原子力施設に影響することなく運転が行われております。今後とも安全の確保に対して絶えざる努力を行ってまいりたいと思っています。

○次に、電力分野の自由化や発電施設の高経年化への対応です。

○これらについては、我が国政府として、既に原子力発電促進のために、安定的な運転を確保していくために原子力発電を
優先的に利用する制度をはじめ、税制上の優遇措置、原子力発電所立地地域のための補助金制度など、様々な政策を行っているところです。

○また、使用済み核燃料の再処理に必要な12.6兆円の資金を、事業者の外部に、国民にも透明性の高い形で積み立て、管理していくために、新しい法律の立法作業を進めております。

○今後とも電力自由化の一層の進展に伴い、官と民の適切な役割分担のあり方をしっかりと議論しながら、官民を挙げてこの課題に取り組んでいく所存です。

【終わりに】

○本年は、2月に京都議定書が発効するとともに、7月に英国で行われるG8サミットにおいても気候変動問題とエネルギー問題がクローズアップされようとしており、世界各国が原
子力発電の果たす役割の重要性を再認識するべきターニングポイントの年と言えましょう。我々も、あらゆる機会を捉えて、勇気を持って、資源制約問題と地球環境問題の双方を解決し得る原子力の重要性を世界に発信していくべきです。

○折しも日本では、愛知県で万国博覧会が開催されます。この万博のテーマは、自然の叡智であります。かつて広島・長崎への原爆投下により核の惨禍を経験した我が国が、その経験を乗り越え、原子力の利用を自然の叡智としていくよう、強い決意で推進していきたいと思います。

○最後に、本国際会議の開催にあたって多大な労を取られた、IAEA、OECD及びフランス政府の関係者の方々に感謝の意を表して、私のプレゼンテーションといたします。

ご静聴ありがとうございました。
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

Mr. Koishi Hirata
Parliamentary Secretary for Economy, Trade and Industry

JAPAN
Japan’s Strategy to Meet the Energy Need for the 21st Century

March 22, 2005
International Ministerial Conference
“Nuclear Power for the 21st Century”

Koichi HIRATA
Parliamentary Secretary for Economy, Trade and Industry

Mr. Chairman, thank you very much for your kind introduction.

[Introduction]
Japan commenced the commercial use of nuclear-powered electricity in 1966, and currently around one-third of the nation’s electricity needs are met by nuclear energy. We currently have 53 nuclear reactors in operation.

Our country has consistently advanced the peaceful use of nuclear power. As a front-runner in the use of nuclear energy for peaceful purposes, Japan is determined to continue providing an example to other non-nuclear weapon states.

The Basic Law on Energy Policy, which was enacted in June 2002, states that Japan’s two core energy policy objectives are ① securing a stable energy supply, and ② working to prevent global warming.

[1. Securing a Stable Energy Supply (Resource Constraints)]
First, I would like to talk about ensuring a stable supply of energy. For Japan, this is a very important issue.

Nuclear power generation has major merits in terms of overcoming energy constraints, because if a practical fast breeder reactor cycle can be realized, Japan will be able to secure a semi-perpetual supply of energy.

Accordingly, Japan has been steadily working toward establishing a nuclear fuel cycle.

Last year, amid participation by the public, Japan’s Atomic Energy Commission [1] conducted comprehensive evaluations of various scenarios from 10 perspectives, including economic efficiency and energy security. Based on the conclusions reached, the government of Japan decided to maintain its basic policy of promoting efforts to achieve a nuclear fuel cycle.
Uranium trials are presently being implemented at the Rokkasho Reprocessing Plant toward the full-scale launch of operations to reprocess spent nuclear fuel. Meanwhile, preparations are proceeding toward restarting the Monju fast breeder reactor.

The Government of Japan will continue operations at both Rokkasho and Monju while disclosing information in an appropriate manner and gaining the understanding of the public.

[2. Preventing Global Warming]
I will now talk about our second core policy, which is the prevention of global warming.

Japan has been implementing diverse policies to reduce CO\textsubscript{2} emissions. These policies include promoting energy conservation and developing renewable energy sources.

In terms of the direction of Japan’s national energy policy, first we must further refine our energy conservation technologies, which are already among the foremost in the world, and thus restrict total energy demand.

Second, we need to utilize both nuclear power and renewable energy sources in meeting the demand for energy in an appropriate manner, while giving due consideration to the prevention of global warming. In particular, from an energy supply standpoint, the importance of nuclear power will only increase, considering its role in the prevention of global warming, and its economic efficiency.

[3. Future Issues in Promoting Nuclear Power]
Of course, there are issues that will have to be dealt with as we continue to actively promote nuclear power.

Naturally, the promotion of nuclear power generation can only be advanced under the critical prerequisite of securing nuclear safety. A series of large earthquakes have been occurring around regions with nuclear power plants in Niigata and Kyushu. With Japan’s earthquake-proof engineering and other safety technologies, however, these earthquakes have not affected our nuclear power facilities, which have continued operating. We will continue to both maintain and refine our efforts to secure nuclear power safety.
Next, I would like to touch on the liberalization of Japan’s electric power sector, and our response to the aging of electricity generation facilities.

In this regard, the government of Japan is already implementing diverse policies to promote nuclear power generation and secure safe operations. These include a system for preferential use of electricity generated by nuclear power plants, tax incentives, and a system of subsidies for communities where nuclear power plants are located.

The government is also preparing new legislation to accumulate and manage external reserves (to be held outside Japanese power companies) to cover the ¥12.6 trillion in funds that will be required for the reprocessing of spent nuclear fuel, in a manner that is highly transparent to the public.

Japanese government and business circles will continue to strive together to address this issue, while holding detailed discussions on the proper division of roles between the public and private sectors in accordance with the further liberalization of the electric power sector.

[Conclusion]

The international community is closely focused on climate change and energy issues, as a result of the Kyoto Protocol coming into force this past February, and with these issues being highlighted again at the G8 Summit in Scotland this July. One might say that 2005 is a turning-point, when nations around the globe recognize anew the importance of the role played by nuclear power generation. We, too, will seize every opportunity to boldly speak to the world about the importance of nuclear power as a means to resolve both resource constraints and global environmental problems.

The 2005 World Exposition in Aichi, Japan will soon open with the theme of “Nature’s Wisdom.” Although Japan experienced the ravages of the atomic bombings of Hiroshima and Nagasaki, I believe we must now overcome that experience to resolutely promote the use of nuclear power as a part of nature’s wisdom.

In concluding my presentation, on behalf of the Japanese delegation I would like to express our sincere gratitude to the representatives of the IAEA, the OECD, and the French government who have worked so hard to arrange this international conference.

Thank you very much for your kind attention.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

Ms. Laurette Glasgow
Minister Plenipotentiary
Canadian Embassy

on
behalf
of

the Hon. John Efford
Minister of Natural Resources

CANADA
Canada's Vision for Nuclear Energy in the 21st Century

a Presentation by

Laurette Glasgow
Embassy of Canada in France

On Behalf of

The Honourable John Efford, PC, MP
Minister of Natural Resources Canada

to the

International Conference on Nuclear Power for the 21st Century

Paris, France
March 22, 2005
I am honoured to be here today to speak to you on behalf of the Minister of Natural Resources, the Honourable John Efford, who, unfortunately, has other pressing commitments at home.

I would first of all like to thank the French Government, the International Atomic Energy Agency and the Nuclear Energy Agency of the OECD for co-sponsoring this timely event and for inviting Canada to present its vision for nuclear power in the 21st century.

We are indeed on the threshold of a new age for nuclear energy in Canada and in many countries around the world. In these early years of the 21st century we are seeing real commitments to investment decisions in new build in the US, Europe and China. Countries like China recognize the need to aggressively expand their nuclear programs to ensure continued economic growth.

In Canada, we have been positioning ourselves for this growth and all the conditions for a "nuclear renaissance" are right for us. One of the basic conditions is demand for electricity. All forecasts both domestic and international point to an increasing demand for electricity and we are seeing that we would have difficulty meeting this demand without nuclear generation.

Canada is blessed with an abundance of energy resources. We recognize, however, that energy security requires a diversified mix of energy options and nuclear has been an important component of that mix for decades. We have 22 nuclear reactors supplying 15% of our electricity needs and 50% of those in Ontario, our largest province.

As a non-emitting source, nuclear energy can also help Canada meet its major commitment to climate change. Indeed, we have made emissions reductions a national priority and it is hard to fathom how we can meet our objectives without making the best use of nuclear energy.
The Government of Canada sees nuclear energy as an essential ingredient of our energy mix now and in the years to come. However, there are a number of other conditions needed in order to ensure the success of the nuclear option and of the nuclear industry that supports it.

So, what are the essential components to ensure success?

First and foremost, there is a need to foster and maintain the creative spirit and vision to spark scientific innovation. In this regard, Atomic Energy of Canada Ltd. is playing a leading role in sparking research and development in Canada and in turning this R&D into a range of energy systems and products, from our indigenous CANDU reactor technology to a range of essential isotopes used in nuclear medicine.

We are proud of the technology and innovation that has developed from our support for nuclear R & D over the past 50 years. As well, the Government of Canada is, in association with AECL, co-funding development of the Advanced CANDU reactor. The ACR’s safety enhancements and evolutionary design are expected to make it more efficient and 40% cheaper to build than existing CANDU reactors. Improvements include a smaller core, the use of slightly enriched uranium fuel and a modular design to allow shorter assembly time. It promises improved safety, economics, and non-proliferation characteristics while producing less nuclear fuel waste.

Canada, as many of you are aware, is among the first five countries to sign the International Generation IV Nuclear R&D Agreement. Gen IV will help us ensure that, by putting creative thought into addressing challenges in the development of new and sustainable nuclear energy systems, we’ll have new scientists and engineers in place for the future of our nuclear program.
Having the necessary know-how and the innovative scientists and engineers that can develop concepts and turn them into tangible results is key. Our support of the nuclear R&D program and next-generation nuclear systems has helped bring the industry to the brink of the new age and ensure its continued growth and competitiveness for the long term.

And there are a number of other conditions that will help us ensure success in responding to the increased demand.

Canada is a world leader in uranium production, and recent market developments have given a bright outlook for the uranium industry.

Canada has excellent industrial capability in nuclear energy, with more than 150 firms employing more than 30,000 Canadians, mainly in high-tech jobs.

Canada has long and successful experience in the construction of nuclear reactors in Canada and abroad.

Canada also has the ability to maintain and extend the life of its nuclear reactor fleet, mobilizing technical and financial resources to refurbish certain reactors and return them to service. In this regard, industry has been successfully mobilizing technical and financial resources to refurbish certain reactors and return them to service.

I’m very pleased that the three Ontario nuclear reactors brought back to service last year have performed well — resulting in a 20-percent increase in electricity generated by nuclear power. Both Bruce Power and Ontario Power Generation are responsible for this great success.

Finally, Canada’s nuclear industry is one of the best mobilized in the world to bring a
nuclear project on stream in a timely and cost-effective way; this means having the ability to bring the necessary technical, industrial and financial elements together successfully.

Minister Efford saw an excellent example of this when he visited China last September. He was very impressed by the CANDU project at Qinshan - the largest commercial venture ever undertaken jointly by Canada and China. These twin CANDU 6 units were completed under budget and ahead of schedule.

We look forward to enhanced nuclear cooperation with China and expanding the role for CANDU technology as China makes decisions on meeting its increasing demand for electricity. In the near term there may be opportunity to replicate the Qinshan project and to work jointly on the development of the Advanced CANDU Reactor (ACR).

Minister Efford was particularly pleased that, following his visit, the Governments of China and Canada entered into an agreement on nuclear energy cooperation. In January of this year, we signed a five-year Memorandum of Understanding (MOU) to establish a framework for collaboration on research and development programs and activities.

So we have in place the conditions from which to respond to the increase in electricity demand; we have the R&D capability, the industrial capacity as well as the resource base. But there are challenges ahead in terms of gaining public support, ensuring health safety and security through regulation, as well as the ability to address issues of economics and financing, waste management and nuclear non-proliferation.

Public support is crucial to success. This has always been a challenge, but we have recently seen a shift in public perception. Recent public opinion polls indicate that eight in ten Canadians believe nuclear power will be part of Canada’s future energy mix.
Key to gaining public support is an effective nuclear regulatory regime. We have learned that a strong and economically viable industry goes hand-in-hand with a strong safety culture — giving utmost priority to safety, security, public health and environmental protection.

Dealing effectively with issues such as nuclear fuel waste will go a long way to dispel outdated perceptions that impede public acceptance of nuclear energy as a viable option.

With regard to fuel waste, a milestone will be reached this year. As required under Canada’s Nuclear Fuel Waste Act, the Nuclear Waste Management Organization is developing — through public dialogue and consultations — long-term waste options to support future government decisions. The organization’s report, recommending a preferred approach, will be submitted to the Government this fall, after which the Government will make a decision.

Both the Government and the nuclear industry have shown responsible leadership in addressing this important issue in the best interest of all Canadians. Furthermore, Canada’s progress on this issue demonstrates that nuclear energy is compatible with sustainable development.

On the economic front, nuclear faces challenges in terms of economics and financing because of perceived risk. Recent studies, including those by the Canada Energy Research Institute (CERI), the University of Chicago and the Massachusetts Institute of Technology (MIT) have shown that, in some regions of the world, like Ontario, nuclear power represents one of the best options for competitively-priced, base-load electricity.

However, economics hinge on the predictability in the cost of capital, the regulatory licensing process and the long-term pricing of electricity rates, all of which are required to ensure an attractive investment climate for nuclear power. Even these conditions, financing of capital intensive projects require innovative approaches by proponents, particularly with regard to the
sharing of risk.

Looking globally, international cooperation for the expansion of nuclear power in the 21st century will depend on States rigorously abiding by and upholding international nuclear non-proliferation norms of behaviour, embracing the NPT, safeguards agreements and the Additional Protocol as well as the nuclear export controls required therein. Canada will continue to work closely with the international community to strengthen and bolster the regime and to improve its credibility and effectiveness.

As well, there must be progress on improved proliferation resistant designs. We recognize the importance of addressing all aspects of proliferation resistance. Canada is working with others internationally within the GIF and INPRO to arrive at an assessment methodology and to provide advice and guidance to designers on how to achieve proliferation resistance characteristics throughout the fuel cycle.

In conclusion, I would like to assure you that nuclear energy remains an important option for meeting Canada’s future energy needs as well as our air quality and climate change objectives. With the right conditions, the injection of creative thought and attention to the challenges, I believe that we can speak with confidence of a real nuclear renaissance both in Canada and around the world in the 21st century.

Thank you.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

Mr. Saeidi
Deputy to and

on
behalf
of

H.E. Mr. Reza Aghazadeh
Vice President
Islamic Republic of Iran
President of the Atomic Energy Organization (AEOI)

IRAN
In the name of God

(Delivered by Dr. M. Saeidi, Vice President of Atomic Energy Organization of Iran, at the International Conference on Nuclear Energy for the 21st Century, Paris, 21-22 March 2005)

Mr. President,

I’m very pleased to address such a scholarly gathering as the representative of the Islamic republic of Iran. I would like to express my appreciation to the Director General of the IAEA and his staff for arranging this conference. In addition, would to extend my tribute to the Government of France for hosting this valuable conference.

Excellencies, Ladies and Gentlemen

The Islamic Republic of Iran, which took its first serious step in nuclear technology in the mid 1950s by establishing the Atomic Center of Tehran University, has based its nuclear development program on peaceful use of this advanced technology. The people and government of Iran are determined to open their way through the tortuous path of peaceful use of nuclear technology despite all imposed restrictions and difficulties.

Generation of nuclear electricity is the prime priority of Iran nuclear program. Due to the Iran’s rapid socio-economic development during the past three decades, the strategy for using fossil resources has been affected
by two restrictive elements. First, rising living standards and improvement of economic indicators have prompted an increase in demanding energy in domestic and industrial sectors and second, Iran’s national economy depends on oil revenues. To dispose of these two contradictory and restrictive elements, Iran needs to develop a long-term Program to reverse the trend of unrestrained use of fossil resources.

It is worthwhile to be mentioned that fossil resources are limited and belong to all subsequent generations and unrestrained use of this source of energy is not prudent. And the utilization of these resources in processing industries such as petrochemicals will generate much greater added value.

Excellencies, Ladies and gentlemen,

In the long term, fossil fuel can not be considered as a sustainable source of energy, and most of the alternative renewable energies have yet to demonstrate that they are not suitable for large scale development.

The aforesaid considerations have made Iran’s reliance on only fossil fuel’s energy, unreasonable and unaffordable and have also made, using new technologies such as the nuclear technology more competitive.

Energy system development and policy assessment have become increasingly complex over time with the recognition that the social, economic, technological and environmental aspects of energy are intrinsically linked.

Each energy option or technology, besides direct costs, has social and environmental cost end benefits. Energy planning and decision making process must strike a balance among all these factors in choosing the best
energy mix option among all available sources for energy/electricity generation for developing a national energy policy using international accepted comparative assessment methodologies and tools.

In order to determine the optimal shares of different types of power plants in supplying electrical energy needs within the next 20 years, Iran conducted a survey following the WASP model. Based on the results of this survey, the medium scenario shows us the production of 6000 MW nuclear electricity, in addition to the 1000 MW Bushehr power plant which is now under construction, is essential to cover the needs of the energy demand for establishing of the sustainable development in Iran.

What is noteworthy at this point is Iran’s decision and determination to diversify its range of nuclear power plants and at the same time its focus on those types of plants which can be designed and built benefiting of nuclear knowledge which has been developed in our country.

Excellencies, Ladies and Gentlemen,

In a long term program, Iran is considering utilizing other types of power plants including Heavy Water Reactors (HWR), in addition to LWR which is now under construction in Bushehr. The use of HWR which is more amenable to indigenous development will enable Iran to use natural uranium recovered from local resources for producing nuclear fuel.

Since Tehran Research Reactor (TRR) will be shut down in next 4 years, Thus, Atomic Energy Organization of Iran (AEOI) is constructing a Heavy Water Reactor (HWR) for research and production several essential radiopharmaceuticals. Moreover, Iran is constructing a
facility, in the near of Arak city, to produce heavy water which is an essential constituent of HWRs.

The second objective in Iran’s nuclear development plan is the attainment of self-sufficiency in all aspects of using the peaceful of nuclear energy including the provision of nuclear fuel. To be able to produce nuclear fuels indigenously, Iran has to put into place a system for mining and processing uranium ores and also for its conversion and enrichment.

The Yazd Saghand project is designed to mine uranium from natural deposits. The Isfahan facility known as UCF project converts yellow cake to uranium hexafluoride, and uranium dioxide; the last item is the main material of nuclear fuel. UF₆ is the main feedstock for Natanz enrichment facility. Therefore, Iran’s activities in Natanz facility are designed to complete the uranium enrichment unit to cover the part of nuclear fuel needs for nuclear power plants using low enriched uranium in the next 20 years.

A Zirconium Production Plant (ZPP) is now operating in Isfahan for production of fuel cladding. It should be mentioned that all aforesaid activities have been declared to IAEA and are being carried out under inspection of IAEA safeguards.

Regarding to aforesaid considerations can be concluded following:

- Iran’s nuclear program is designed for peaceful purposes and Iran’s needs to provide energy in the next 20 years.
- Iran invites all the countries to participate in the construction of Nuclear Power Plants and other facilities in the line of Iran’s nuclear long term program.
• Without doubt, nuclear energy as a clean and confident source can play an important role in our world future.

• Base on the Article 4 of NPT, it is the inalienable right of Member countries to engage in research, production and use of nuclear energy for peaceful purposes without discrimination.

Mr. President, I am confident that under your leadership the conference will achieve important results on the future of nuclear energy.

Thank you, Mr. President,
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Mykola Steinberg
Deputy Minister of Fuel and Energy

UKRAINE
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

Ms. Wroblewska

on behalf of

H.E. Mr. Jerzey Hausner
Minister of Labour & Economy

POLAND
On behalf of the Minister of Economic Affairs and Labour of Poland, I would like to thank for the invitation to this conference which can constitute an important factor in the process of shaping of energy strategies in many countries trying to cope with challenges of the XXI century in the area of energy supply security and sustainability. Poland becoming last year one of the new Member States of the extended European Union, began simultaneously the debate on an updated version of its energy policy. The obligation of periodical assessment of guidelines for the Poland’s energy policy and preparation of necessary corrections stems from our Energy Law. After a long period of discussions, a new document was approved by the Council of Ministers on 4th January this year – *Energy Policy of Poland until 2025*. Let me present some most essential assumptions and conclusions from this document.

The preparation of the document was based on the forecast of GDP growth at the level of 5.1 – 5.8 % depending on a particular 5-year periods between 2005 and 2025 which gives the average growth rate for the whole 20-year period equal to 5.3%. The second assumption was the necessity to fulfill requirements of international commitments concerning permissible limits of emissions of pollutants into the air. For variants of possible demand for energy were elaborated and called respectively: Treaty Scenario, Basic Coal-, Basic Gas- and Effectiveness Scenario. They differ in assumptions concerning the share of particular energy carriers and the level of possible progress in improvement of effectiveness of the whole economy. In the Polish primary energy balance hard coal together with lignite is a dominant energy source. It is caused by large indigenous coal resources. The current level of electricity production from coal reaches 95%. According to the elaborated forecast till 2025, the total final energy consumption will increase by 48-55%, primary energy by 41-50% and electricity by 80-93%.

Hard and brown coal should remain the main source of primary energy till 2025. However, the share of oil, liquid hydrocarbons and natural gas should increase significantly as well as the share of RES which in 2010 should reach the level of 7.5% in the total electricity consumption and the share of biocomponents in transportation fuels - the level of 5.75% in 2010.

Poland has very small resources of oil, so Poland’s dependency on oil import will still be high in the future and is predicted to remain at the level of 90% despite slightly growing volumes of national oil extraction.
Poland is also dependent on natural gas imports. Currently, the level of this dependency reaches 68% but in the prognosis period can grow up to 85% although the production from indigenous deposits should increase from 4 bln cm up to 6 bln cm annually.

Due to domination of coal in production of electricity and heat, the levels of emissions of pollutants into the air from the energy sector are relatively high despite of efforts made in the period of last 10 years to install in many plants modern equipment for environmental protection. Meeting the requirements of international obligations binding Poland in the area of environmental protection in the energy sector will cause the need for extensive investment programme which is very costly. The modern technology which can significantly contribute to solving the Polish problems with environmental protection and the need for rapidly increasing electricity generation capacity, is nuclear power. Therefore, its introduction is anticipated in all the variants of the policy scenarios.

Poland currently has no nuclear power plants although is surrounded by countries possessing many nuclear units. In the past, the construction works of the Polish first nuclear power in Zarnowiec were stopped by the Chernobyl catastrophe. Now the attitude of the society to nuclear power is more friendly. According to results of the recent public opinion research, about half of respondents accepts the idea of a nuclear power plant in Poland. The document “Energy policy of Poland until 2025” indicates the need to commence nuclear power exploitation around the year 2021. Start up of the first nuclear power plant before 2020 is considered infeasible because the necessary investment process is estimated to last 10 years and the duration of the social acceptance campaign, preceding this process, for 5 years.

The list of tasks to be done in order to implement the assumptions of this energy policy covers the need to carry out a detailed analysis of introduction to Poland of nuclear power, including a study on experience of other countries in this respect. For more than 15 years from the abandoning of the construction plans of the Zarnowiec nuclear power plant, the entire organizational and technical potential created then for realization of the programme, has been lost. Therefore, in the case of a positive decision fast reactivation of organizational technical and regulatory activities will be necessary. The Conference like this one can help us to estimate the current status of nuclear energy and prospects for its development.

Thank you very much for your kind attention.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

Ms. Wroblewska

on behalf of

H.E. Mr. Jerzey Hausner
Minister of Labour & Economy

POLAND
Poland’s Energy Policy until 2025

Elżbieta Wróblewska
Deputy Director of the Energy Security Department
Ministry of Economic Affairs and Labour
## Economic Growth Forecast

### The rate of GDP growth

<table>
<thead>
<tr>
<th>Years</th>
<th>Average growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005 - 2010</td>
<td>5.8%</td>
</tr>
<tr>
<td>2011 - 2015</td>
<td>5.2%</td>
</tr>
<tr>
<td>2016 - 2020</td>
<td>5.1%</td>
</tr>
<tr>
<td>2021 - 2025</td>
<td>5.1%</td>
</tr>
</tbody>
</table>

Average growth rate in the years 2005 - 2025: 5.3%
Fossil Fuels & Energy

Demand Forecast

Accession Treaty Scenario

- Renewable energy
- Nuclear energy
- Other fuels
- Oil
- Natural gas
- Lignite
- Hard coal

Fossil Fuels & Energy

Demand Forecast

Primary Energy [Mtoe]
Nitrogen Oxides ($NO_x$) Emissions for Large Combustion Plants

The graph illustrates the emissions trend of Nitrogen Oxides ($NO_x$) from 2002 to 2025, categorized by types of fuels and treaty effectiveness. The emissions are shown in thousand tons (th. tons).

- **Treaty** (green line): Emissions under the treaty show a decreasing trend with fluctuations.
- **Basic-Coal** (black line): Emissions for basic coal show a significant decrease, followed by a more gradual rise towards the end.
- **Basic-Natural gas** (purple line): Emissions for basic natural gas show a similar trend to basic coal, with a decrease followed by gradual increase.
- **Effectiveness** (blue line): This line represents the effectiveness of measures, indicating improvements over the years.
- **Accession Treaty** (red line): This line indicates the accession of new treaties, showing a steady decrease.

The data suggests that while there are fluctuations, overall emissions are decreasing, with accession to new treaties playing a significant role in reducing emissions.
National CO₂ Emissions from the Burning of Fossil Fuels

- Treaty
- Basic-Coal
- Basic-Natural gas
- Effectiveness
- Kyoto Protokol Limits

[Graph showing emissions trends from 2002 to 2024]
Sulphur Dioxide Emissions ($SO_2$) for Large Combustion Plants

- Treaty
- Basic-Coal
- Basic-Natural gas
- Effectiveness
- Accession Treaty

[Graph showing emissions trends over years]

1. It is projected that by 2025 domestic consumption of final energy will grow by 48-55%, of primary energy by 41-50%, and of electricity by 80-93%.

2. In each of the forecast variants the change in structure of domestic energy consumption in favour of natural gas and liquid fuels is anticipated, but the individual variants differ on the increase of gas consumption.

3. Significant improvement in energy efficiency is projected in all the variants. In all the variants, ecological requirements stipulated in the Kyoto Protocol, 2\textsuperscript{nd} Sulphur Protocol, 2\textsuperscript{nd} Nitrogen Protocol and the National Plan for Emissions Reduction are fulfilled.

4. Poland has no nuclear power plants, unlike many European countries. Nuclear power introduction is purposeful due to the needs to diversify primary energy carriers and to limit greenhouse gases and sulphur dioxide emissions to the atmosphere, therefore it is being forecasted in all the variants. Forecast calculations indicate the need to commence nuclear power exploitation in the last 5 years of the period in question i.e. around 2021-2022.
Conclusions of the Government’s Energy Policy (3):

5. Start-up of the first nuclear power plant before 2020 is considered impossible since the duration of the investment process in the country which hardly has any experience in this scope is estimated for 10 years, and the duration of the social campaign for acceptance of nuclear power generation, preceding the process, for 5 years.
Thank you
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Azmi Khriesat
Minister of Energy and Mineral Resources

JORDAN
The Speech of H.E Azmi Khreisat/Minister of Energy and Mineral Resources in Jordan

The International Conference about Nuclear Energy in the Twenty First Century

Organized by

The International Atomic Energy Agency

In cooperation with Organization of Economical Cooperation and Development

Hosted by
The French Republic

22/3/2005

Paris - France
Ladies & Gentlemen,

It’s a great honor to me and to the Jordanian delegation to participate in this important conference organized by The International Atomic Energy Agency in cooperation with Organization of Economical Cooperation and Development, hosted by The French Republic.

Ladies & Gentlemen,

The fulfillment of the increasing needs for energy and water requires from us, the specialists and decisions makers, efforts for providing enough electrical power in a sufficient and continuous manner, consequently working on providing continuous sources for its production; Which arose the need for looking for other sources to face the increase demand for electrical energy and protect the environment, such as nuclear and renewable energy sources.

Ladies & Gentlemen,

The Jordanian Government is looking forward to build an ever developing modern country, and is setting
programs and plans to obtain progressive economy, which depends on the development of natural and human resources. And attracting private capital investment by providing the appropriate investment atmosphere.

The consumption of energy in Jordan during 2004 was up to 5.9 million tones of oil equivalent, with a growth percentage of 3% and it is expected to have an annual growth of 2.5% during 2005 – 2015. This requires importing most of our needs in the form of primary energy, which is a big challenge to the economy.

The demand on electricity in the year 2004 was around 9300 GWh with a growth of 9%, which means an average consumption per capita of about 1600 kWh, and it is expected that the annual growth average will be 4-6% during the period 2005 – 2015.

Electrical power generation resources in Jordan are only using conventional methods, which depend on oil; therefore technologies used in this field are steam units, gas turbines and combined cycle, which is used recently. In the coming years concentration will be on combined cycle units, which burns natural gas starting from 2006, we are also working on the strengthening the electrical
networks with Egypt and Syria through the seven countries interconnection Project.

To fulfill the demand on energy and face the sector challenges, the Government of Jordan, has developed an integrated and comprehensive Energy Master Plan for the development of the energy sector over the next 15 years. The plan was approved by the Council of Ministers in December 2004 and requires investment of over $3 billion.

The plan concentrated on the following:

1. Development of local Indigenous Energy Resources
2. Improve Crude and Product Supply Infrastructure
3. Encourage further development of the gas sector and gas distribution networks.
4. Restructuring of fuel market and open it to competition.
5. Restructuring of electricity sector and privatize generation and distribution assets.
6. Developing and strengthening the regional networks in gas, oil and electricity.
7. Efficient uses of energy.
8. Utilize all viable renewable energy sources.

Ladies & Gentlemen,

The Jordanian Nuclear Energy Commission was established by the law No. 29 in 2001 called the law of Nuclear Energy and Radiation Protection to achieve the peaceful uses of nuclear energy in medical, agricultural and industrial purposes with the coordination with The International Atomic Energy Agency to enable providing programs for securing the radiation sources and provision of needs for implementing them.

In Jordan we are looking forward to sharing with you in this conference thoughts and means to increase the use of nuclear energy as an alternative electricity generation through regional and international cooperation. In our region this can benefit from the already planned regional electricity market in south and north Mediterranean region.

Ladies and gentlemen
Finally I would like to express our appreciation and gratitude to the efforts of The International Atomic Energy Agency, The Organization of Economical Cooperation and Development in organizing this important conference which we hope to achieve positive recommendations to support using of nuclear energy to provide alternatives for the social and economical progress for the whole world.

Wa Alsalam Alikum Wa Rahmatu Allah Wa Barakatuh
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Christian Sina Diatta
Minister of Scientific Research

SENEGAL
DÉCLARATION DU SÉNÉGAL
Professeur Christian Sina DIATTA, Ministre de la Recherche Scientifique

Mesdames et Messieurs les Ministres,
Monsieur le Directeur Général de l’Agence Internationale de l’Énergie Atomique, AIEA,
Mesdames, Messieurs,


Le Sénégal remercie et félicite le Gouvernement français pour l’accueil de la Conférence qui permet de faire le point contextuel sur l’énergie atomique et les besoins de la population mondiale en compétition avec le besoin de protection de l’environnement.

Deux certitudes hantent toutes les nations, à savoir :

- La croissance continue des besoins en énergie des nations.
- La menace de l’environnement engendrée par la pollution de l’atmosphère faisant de la population humaine un véritable facteur météorologique.

Il apparaît que les procédés scientifiques et technologiques doivent contenir en eux-mêmes les solutions de contrôle des outils de progrès quelle qu’en soit la forme. L’habitude acquise dans l’usage des énergies conventionnelles et le couplage entre l’énergie atomique et le progrès des sciences acquis depuis un siècle environ crée des résistances, des craintes et une inertie de l’humanité dans l’application intensive, extensive et non sans risques de l’électronucléaire.

Les conditions du progrès pour des pays comme le Sénégal procèdent de la politique scientifique nationale clairement inscrite dans les perspectives gouvernementales. Elles sont clairement formulées pour le contexte sénégalais. Elles tendent à répondre à l’insuffisance en quantité et en qualité d’énergie électrique. À titre d’exemple le courant électrique est à la fois aléatoire et fluctuant, la vitesse du vent d’où pourrait être tirée l’énergie éolienne n’est en moyenne que de trois mètres par seconde. Le réseau électrique est instable. Il en résulte de sérieux handicaps pour l’industrie et les laboratoires de recherche.

Pour répondre à ces difficultés la formation d’un potentiel de ressources humaines en sciences et techniques est requise. Un programme de troisième cycle a été mis au point depuis 1992 et participe au développement de la recherche en sciences et techniques nucléaires. Il s’agit de préparer ainsi le potentiel en ressources humaines, en laboratoires et instituts permettant une éventuelle candidature du pays à la mise en place de centrales nucléaires.

Des perspectives s’ouvrent dans le sens d’une intégration des réseaux électriques des pays de l’Afrique de l’Ouest fondées sur l’hydroélectricité. De plus, un ministère entièrement dévolu à la
recherche scientifique a été créé au Sénégal. De même, un système national de recherche scientifique constitué d’instituts et de laboratoires en réseaux a été créé depuis l’an 2000.

Ainsi, les conditions d’application de l’énergie atomique à des fins pacifiques au Sénégal se réalisent progressivement, notamment dans les domaines stratégiques de la vie nationale : éducation, sciences médicales et pharmaceutiques, agriculture, nutrition, minéralogie et radioprotection.

Le Sénégal qui préside pour 2005 le programme AFRA (programme de coordination, de formation en sciences et techniques nucléaires pour le continent africain, en coopération avec l’Agence Internationale de l’Énergie Atomique) soutient les pays africains membres de l’Agence qui ont atteint des performances leur permettant de disposer de réacteurs de recherche ou d’installations electronucléaires sous réserve de respect des conditions stipulées dans les différentes conventions formulées par l’AIEA. Les besoins du continent dans ce sens sont immenses aussi bien du point de vue énergétique que du point de vue des applications technologiques liées au développement de tous les secteurs où intervient le rayonnement nucléaire avec efficacité. Il serait hautement souhaitable que l’ingénierie nucléaire puisse être largement partagée à l’échelle internationale et pour ce qui concerne le continent africain par les pays leaders dans ce domaine, à travers l’Union Africaine ou le Nouveau Partenariat pour le Développement de l’Afrique, le NEPAD.
International Ministerial Conference:

“Nuclear Power for the 21st Century”

Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Mehmet Hilmi Güler
Minister of Energy and Natural Resources

TURKEY
International Ministerial Conference
“Nuclear Power for the 21st Century”
Paris 21-22 March, 2005


Address by Dr.Mehmet Hilmi GÜLER
Minister of Energy and Natural Resources of Turkey
Mr. President, Excellencies,  
Distinguished Guests,

It is a pleasure for me to address you on the occasion of the International Ministerial Conference on “Nuclear Power for the 21st Century”, organized by the International Atomic Energy Agency, in cooperation with the Nuclear Energy Agency.

I would like to extend my appreciation to the Government of France and the two organizing agencies for this most timely and necessary meeting. I believe this conference is an important step forward for the further development of nuclear power, an essential source of energy both to protect the energy security of our economies, and to promote sustainable environmental development.

Mr. President,

Energy supply security remains as one of the main challenges facing growing economies. Turkey, having the fastest growing economy within the OECD, has been faced with this challenge for decades. Meeting our constantly increasing energy needs has required maximum utilization of our domestic resources, and diversification of the source and variety of our-imports.

We view nuclear energy, a safe, clean and cost effective energy resource, as one of the main components of our energy policy for the future. Nuclear energy, with virtually zero Greenhouse Gas Emissions generation option, will also result in a significant reduction in environmental emissions from the power sector.

Studies that we have conducted for domestic purposes have demonstrated the need over the next decade to commission nuclear power plants into the Turkish electricity grid. We envisage that around 5 GWe of base load nuclear capacity will be placed before 2015 and that the nuclear power will contribute to around 5-6% of our total installed capacity by the year 2020. We aim to diversify the portfolio
of electricity generation options and to reduce our dependency on imported fossil fuels through the sequential commissioning of nuclear power into the Turkish electricity grid.

**Mr. President,**

Nuclear power is not a new issue for Turkey. Our long lasting efforts in the area of nuclear energy started the establishment of the “Atomic Energy Commission” in 1956. Following that, Turkey became a member to the International Atomic Energy Agency in 1957.

We are determined to successfully fulfil our national nuclear power policy and based on our experience we are confident that we will soon have implemented a modern and well managed programme we hope may serve as a model for other countries. Turkey has a strong cadre of well qualified scientists and technicians able to manage a nuclear energy facility according to the standards of the 21st Century.

In this regard, we have developed a long term nuclear power programme:

- to fully utilize the legal, institutional, industrial and manpower infrastructure,
- to foster greater R&D activities as a part of our science and technology policy,
- to encourage private sector participation in the development of nuclear power projects in line with our efforts to liberalize the electricity market,
- and to implement our nuclear energy strategies for peaceful purposes and in conformity with international commitments.

No doubt we will greatly benefit from your experience in sustaining an excellent record of nuclear safety and use this valuable expertise in shaping our strategies for a well developed and well managed safe and sustainable nuclear programme.
Mr. President,

The international concern and undertakings to reduce greenhouse gas emissions together with escalating gas and oil prices have stimulated a renewed interest for nuclear energy. I believe that the future of nuclear power will depend on our success in reaching out to civil society and demonstrating to them through sound scientific principles that Nuclear Energy is a safe, clean and sustainable source of energy supply. We, as the Government, share the very same concerns as all concerned citizens for the well-being of our earth.

I would also like to stress the need for global solutions in the area of waste management. This continues to be an increasingly serious public concern despite the comparative advantages of nuclear power over other options in terms of waste generation volumes. As the amount of waste generated increases, the need for a safe and permanent disposal method becomes even more critical particularly in meeting public concern regarding the ensuring safety throughout the entire nuclear fuel cycle.

We, therefore, attach great importance to the waste management issue as an integral part of our nuclear programme. We are committed to cooperate in developing safe and cost effective waste disposal strategies.

Mr. President,

Transparency is essential for the continuation of nuclear power in contributing to global sustainable development. An effective global safety mechanism and well focused R&D programmes are also crucial aspects in utilizing nuclear power as a reliable option in meeting global energy demands, while maintaining the quality of the environment.

Turkey recognizes the significance of peaceful uses of nuclear technology and attaches utmost importance to the IAEA’s international safeguards system that is an essential part of the global nuclear non-proliferation regime. We have always been a strong
supporter of the Agency’s efforts to strengthen the “non-proliferation” regime. We consider the universal adoption and implementation of Comprehensive Safeguards Agreements, and Additional Protocols to them, as a pre-requisite to an effective and credible verification system.

I believe this Conference will create the synergy to broaden our cooperation and dialogue in all aspects of nuclear power, so that we will continue our efforts in achieving the global sustainability by utilizing nuclear energy for peaceful purposes.

Thank you for your attention.
International Ministerial Conference:  
“Nuclear Power for the 21st Century”  
 garnered approval from attendees. 

Paris  

21 - 22 March 2005  

Ministerial Presentation  

Ms. Dana Drabova  
Chairman  
State Office for Nuclear Safety  

CZECH REPUBLIC
Nuclear option in the long-term energy strategy of the Czech Republic

Martin Pecina, Dana Drábová
Ministry of Industry and Trade
State Office for Nuclear Safety
Praha, Czech Republic.

Ladies and gentlemen,

At the outset, let me express my sincere thanks for giving me the opportunity to be with you today and to have the possibility to present to this distinguished audience some ideas from the energy vision of the Czech Republic for the 21st century. Let me start with the quotation from famous physician Niels Bohr, who said: “Prediction is very difficult, especially about the future.” This sentence describes quite well the situation of today’s world, nevertheless we can not live without the vision.

The integrated vision of the Czech energy management in the form of the State energy policy was approved by the government of the Czech Republic in March 2004. It is a reflection of the state’s responsibility for creating conditions for reliable and permanently safe supplies of energy at acceptable prices and for creating conditions for its safe and efficient use that will not threaten the environment and will comply with the principles of sustainable development.

In this context I would like to mention two aspects. On one hand it uses a
large share of renewable energy resources, which in 2030 should reach almost 16% of all primary energy sources. Adoption of this was the result of broad compromise and this proportion is at the very limit of feasibility and the future economic capacity of our national economy. Further, it is a fact that to secure energy at affordable prices and at same time to be considerate to the environment, a certain proportion of nuclear energy is essential in the long-term outlook of the Czech Republic energy management. Nuclear energy will help to reduce the environmental load within the Czech Republic, including a reduction of greenhouse gas emissions. Nuclear energy will also support the priority of maximum independence of the country from foreign energy sources.

The decision on use of nuclear energy was taken in the CR in 1955; subsequently, the infrastructure for industry and R&D was developed. Connection of NPP Temelin to grid in 2002 finalized this effort. The share of nuclear energy on electricity production is about 32%, the installed capacity being 3760 MW. The share of the Czech nuclear industry on construction of own NPPs reached 90%; it took part also in construction of NPPs abroad. The results were achieved thanks to goal oriented research effort which is necessary condition for a long-time orientation on the nuclear power.

To replace step by step some obsolete capacities in coal power plants, Czech energy policy expects to install at least 1,2 GWe in new NPPs
until 2030 Studies beyond 2030 to 2060 shows potential needs for GEN IV NPPs both for electricity (7 GWe) and hydrogen (5 GWth) production. Czech R&D and industry is ready to participate in multilateral effort to increase the nuclear energy utilization.

Nevertheless the situation is not simple and straightforward. In the Czech Republic like in other countries the use of nuclear energy and ionising radiation is being extensively scrutinised once again in light of present debate on its role in sustainable development and on global security problems. The primary objective is to allow mankind to maximise the benefits and minimise the risks emanating from nuclear sciences and their applications. The key words of this debate are safety, verification & security, waste management and technical co-operation in the peaceful uses of nuclear technology. The Czech government perceives the highest reasonably achievable level of nuclear safety and radiation protection as a necessary precondition for using of nuclear power generating facilities. However the Czech industry and regulator have to face newly arising challenges such as ageing of equipment and staff, growing shortage of graduated engineers, knowledge preservation and public risk awareness.

The level of public confidence in existing safety regime and consequently public acceptance of nuclear power seem to be other key issue. Considerable thought is being given to ensuring that the public is and
feels that it is contributing to the decision-making process.

Efforts in strengthening the global safety regime resulted in really positive achievements in turn of the millennium. Quality of newly revised IAEA standards or promising start of the review process both under the Convention on Nuclear Safety and Joint Convention on Safe Management of Radioactive Waste and Spent Fuel represent two most visible achievements. The specific “European” discussion on “nuclear package” proposal should, in our view, complement the world wide effort.

Ladies and gentlemen, thank you for your attention.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Muhammad Akram Sheikh
Deputy Chairman
Minister of State Planning Commission

PAKISTAN
Mr. Chairman, Excellencies, Mr. Director General, Distinguished Delegates, Ladies and Gentlemen.

Some of the major challenges in the decades ahead relate to those caused by increasing population, waste and pollution resulting from growing prosperity. A new look at the energy mix as well as technological innovation in the generation, delivery and use of electricity can play a central role in meeting these challenges.

Energy, specially electricity, is universally recognized as a major component of the development debate. Per capita income and energy consumption are considered as key indicators of economic development. At present, Pakistan's per capita income of US$ 652 is very low compared to the world average. The per
capita primary commercial energy consumption of 0.30 Tonne of Oil Equivalent (TOE) is also about one-fifth of the world average of 1.55 TOE.

With macroeconomic stability and recent key economic reforms, the slow growth of the nineties has been reversed, and economic growth in Pakistan is accelerating again. In the current fiscal year of 2004-05, it is expected to grow by around 7% with targets of 8% economic growth by 2009-10 and thereafter for a decade or more-through accelerated growth in all sectors particularly the industrial sector. In the coming years Pakistan hopes to enter the group of middle-income economies.

To sustain such high economic growth, large increases in energy supplies will be required. The Government of Pakistan has formulated a medium to long-term (Vision 2030) energy strategy that aims to ensure availability of sufficient energy on sustainable basis at affordable prices to achieve planned economic growth targets.

Before giving an outline of the energy strategy, I would like to share with you some of the key energy issues of Pakistan.

First, the energy mix of Pakistan is not diversified. Only three energy sources, i.e. gas, oil and hydro, account for 93% of the total primary energy supplies of 51 MTOE (2003-04) in Pakistan. The share of coal in primary energy is very low – only 6%. The share of nuclear power in total energy supply is less than 1%, and is only 2.2%, in electricity generation, which is very low compared to 30% in Western Europe and 19% each in North America, and Eastern Europe.

Second, energy requirements are increasing rapidly, because of changes in the level of economic activity, and increase in a mobile and affluent middle class. To achieve these demands, primary commercial energy requirements will increase by a factor of 3.5 by 2020 and by a factor 7.1 by 2030 (361 MTOE). The gap in 2030 between total demand and indigenous supply will be 208 MTOE (or 57.4 % of the projected demand).

Third, a large fraction of population still does not have access to commercial fuels, in spite of public demand. Compared to many other developing countries, Pakistan has fairly extensive electrification network with about 75% households electrified, but access to modern fuels for domestic use is still very low. Only about 20% of the households have access to piped natural gas supply, no one uses electricity for cooking, and only a few percent additional households use liquefied petroleum gas (LPG) and kerosene oil. The majority of rural households still rely on traditional fuels (i.e. wood, crop residues and animal dung). The amount of traditional
fuels used remains high at about 22 million TOE as against the primary commercial energy consumption of 51 million TOE. The use of traditional fuels has adverse impact on the environment through deforestation, potential loss of natural fertilizer, and health of women.

Fourth, there is under-exploitation of indigenous conventional energy resources. Pakistan has fairly good prospects of oil and gas. However, the oil and gas exploration activity till now has been rather low. Against a world average of on-shore drilling density of 9.5 wells per thousand square kilometers, the drilling density in Pakistan is only 2.3 wells per thousand square kilometers. The indigenous proven oil and gas reserves of Pakistan, as of June 2004, correspond to 300 million barrels and 0.8 trillion cubic meters respectively, while ultimate reserves may be as high as 27 billion barrels and 8 trillion cubic meters. The reserves to production ratios of oil and gas are 13 and 24 years respectively. A substantial increase in petroleum exploratory effort is needed to discover more reserves and increase the production levels.

The coal resources (estimated to be over 185 billion tons) are grossly underutilised, with measured recoverable reserves to production ratio of over 1000.

On the hydel front, only 14% of the present identified potential (6,460 MW against 46,000 MW potential) of Pakistan has been exploited so far.

Other constraints on development of energy system of Pakistan include overall shortage of investment funds and lack of international cooperation, particularly in nuclear power development.

Distinguished Delegates,

Now I would like to share with you the salient features of the recently approved 25 Year Energy Security Plan to achieve the national socio-economic development targets.

To meet the primary commercial energy demand of 361 million TOE in 2030, the government of Pakistan plans to exploit all indigenous sources and diversify the energy mix in the next few decades including full deployment of renewable energy.

For electricity generation, Pakistan will continue to rely heavily on natural gas and hydro. Their combined contribution will be around two-thirds of the total electricity generation, with natural gas (45%) remaining the largest contributor among all energy sources.
• The increasing gap in indigenous sources of 208 MTOE (57.4% of demand) is to be met through imports of gas and oil

• Use of coal from the Thar field is to be increased from 3.3 million TOE in 2004 to 69 million TOE in 2030, mainly for electricity generation, raising its share to 19%

• The share of nuclear energy in electricity generation is planned to be increased from 0.8% in 2004 to at least 7% by the year 2030 (adding 8,400 MW).

• In 2030, 2.5% of the total commercial energy supply will be met through renewables.

• As furnace oil is the most expensive option for base load electricity generation, it will be used only to fill up the gap between demand and supply and its share will decrease to 5% by the year 2030 from the present 16%.

**Nuclear Power**

Excellencies, ladies and gentlemen, please allow me to dilate a little on the decision of Pakistan to retain and enhance the role of nuclear power generation, which we see in the context of three increasingly important energy issues: sustainability, climate change and electricity market competition.

We are convinced that nuclear power will allow us to meet our energy needs for sustainable development because it is free of carbon dioxide emissions. We are further assured in this approach because of excellent safety records in general, and Pakistan in particular. Moreover, efficiencies are increasing everywhere, with our own 2nd nuclear plant showing a net capacity factor better than 90% since the start of its third operating cycle in July 2004. Nuclear plants can also combine with hydel power plants by helping to pump water back up into the water reservoir during off-peak periods for generation of hydel power at peak hours- thus reducing dependence upon gas fired turbines during peak loads.

Pakistan was the fifteenth country making use of nuclear power and has more than 35 years experience of operating nuclear power plants. It has developed a reasonable autarky in the nuclear fuel cycle based on indigenous uranium. It has experienced human resources for operating nuclear power plants. All these factors encourage us to increase our share of nuclear electricity.
While these reflect the positive side of nuclear power plants, we in Pakistan cannot ignore global concerns about decommissioning nuclear plants safely and economically, as well as issues of waste management. We are happy that many new plants are being built, but these concerns are real and must be addressed, specially when one considers that about 100 facilities worldwide would have to be decommissioned by the year 2010. One can of course employ life extension programmes, but this only postpones and does not eliminate decommissioning and waste management concerns. Recently, a political dimension has been added to the debate – physical security of these plants and material therein. We are conscious of all these issues and extend our full co-operation in their resolution within a wider and transparent international framework where nations can share expertise and knowledge.

Distinguished delegates, I therefore invite your attention to the following:

First, our current vision envisages a minimum of 10 nuclear plants totaling 8800 MW by 2030 (8% share of electricity), with least burden on the public exchequer through self financing and other schemes.

Second, since Pakistan will face a gap of nearly 57.4% by 2030, we would welcome its reduction with even more nuclear generation.

Third, we intend to treat these nuclear power stations like others which have been financed, set up, and operated by the private sector in Pakistan. We feel that one way to address concerns about safeguards in these power plants is for, say, the international nuclear power industry to build and operate these plants in Pakistan. We would like to suggest joint ventures for setting up nuclear power plants in Nuclear Parks in Pakistan. To alleviate proliferation and other concerns, nuclear power plants can be treated in a special manner. Several nuclear power plants could be constructed in a designated zone, the boundaries of which are specially secured to the satisfaction of all concerned. It can be ensured that the plant and associated facilities are fully safeguarded. This could be a solution for Pakistan and many developing countries.

We only need assurances of risk mitigation as regards shutdown, while the operator is responsible for taking care of high and low level waste. The Government of Pakistan would be prepared to sign a guaranteed long-term power purchase agreement on reasonable rates not only for the current projected 8400 MW, but even for a larger capacity.

Fourth, we are promoting competitive electricity generation and nuclear power will not be immune to that. With so many nuclear plants coming on-line, it will help to
reduce capital and generating costs if Pakistan’s expertise in manufacture of plant assets such as machinery, instrumentation and controls is utilized by the foreign nuclear plant operator. It should be noted that much of plant and machinery in nuclear and non-nuclear plants is common, leading to economies of scale for our non-nuclear power plants also.

**In conclusion** I would like to say that Pakistan is presently aiming at a nuclear share of modest 8% in total electricity supply by 2030. Even achieving this target is a major challenge for us. This will require expansion of our design and engineering capability, strengthening of industrial infrastructure and human resources. International cooperation in expansion of nuclear power development in Pakistan is highly desired and mutually beneficial. An expanded nuclear power programme of Pakistan will help in reducing the burden on environment and stress on global conventional fossil fuel resources.

**In the end I would like to offer sincere thanks to** the Government of France, Director General IAEA, and OECD, for organizing this Ministerial Conference on Nuclear power for the 21st Century. The exchange of views at the Conference would help develop shared perspectives in this important sector, encourage better understanding of each others’ point of view and in ensuring exclusive application of nuclear power and technology for peaceful use - enhancing economic growth and betterment of humanity.
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Ministerial Presentation

H.E. Mr. Muhammad Akram Sheikh
Deputy Chairman
Minister of State Planning Commission

PAKISTAN
بسم الله الرحمن الرحيم
Strategy to Meet the Growing Energy Requirements of Pakistan

International Ministerial Conference on Nuclear Power in the 21st Century

Paris, March 21 – 22, 2005

Presented by:

Dr. M. Akram Sheikh
Deputy Chairman, Planning Commission of Pakistan
Primary Commercial Energy Consumption of Pakistan in year 2003-04

Total Primary Commercial Energy Consumption = 51 million TOE
(Imported: 27.7)

- **Coal** (Imported: 3.6%)
- **Hydel**
- **Nuclear** (1%)
- **Oil** (30%)
- **Gas** (50%)

Total Primary Commercial Energy Consumption = 27.7 TOE

Per Capita Comm. Energy Consumption (TOE)

World Average: 1.55

Pakistan: 0.3
Share Of Nuclear Electricity Generation (2003)

<table>
<thead>
<tr>
<th>Country</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithuania</td>
<td>79.9</td>
</tr>
<tr>
<td>France</td>
<td>77.7</td>
</tr>
<tr>
<td>Slovakia</td>
<td>57.3</td>
</tr>
<tr>
<td>Belgium</td>
<td>55.5</td>
</tr>
<tr>
<td>Sweden</td>
<td>49.6</td>
</tr>
<tr>
<td>Ukraine</td>
<td>45.9</td>
</tr>
<tr>
<td>Slovenia</td>
<td>40.4</td>
</tr>
<tr>
<td>Korea, S</td>
<td>40.0</td>
</tr>
<tr>
<td>Switzerland</td>
<td>39.7</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>37.7</td>
</tr>
<tr>
<td>Armenia</td>
<td>35.5</td>
</tr>
<tr>
<td>Hungary</td>
<td>32.7</td>
</tr>
<tr>
<td>Czech Rep</td>
<td>31.1</td>
</tr>
<tr>
<td>Germany</td>
<td>28.1</td>
</tr>
<tr>
<td>Finland</td>
<td>27.3</td>
</tr>
<tr>
<td>Ukraine</td>
<td>25.0</td>
</tr>
<tr>
<td>UK</td>
<td>23.7</td>
</tr>
<tr>
<td>Spain</td>
<td>23.6</td>
</tr>
<tr>
<td>Taiwan</td>
<td>21.5</td>
</tr>
<tr>
<td>USA</td>
<td>19.9</td>
</tr>
</tbody>
</table>

Source: International Atomic Energy Agency.
Nuclear energy consumption by area

Million tonnes oil equivalent

Global nuclear power generation contracted in 2003, for only the second time in its history, as output fell in the USA and Japan, the world's largest and third-largest generators respectively.

Source: BP Statistical Review of World Energy 2004
ENERGY SUPPLY DEMAND GAP

Note: Greater explorations as proposed should result in increased indigenous supplies and narrow the demand-supply gap. The dependence on imported energy would accordingly go down and timely adjustment for import of fuel taken to reduce outflow of foreign exchange.
# Ultimate Energy Resource Potential Estimates
*(As of June 2004)*

## Hydrocarbon

<table>
<thead>
<tr>
<th>Resource Category</th>
<th>Ultimate/Proved estimates</th>
<th>Level Of Production</th>
<th>Level Of Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil (barrels)</td>
<td>27Billion/300 Million</td>
<td>22.6 Million</td>
<td>100.0 Million</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>8.0/0.8 TCM</td>
<td>93 MCMD</td>
<td>82 MCMD</td>
</tr>
<tr>
<td>Coal</td>
<td>185/3.3 billion</td>
<td>3.3 Million</td>
<td>6.1 Million</td>
</tr>
</tbody>
</table>

## Hydel Potential

- **Identified**: 46,000 MW
- **Installed**: 6,459 MW
## Energy Mix Plan Projections

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Current</th>
<th>Short Term</th>
<th>Medium Term</th>
<th>Long Term</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2004</td>
<td>2010</td>
<td>2015</td>
<td>2020</td>
</tr>
<tr>
<td><strong>Total MTOE</strong></td>
<td>50.8</td>
<td>79.39</td>
<td>120.18</td>
<td>177.35</td>
</tr>
<tr>
<td>Oil</td>
<td>15.20</td>
<td>20.69</td>
<td>32.51</td>
<td>45.47</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>25.45</td>
<td>38.99</td>
<td>52.98</td>
<td>77.85</td>
</tr>
<tr>
<td>Coal</td>
<td>3.30</td>
<td>7.16</td>
<td>14.45</td>
<td>24.77</td>
</tr>
<tr>
<td>Hydro</td>
<td>6.43</td>
<td>11.03</td>
<td>16.40</td>
<td>21.44</td>
</tr>
<tr>
<td>Renewable</td>
<td>0.00</td>
<td>0.84</td>
<td>1.60</td>
<td>3.00</td>
</tr>
<tr>
<td>Nuclear</td>
<td>0.42</td>
<td>0.69</td>
<td>2.23</td>
<td>4.81</td>
</tr>
</tbody>
</table>
# Power Generation Plan

<table>
<thead>
<tr>
<th>Year</th>
<th>Nuclear</th>
<th>Hydel</th>
<th>Coal</th>
<th>Renewable</th>
<th>Oil</th>
<th>Gas</th>
<th>Total</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing (2005)</td>
<td>400</td>
<td>6460</td>
<td>160</td>
<td>180</td>
<td>6400</td>
<td>5940</td>
<td>19540</td>
<td></td>
</tr>
<tr>
<td>Addition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>160</td>
<td>4860</td>
<td>7880</td>
<td>27420</td>
</tr>
<tr>
<td>2015</td>
<td>900</td>
<td>7570</td>
<td>3000</td>
<td>800</td>
<td>300</td>
<td>7550</td>
<td>20120</td>
<td>47540</td>
</tr>
<tr>
<td>2020</td>
<td>1500</td>
<td>4700</td>
<td>4200</td>
<td>1470</td>
<td>300</td>
<td>12560</td>
<td>24730</td>
<td>72270</td>
</tr>
<tr>
<td>2025</td>
<td>2000</td>
<td>5600</td>
<td>5400</td>
<td>2700</td>
<td>300</td>
<td>22490</td>
<td>38490</td>
<td>110760</td>
</tr>
<tr>
<td>2030</td>
<td>4000</td>
<td>7070</td>
<td>6250</td>
<td>3850</td>
<td>300</td>
<td>30360</td>
<td>51830</td>
<td>162590</td>
</tr>
<tr>
<td>Total:</td>
<td>8800</td>
<td>32660</td>
<td>19910</td>
<td>9700</td>
<td>7760</td>
<td>83760</td>
<td>162590</td>
<td></td>
</tr>
</tbody>
</table>

*Note: KANNUP to be retired in 2019*
World Energy Supplies (Long Term Strategies)

Source: SPE International (Society of Petroleum Engineers)
Main Objectives of Energy Security Action Plan

- Ensure availability of sufficient energy on sustainable basis and at affordable prices to achieve planned GDP growth targets (2005/10 – average 7.4%; 2011-2030 – average 8%).

- Maximum utilization of indigenous resources to meet the growing demand on a sustained and affordable basis thereby providing energy security, sovereignty and sustainability.

- Accelerated exploitation/exploration of indigenous energy resources

- Increase the indigenous coal share in the energy mix i.e. upto 20% in 25 year plan and lay the foundation for future share to go up to 50%.

- Promotion of nuclear and renewable energy sources (wind, solar) to have at least 10% share in energy mix in 25 years.

- Resort to import of natural gas and LNG through multiple sources on best possible terms if indigenous resources fall short to maintain GDP growth.

- Promotion of R&D for improvement in energy efficiency and conservation and development of energy efficient appliances. Achievement of at least 10% improvements in Value Addition to energy consumption ratio.

- Improve the strategic oil reserves.

- Improve quality of consumer services and creating competitive environment to solicit maximum private sector participation.

- Promote human resource development to ensure availability of required manpower to achieve Plan objectives.
THANK YOU
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Ministerial Presentation

Prof. Dr. Khadiza Begum
Chairman
Bangladesh Atomic Energy Commission

on behalf of

H.E. Mr. Abdul Moyeen Khan
Minister of Science and Information and Communication Technology

BANGLADESH
General Information on Bangladesh

- Location: Latitude-Between 20°34’N and 26°38’N, Longitude-Between 88°01’E and 92°41’E
- Area: 147,570 Sq. Km
- Population: 133.4 million
- Population density: 904 per sq. km
- Population growth rate: 1.48%
- Literacy rate: 65%
Economic Overviews

- Economy: Agriculture based
- Total GDP: 300485 million taka
- GDP growth rate: 5.33% (Fixed price)
- GDP per capita: 22523 taka
- Inflation rate: 4.87%
- Exchange rate: Tk. 61.5/USD
Energy Situation of Bangladesh

Per capita consumption
- energy: 220 KGOE
- electricity: 140 KWh

Share of commercial resources: 35%
Traditional biomass resources: 65%

- Present consumption pattern is less than one fortieth of the average of industrialized country, one sixth of the Asian average and one third of India and Pakistan.

- Access to electricity is less than 20% of total population

- 2.2% of the households, mostly in the urban locations have access to pipe line gas.

Rural population of the country is about 80%, they are still deprived of the benefits of modern energy
TRADITIONAL BIOMASS

Bangladesh still belong to the subsistence level of economy and traditional biomass fuels such as firewood, agriculture residues, leaves, cattle dung, straw, rice husk etc. play the vital role in the energy balance of the country.

- More than 40 million tones of biomass fuels are being consumed (Islam, 2001) and
- 95% households in rural area use biomass for cooking

With the growth of population accompanied by crisis of commercial fuels, more pressure is being put on biomass fuels and

Biomass fuels already attained its saturation level or even is being supplied beyond their sustainable level.
IMPACTS OF EXCESSIVE USES OF BIOMASS AS FUELS

q **Reduction of organic matter of soil**
Erosion of soil and depriving the cultivable land of organic matters – decreasing fertility day by day.
Organic recycling: China 65%, India 40% and Bangladesh 11%

q **Deforestation**
forest area has dwindled to 9% and rapid depletion of forest resources are causing ecological imbalance and change in climate pattern.

q **Health Hazard**
Various types of health effects are occurring in women and young children through passive smoking: acute & chronic respiratory diseases, lung cancers, cardiovascular disease, etc. In India, about 6% of the national burden of disease in women and young children

  - Uses of biomass as a fuel should be limited
Main commercial energy resources are:
- Indigenous natural gas
- Hydroelectricity and
- Imported crude oil and other petroleum products

Supply of the above fuels was 12.59 MTOE (2000)

Per capita availability of commercial energy is about 100 KgOE

Natural gas accounts for about 75% of the total commercial energy and about 85% of power generation. (Petrobangla, 2001)

If the supply of traditional fuels is estimated to be 137 KgOE (estimation from the demand side), then the per capita consumption of total energy works out to be 237 KgOE in which the share of traditional energy is roughly 60%
Energy Situation of Bangladesh – CONT’D

RESERVES OF COMMERCIAL ENERGY

Natural Gas

22 Gas Fields, Proven reserve 10.5 TCF. It is reported that proven fields, undrilled structures and structural leads could increase reserve by about 42 TCF, out of which 10% could become recoverable. Thus recoverable reserve would be maximum about 15.0 TCF. *Per capita reserve is 1/10 of world average.* At present rate of use the natural gas deposit may be exhausted within 17 yrs.

Coal

Barapukuria: 150- 300m in depth; reserve 300 MT; 23.30% is recoverable. presently extracting for uses of 300 MW coalpower plant

Jamalganj-Jaipurhat: (bituminous coal) 1000m in depth; reserve 1000 MT; not economically viable

Khalasper:200 – 450m in depth; reserve 450 MT; not economically viable

Faridpur, Khulna and Sylhet: (peat coal) 1 - 3 meters in depth with a shallow layer of around 2 – 3 meters; unrealistic to tap

*Per capita coal reserve is 1/200 of world average*
Energy Situation of Bangladesh – CONT’D

POTENTIAL ENERGY RESOURCES

q Hydro
Presently harnessing 230 MW from the Kaptai Dam. There are two potential sites are Matamuhuri and Sangu with potential of 300 GWh and 200 GWh per/year. A few sites in Sylhet, Chittagong and CHTs are potential for mini-hydro power plants of 10 GWh per/year.

q BIOMASS FUELS
In the foreseeable future, they can not make a large contribution

q SOLAR ENERGY
The REB is commercially operating its first 62 KW pilot solar PV project in two unions of isolated river islands of Narsingdi. Six more projects of same size in planning stage.
• the Grameen Shakti is one specialized and pioneer that has been working to promote and disseminate photovoltaic technology to the rural households.

q WIND ENERGY
• The LGED installed a 400W turbine at Kuakata, Potuakhali. Currently, the LGED is powering 14 lamps from this system.
• Each 450 KW wind turbine power plants are under construction at Patenga, Cox Bazar, Feni and Kuakata having a total capacity of 1800 KW. There is a number of potential locations along the coast line of size 100 MW.
• Further investigation of the potential wind power development is warranted.
NATIONAL ENERGY POLICY

- To provide energy for sustainable economic growth
- To meet the energy needs of different zones and socio-economic groups
- To ensure optimum development of all the indigenous energy sources
- To ensure sustainable operation of the energy utilities
- To ensure rational use of total energy sources
- To ensure environmentally sound sustainable energy development programmes
- To encourage public and private sector participation
- To ensure reliable supply of energy to the people at reasonable and affordable price
- To develop a regional energy market for rational exchange of commercial energy to ensure energy security
### NATIONAL ENERGY POLICY: PROJECTED DEMAND

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2005</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (million)</td>
<td>130</td>
<td>141</td>
<td>153</td>
<td>165</td>
<td>177</td>
</tr>
<tr>
<td>Low Scenario</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per capita KGOE</td>
<td>92</td>
<td>127</td>
<td>157</td>
<td>219</td>
<td>272</td>
</tr>
<tr>
<td>Peak Load MW</td>
<td>3668</td>
<td>5220</td>
<td>6100</td>
<td>8995</td>
<td>11794</td>
</tr>
<tr>
<td>Per capita KWh</td>
<td>141</td>
<td>185</td>
<td>203</td>
<td>282</td>
<td>351</td>
</tr>
<tr>
<td>Reference Scenario</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per capita KGOE</td>
<td>94</td>
<td>131</td>
<td>194</td>
<td>269</td>
<td>384</td>
</tr>
<tr>
<td>Per capita KWh</td>
<td>146</td>
<td>199</td>
<td>260</td>
<td>363</td>
<td>523</td>
</tr>
<tr>
<td>Peak Load MW</td>
<td>3799</td>
<td>5620</td>
<td>7823</td>
<td>11581</td>
<td>17580</td>
</tr>
</tbody>
</table>
### NEP: PROJECTED DEMAND OF ENERGY

#### Roles of Indigenous fuels (in GWh)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas</td>
<td>15000</td>
<td>15000</td>
<td>15000</td>
<td>15000</td>
<td>15000</td>
</tr>
<tr>
<td>Coal</td>
<td>1030</td>
<td>3090</td>
<td>5150</td>
<td>6180</td>
<td>7210</td>
</tr>
<tr>
<td>Hydro</td>
<td>800</td>
<td>800</td>
<td>800</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>Total (GWH)</td>
<td>17030</td>
<td>19090</td>
<td>21450</td>
<td>22480</td>
<td>23510</td>
</tr>
<tr>
<td>Deficit (Low Scenario)</td>
<td>1285</td>
<td>6970</td>
<td>9544</td>
<td>24011</td>
<td>38478</td>
</tr>
<tr>
<td>Deficit (High Scenario)</td>
<td>1941</td>
<td>8970</td>
<td>18300</td>
<td>35847</td>
<td>68892</td>
</tr>
</tbody>
</table>
NEP: PROJECTED DEMAND OF ENERGY

Import requirements in meeting projected demand of energy and electricity

Import Options: oil, coal and nuclear (NEP)
BPDB A single public sector utility was responsible for entire range of activities: generation, transmission, distribution, and sales.

Structural changes:

- Rural Electrification Board (REB, 1977): Responsible for electrification of rural areas
- DESA (90,s): Responsible for electrification of Dhaka and adjacent areas
  - Way of separation of commercial operation in phases
- IPP from mid nineties exhibiting incremental contribution for generation.
- Power grid company of Bangladesh was formed to take responsibility for electricity transmission network.
PRESENT STATUS OF POWER SECTOR

Installed Capacity, 2003: 4680 MW

- Gas: 85%
- Diesel: 6%
- Furnace oil: 5%
- Hydro: 4%
PRESENT STATUS OF POWER SECTOR

The total Installed Capacity (2003) of different power plants including IPP consists of the following mix:

<table>
<thead>
<tr>
<th>Power plants</th>
<th>Installed capacity</th>
<th>percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>hydro</td>
<td>230 MW</td>
<td>4.91%</td>
</tr>
<tr>
<td>Steam turbine</td>
<td>2228 MW</td>
<td>47.61%</td>
</tr>
<tr>
<td>Gas turbine</td>
<td>994 MW</td>
<td>21.24%</td>
</tr>
<tr>
<td>Combined cycle</td>
<td>990 MW</td>
<td>21.15%</td>
</tr>
<tr>
<td>Diesel</td>
<td>238 MW</td>
<td>5.09%</td>
</tr>
<tr>
<td>total</td>
<td>4680 MW</td>
<td>100%</td>
</tr>
</tbody>
</table>
PRESENT STATUS OF POWER SECTOR

Generation Pattern, 2003: 18422.07 MKWh

- Gas: 89%
- Diesel: 5%
- Furnace oil: 5%
- Hydro: 1%
PRESENT STATUS OF POWER SECTOR

ZONE BASED TOTAL ENERGY GENERATION (INCLUDING IPP)
PRESENT STATUS OF POWER SECTOR

GROWTH OF MAXIMUM DEMAND
PRESENT STATUS OF POWER SECTOR

HISTORICAL DEVELOPMENT OF ELECTRICITY DEMAND SERVED:
PRESENT STATUS OF POWER SECTOR

Consumption Pattern sector wise, 2003: 16331.56 MKWh
PRESENT STATUS OF POWER SECTOR

The comparative generation picture of BPDB’s own with IPP:

TREND OF ELECTRICITY GENERATION
NEED FOR NUCLEAR POWER IN BANGLADESH

To reach the protected level about 18,000 MW in 2020, the generation capacity needs to increase about 12,000 MW from present generation level

- Present annual import: 2 million tones
- Gas Reserves: Life ends 2017?
- Coal: Economically not feasible + global issues
- Energy deficit: By 2020: 80%
  - Requirement 25 – 35 times of present import
- Beyond 2020: 100% import?

Impossible to reach the protected level! Because of limited as well as unevenly distributed Indigenous resources and present mode of Imports. Huge amount of fuels have to be import
NEED FOR NUCLEAR POWER IN BANGLADESH

A generation mix consisting indigenous fuels and imported coal, oil and nuclear needs to be considered in a new way in the perspective plan for energy development.

Issues and strategies for import?

Coal:
- Emission of greenhouse gases and global warming effect
- Development of additional infrastructure for the logistics of handling and internal movement

Oil
- Uncertainties in price
- Uncertainties of availability in international market

Nuclear Power
- Absence of greenhouse gases
- Low operating cost
- Less sensitivity to fluctuations in the price of fuel
- Spin off benefits are enormous

Nuclear power offers a proven and economically viable option for a fast growing and secured energy sector development in the countries with limited resources.
NEED FOR NUCLEAR POWER IN BANGLADESH

REGIONAL IMBALANCE

Gap in energy use between East and West zones of the country is widening day by day since all natural resources are located in the West Zone. In the 2003, total generation in the West Zone was about 15% of the system total while the peak demand was more than 33%. Such a situation is hampering the overall economic development of the west zone.

Fig. 3. Growth of Maximum Demand of Electricity in the East and West Zones as well as System total of Bangladesh
Desired growth in generation is being hampered due to inadequacy in supply. The gap between the projected demand of electricity and demand serve is rising sharply.

Therefore!!

- A generation mix consisting indigenous fuels and imported coal, oil and nuclear needs to be considered in a new way

- Implementation of Nuclear Power Project
ROOPPUR NUCLEAR NUCLEAR PROJECT

The growing need for electricity and paucity of indigenous primary energy resources in the country in general and in the Western Zone in particular, Rooppur site was selected in 1961.

The site is qualified by international standards.

A number of Feasibility study on the site have been carried out. All these studies have clearly established economic and technical viability of the project.

Before and after liberation, the Government approved the projects for several times.

A number of suppliers had submitted proposals for the project both before and after liberation.

The project could not, however, be implemented due to several problems with financing as the main obstacle.
ROOPPUR NUCLEAR NUCLEAR PROJECT

PRESENT STATUS
For implementation of the project, a Cabinet Committee headed by the Honorable Prime Minister has been working for implementation of the Project. Chairman, BAEC is the Member-Secretary of that Committee. A plant of 600 MW(e) has been proposed for implementation.

MODE OF IMPLEMENTATION
Under arrangements like Build, Operate, Own (transfer), Joint Venture, etc.

PRE-IMPLEMENTATION PHASE ACTIVITIES
- Site Safety Report of 600 MW(e) has been finalized
- Bangladesh National Nuclear Power Action Plan (BANPAP) was adopted at the appropriate level of the Government
- The draft Request for Proposal (REF) of 600 MW(e) has been finalized and submitted to the MOSICT, GOB for further direction
EXISTING NUCLEAR RELATED LAW AND REGULATION

Nuclear Safety and Radiation Control Act (1993)

BAEC has been empowered to enforce different provisions of the law.

Nuclear Safety and Radiation Regulations (1997)

In light of the Act and the IAEA Basic Safety Standards, BAEC has formulated the Nuclear Safety and Radiation Regulations in 1997. The Nuclear Safety and Radiation Control Division (NSRCD) of BAEC performs different regulatory functions.

INTERNATIONAL COMMITMENTS

Bangladesh is fully committed to use nuclear energy exclusively for peaceful purposes. Bangladesh has signed the Treaty On Non-Proliferation of Nuclear Weapons (NPT), Comprehensive Test Ban Treaty and the Agreement on Safeguards with the IAEA. Bangladesh has also signed Bilateral Agreements on Nuclear Cooperation with the United States of America and France. It is also a signatory to the following Conventions with the IAEA: The Convention on Early Notification of a Nuclear Accident (1986), The Convention on Assistance in the case of Nuclear Accident or Radiological Emergency (1986) and The Convention on Nuclear Safety (1995).
ROOPPUR NUCLEAR NUCLEAR PROJECT

RELEVANCE OF R & D TO NUCLEAR POWER PROJECT

Trained professionals belong to the following broad disciplines:

- Nuclear Engineering
- Mechanical Engineering
- Electrical Engineering
- Heat transfer
- Control & Instrumentation
- Chemical Engineering
- Chemistry (Nuclear, Analytical & water chemistry)
- Reactor physics
- Health physics
- Non destructive testing and Q/A
- Radioactive waste management
- Civil Engineering
- Architecture
ROOPPUR NUCLEAR NUCLEAR PROJECT

PUBLIC ACCEPTANCE
The public has been maintaining keen interest since 1961.

REMARKS ON PROPOSED ROOPPUR NUCLEAR POWER PROJECT SITE
The Rooppur Nuclear Power Project Site is suitable for construction of two Nuclear Power Plants.
THANK YOU
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Ms. Lulu Xingwana
Deputy Minister of Minerals and Energy

SOUTH AFRICA
STATEMENT BY THE LEADER OF THE SOUTH AFRICAN DELEGATION,
MS LULAMA XINGWANA, DEPUTY MINISTER OF MINERALS AND ENERGY
ENERGY NEEDS FOR THE 21ST CENTURY AND SOUTH AFRICA’S STRATEGIES TO MEET THEM

Conference President, The French Minister of Industry
Honourable Ministers,
Your Excellencies,
Director-General of the IAEA
Director General of the NEA
Distinguished Delegates,

Allow me to begin by expressing our appreciation to the host country France, with whom we have a special partnership in skills development and in other areas. Our sincere gratitude also goes to the IAEA and the OECD for organising this conference.

We meet at a critical time in history, under challenging international circumstances, where we are witnessing the escalation of energy
costs, while we are endeavouring to meet our millennium goals of reducing poverty and underdevelopment.

The Director-General of the International Atomic Energy Agency, Dr Mohammed EL-Baradei indicated earlier this year that “the IAEA forecasts stronger growth in countries relying on nuclear power, projecting at least 60 more plants will come online over the next 15 years to help meet global electricity demands”. In this context, we wish to reiterate our national position that nuclear energy has got to be an integral part of a sustainable energy mix.

In South Africa we are at a stage where our excess capacity is diminishing as our economic growth accelerates. An equivalent of 10 Billion Euros will be spent on new generation capacity in the next 5 years alone. In the next 20 years an equivalent of our entire generation capacity will have to be added to our national electricity grid. This, partly as a result of us having to retire some of the older coal fired power plants. Our President announced that in 8 years we would achieve universal access to electricity. This means an additional 3 million households that will be supplied through the electricity grid. Currently we electrify in excess of 300000 households per annum.
Our energy strategy is informed by our White Paper on Energy Policy, which amongst other implores us to ensure diversity as well as security of supply. Whilst we recognise that coal will continue to provide the bulk of our electricity demands, our integrated energy plan recognises that hydro, renewables and nuclear power will have to play an increasing role as we reduce our dependency on coal. We have therefore entered into an agreement on what is referred to as the WESCOR project in which a number of countries in the SADC region have signed an agreement to facilitate the development of the electricity generation capacity of the Inga dam in the Democratic Republic of Congo, for the benefit of all.

Further to commitments we made during the world summit on sustainable development, we have committed up to 10000GWh of Renewable energy by 2010, a target that we are confident of meeting. The development of a wind farm in Darling, not far from the Koeberg nuclear power station, has just been given go a ahead by our Environmental Affairs Department.

In a country that has abundant uranium resources, it follows that we would continuously seek ways of utilising this abundant resource for peace and economic development.
The Pebble Bed Modular reactor was borne out of the need to ensure security of supply through diversity.

In our Integrated Energy Plan we have recognised the need for nuclear power to play a role in meeting our energy demands. The decision to proceed with the PBMR project was taken with full understanding that successful commissioning of the project will contribute towards efforts aimed at meeting the Millennium Development Goals (MDGs) and enhance sustainable socio-economic development. As South Africa, it remains our fervent hope that the project has potential to push back the frontiers of poverty and underdevelopment, which has engulfed the African region for many decades. It is against this background that today we remain unwavering in our principled position that the PBMR project is also a programme aimed at contributing towards sustainable development.

Having said that, we continue to uphold the principle of constructive engagement. We strongly believe that this principle offers the international community with ample opportunity to fully comply with credible, acceptable and pertinent international standards as enunciated in the IAEA Statute. It would also be
recalled that the statute inter alia advocates that, the Member State have the inalienable right to access and/or acquire nuclear technology for peace purposes.

In terms of the developments on the PBMR project, my delegation wishes to inform this August Conference that in 2004, the PBMR signed 12 (twelve) long-lead time components such as turbine; pressure boundary; core barrel assembly, etc. Also, the constructions of the helium test facility began in December 2004. This facility will be used to test components under hot helium environment. It is again worth mentioning that our Cabinet approved a programme to develop human capital and improve research and innovation in relation to the PBMR project, which will broaden participation by all relevant stakeholders in the development of the project. In this regard, we would like to thank the IAEA and indeed Framatome for giving South African youth opportunities for capacity building and study in nuclear science. The government also approved the initial funding for developing a demonstration unit gas cooled PBMR due to be commissioned around 2010.
We however, recognise the fact that more challenges still lie ahead in particular, an urgent need for more investment and partnerships in the project. In this context, we invite members of the international community to establish partnership with us as we move forward in our resolve to create the climate conducive for a better life for all. As we have mentioned earlier on, the PBMR project has the potential to also contribute to efforts by the African Union (AU) in its recovery programme, the New Partnership for Africa’s Development commonly referred to as the NEPAD. Hence we submit that, establishment of such partnerships with the PBMR Company will enhance sustainable development in Africa.

We however realised that for nuclear energy to succeed, a lot of effort has to go towards superior designs that are economically viable and proliferation resistant. Nuclear Energy cannot thrive without social acceptance. Programmes aimed at educating the general population on the benefits of nuclear energy must be enhanced. We need to guard against talking amongst ourselves and ensure that we reach out to society. The development and maintenance of national infrastructure to ensure peaceful and safe usage of nuclear power is essential. In this regard we remain grateful to the work done by the IAEA in supporting member states
and we hope that these programmes will in future be enhanced, as the dawn of a nuclear energy future is no longer in question.

In conclusion, South Africa would like to propose four themes that could serve as pillars for the growth of nuclear energy: Firstly the international community must strengthen regional bodies for example AFRA in terms of implementation of regional projects; Secondly the international community must develop a coherent and integrated nuclear regulatory training that will take into account the specific needs and interests of the developing countries; Thirdly, the need for strengthening Safeguards Implementation and Additional Protocol cannot be over-emphasised; Fourthly, the international community must foster application of nuclear energy in areas such as desalination and other process-heat applications; In this context nuclear energy has to be an underpinning energy source for developing countries.

I Thank You
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

Mr. A. Dainius
Ministry of Economy

on
behalf
of

H.E. Mr. Viktor Uspaskich
Minister of Economy

LITHUANIA
Вызовы энергетики Литвы 21-ого века

Дамы и господа, уважаемая аудитория,

Благодарю за оказанную мне честь выступить на этом форуме. Я хотел бы вкратце представить стратегию Литвы по вопросам энергетики на ближайшие десятилетия. Как Вы знаете, при вступлении в Европейский Союз Литва взяла на себя обязательства остановить 1-ый и 2-ой блоки Игналинской атомной электростанции соответственно в 2004 и 2009 году. В Игналине в эксплуатации находятся реакторы советского типа РБМК, которые экспертами и политиками Западных стран были признаны небезопасными. 31 декабря 2004 года первый реактор Игналинской АЭС был остановлен.

Решение о закрытии атомной электростанции вызвало немало бурных дискуссий в общественной и политической жизни Литвы, так как электростанция производит почти 80 процентов потребляемой в Литве электроэнергии. До 2010 года, когда прекратит действовать и второй реактор, остаётся немного времени, поэтому мы должны со всей ответственностью рассмотреть дальнейшую стратегию развития энергетики Литвы и предусмотреть проблемы, которые могут возникнуть в будущем.

Развитие сектора энергетики Литовской Республики осуществляется на основании Национальной энергетической стратегии, которая определяет направления развития энергетики на двадцатилетний период. В ней определены стратегические цели Литвы, которые я сейчас и рассмотрю.

Одной из основных целей является гарантия надёжной и безопасной поставки энергии. Литва, как и другие Балтийские государства, с точки зрения энергетики находится в специфическом положении по сравнению с другими странами ЕС. Исторически ситуация сложилась таким образом, что энергетические системы Балтийских стран непосредственно связаны только с энергетической системой бывшего Советского Союза и прежде всего России. Газ, электроэнергию и большую часть нефти Литва имеет возможность ввозить только из России.

В связи с этим для нашего государства особую важность имеют проекты по соединению трансевропейских энергетических сетей. Литве, как члену Европейского Союза, необходимо присоединиться к общему единому рынку электроэнергии Европейского Союза. Сделать это возможно путём осуществления идеи Балтийского кольца, то есть с помощью соединения энергетических систем Эстонии и Финляндии, а также Литвы и Польши. При закрытии Игналинской АЭС для производства электроэнергии будут использованы другие мощности, а ядерное топливо будет заменено органическим топливом, прежде всего природным газом как наиболее отвечающим требованиям по охране окружающей среды. Поэтому безопасность поставок природного газа приобретает особое значение. Без осуществления важных проектов по развитию инфраструктуры Литва, как и другие Балтийские страны, не только не сможет присоединиться к общим энергетическим рынкам ЕС, но и станет всё более зависимой от одного поставщика энергоисточников – России.

Новые международные соединения энергетических систем важны и с другой точки зрения. Если в прошлом Европа чувствовала себя в достаточной безопасности, то произошедшие в последние годы крупные сбои в поставке электроэнергии не могут не вызвать большой озабоченности. В будущем ситуация может только ухудшаться, так как строительство новых мощностей практически не ведётся, старые мощности стареют, несколько стран решили отказаться от ядерных энергетических источников. Узкий или
локальный взгляд на аспекты безопасности поставки энергии действительно не увеличивает доверия потребителей энергии. В связи с этим надлежащие механизмы поощрения должны быть обсуждены и приняты с согласия всех стран с целью надёжного обеспечения энергетий в будущем. Данные вопросы должны иметь чёткий приоритет.

Второй важный момент – поощрение конкуренции. Вклад энергетики в повышение конкурентоспособной экономики прежде всего проявляется успешно осуществлённой реформой энергетического сектора, которая оказало положительное влияние на общую деятельность предприятий данного сектора. В 2000-2003 году произведённых предприятиями секторов электроэнергии, газа и тепла общая добавочная стоимость увеличилась на 51,4 процента. Во время подготовки к вступлению в ЕС Литва лучше чем другие страны – кандидаты согласовала своё энергетическое хозяйство для работы в условиях Европейского Союза. В настоящее время структура и принципы управления данным хозяйством полностью соответствуют практике наиболее прогрессивных государств и удовлетворяют требования новейших директив ЕС.

В-третьих, - уменьшение отрицательного влияния энергетики на окружающую среду и повышение эффективности использования энергии. После восстановления независимости в Литве очень повысилась эффективность использования энергии, уменьшились расходы энергии на производство и количество выбрасываемых загрязнений.

В-четвёртых, стимулирование использования возобновляющихся источников энергии. В результате выполнения обязательств Литвы в отношении Европейского Союза производство электроэнергии путём использования возобновляющихся источников энергии в начале 2010 года составит более 7 процентов от общего производства электроэнергии. Постепенное увеличение использования местных возобновляющихся источников энергии является неизбежным и должно стимулироваться, однако в связи с этим не должна повышаться стоимость производства энергии. В настоящее время так не происходит. Технологический прогресс в данной области очень стремителен, поэтому слишком раннее более широкое использование возобновляющихся источников стало бы слишком тяжёлым бременем для нашей экономики.

В-пятых, вопросы ядерной безопасности и хранения радиоактивных отходов. Литва начала заботиться о данных вопросах сразу после восстановления независимости. В течение короткого периода времени было достигнуто то, что безопасность реакторов ИАЭС соответствует уровню оборудованных в то же время реакторов Западных стран. Согласно плану выполняются подготовительные работы для безопасного хранения и захоронения радиоактивных отходов всех типов. Это один из основных факторов, которые могут обеспечить безопасное прекращение эксплуатации ИАЭС. Кроме того, проводятся исследования по определению места, пригодного для создания могильника для захоронения отработанного ядерного топлива. Таким образом, более ранняя остановка реакторов ИАЭС станет значимым фактором для развития научного и технического потенциала Литвы.

В настоящее время в большинстве Европейских стран преобладает осторожный и резервный взгляд на меры по повышению безопасности поставок энергии. Правительство Литвы считает, что одним из способов обеспечения безопасной поставки энергии для всех трёх Балтийских стран могло бы быть строительство новой атомной электростанции в Литве. Правительство уже выразило своё одобрение строительству новой ядерной установки в будущем, когда будет закрыта Игналинская атомная электростанция. Для возможного инвестора мы готовы предложить подготовленное место для атомной электростанции, необходимую для её строительства инфраструктуру и специалистов.
На наш взгляд, в рамках ЕС или в более широком масштабе должны быть приняты положения об общей энергетической стратегии, которые стремились бы обеспечить осуществление основной цели электроэнергетики – с наименьшими расходами надёжно обеспечить электроэнергией её потребителей. Это охватывает как строительство новых генерирующих мощностей, так и развитие межсистемных электроэнергетических соединений, позволяющих оптимально осуществлять развитие энергетических систем. В данном контексте дополнительный стимул мог бы быть также предусмотрен регулированием соответствующих финансовых гарантий, так как энергетика не является наиболее привлекательной областью для инвестиций, однако именно она обеспечивает комфорт в нашей и Вашей жизни. Ядерная энергетика также занимает здесь не последнее место.

Благодарю за внимание.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

Mr. A. Dainius
Ministry of Economy

on
behalf
of

H.E. Mr. Viktor Uspaskich
Minister of Economy

LITHUANIA
The Lithuanian power challenges for the 21st century

Ladies and gentlemen, distinguished participants,

It is great honor and pleasure for me to deliver the speech of the Lithuanian Minister of Economy Mr. Victor Uspaskich at this important event.

First of all, by sharing views of many speakers, I would like to outline the great contribution of nuclear energy to decreasing greenhouse emissions. Figures provided by Dr. Mohamed El Baradei show clear advantage of nuclear energy compared to fossil energy by volumes of waste as by-product of electricity generation. We do not need to prove ourselves at this auditorium on the advantages of nuclear power as progressive, ecological, efficient and competitive generation. In addition, peaceful use of nuclear energy unites countries and associations with different political orientation.

We also see a clear advantage in development of large interconnectors thus providing abilities to reduce investments into power reserves. Peak shifting for large territories provide big economies of scale throughout the balance of expensive peak capacities and much cheaper base load sources.

Lithuania has the necessary experience in construction and commissioning, operations and maintenance of nuclear plant. Shutdown of Unit 1 at Ignalina NPP and preparations for it would also enable us to obtain expertise in decommissioning as well as radioactive waste management. Having available highly skilled operators and support staff as well as infrastructure and site we consider Lithuania being one of the most attractive places to locate a new nuclear power plant.

The power sector development of the Republic of Lithuania is based on the National Energy Strategy providing that Lithuania shall remain nuclear energy generation country.

My minister being a member of Lithuanian Government, as well as Parliament member and the leader of the largest elected party is declaring, that Lithuania welcome proposals on investments into the new nuclear units in Lithuania and extended discussions with its neighbors on common use of a new nuclear unit. This would provide smaller countries with opportunities to continue utilization of clean and safe nuclear generation.

Thank your for your attention.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Armen Movsisyan
Minister of Energy

ARMENIA
ОСНОВНЫЕ ПОЛОЖЕНИЯ СТРАТЕГИИ РАЗВИТИЯ ЭНЕРГЕТИКИ АРМЕНИИ

Министр энергетики Республики Армения
Мовсисян А. Х.

22.03.2005г.
г.Париж

В последние годы сохраняется тенденция устойчивого и достаточно высокого уровня роста экономики Армении. Годовой рост Внутреннего Валового Продукта за последние 5 лет составил в среднем 10,5 %.

В процессе макроэкономической стабилизации удалось ввести систему гибкого курса валюты и были достигнуты значительные успехи в деле ужесточения фискально-денежной политики.


Одним из основных приоритетов в деятельности Правительства RA в последние годы являлось кардинальное улучшение финансово-экономической ситуации энергетического сектора в целом. В результате, 2003 и 2004 годы были завершены с беспрецедентным за прошедшие годы положительным сальдо по финансовым потокам энергосистемы. Это стало возможным благодаря повышению эффективности управления финансовыми средствами, успешной деятельности электrorаспределительной и газоснабжающей компаний, оптимизации режимов работы энергосистемы.

Энергетическая политика Армении основана на концепции обеспечения необходимого уровня энергетической безопасности. В результате
осуществления последовательных шагов по ее реализации, мы сегодня можем констатировать, что Армения полностью покрывает растущий спрос на внутреннем рынке и является экспортером электроэнергии в целом дефицитном регионе Южного Кавказа.

Выход из экономического кризиса, устойчивая тенденция макроэкономического роста позволили сконцентрироваться на вопросах развития Топливно Энергетического Комплекса.

Руководство Армении придает важное значение энергетической безопасности и энергетической независимости республики, которые необходимы для дальнейшего устойчивого развития страны. Поэтому, в основу как комплексных Программ развития энергетики, так и различных целевых программ положена концепция обеспечения разумного уровня энергетической безопасности страны.

Стратегия развития энергетики Армении предусматривает:

- Максимально возможное использование собственных энергетических ресурсов для производства тепловой и электрической энергии;
- Обеспечение иерархии диверсификации:
  - по источникам генерации – АЭС, ГЭС, ТЭС;
  - по топливоснабжению – ядерное топливо, природный газ, мазут;
  - по путям обеспечения энергоресурсов – электро- и газотранспортные магистрали, транспортные средства и пути доставки нефтепродуктов.
- Углубление и развитие межрегионального сотрудничества и интеграции электроэнергетических и газотранспортных систем.
Базируясь на этих стратегических принципах программа развития энергетики предусматривает:

- в области теплоэнергетики:
  - эксплуатацию существующих блоков и агрегатов до полного исчерпания технического ресурса;
  - техническое переоснащение теплоэлектростанций современными парогазотурбинными установками;

- в области электросетевого строительства – завершение полной модернизации высоковольной сети с внедрением системы SCADA в 2006 году.

- в области газоснабжения:
  - модернизация и развитие газотранспортных и распределительных сетей;
  - модернизация и расширение подземного газохранилища,
  - строительство газопровода Иран-Армения (в стадии реализации),
  - полное восстановление газоснабжения населения – до 2008 года;

- восстановление и развитие системы теплоснабжения населения – до 2010 года;

- полное освоение экономически доступного потенциала собственных возобновляемых энергоресурсов:
  - реабилитация и модернизация существующих ГЭС;
  - освоение всего экономически обоснованного гидропотенциала суммарной мощностью порядка 540 МВт и выработкой порядка 2,0 млрд. кВтч/год;

  - развитие ветроэнергетики с годовым производством до 1,3 млрд. кВтч;

  - развитие солнечной энергетики;

  - возможное освоение потенциала геотермальной энергетики;

- планомерная реализация энергосберегающей политики, потенциал которой можно оценить порядка 500 млн. кВтч;
продолжение работ по поиску запасов углеводородов;

В области ядерной энергетики Правительством Армении реализуются все предусмотренные мероприятия, направленные на непрерывное повышение уровня безопасности эксплуатации действующего блока Армянской АЭС вплоть до дня его вывода из эксплуатации;

В этом направлении нами осуществлены следующие шаги:

- В 1998 году Армения присоединилась к Конвенции МАГАТЭ по ядерной безопасности и регулярно представляет отчет по безопасности в Агентство.

- На основе TECDOC-640, а также учитывая опыт других атомных станций с реактором ВВЭР-440/230, был разработан «Перечень технических мероприятий по повышению безопасности блока 2 Армянской АЭС», который был согласован с такими международными организациями, как МАГАТЭ и Всемирной Организацией Ядерных Операторов, а также с ведущими специалистами в области ядерной энергетики. Мероприятия по Перечню неукоснительно выполняются.

- С 1996 года при Президенте Армении действует Совет безопасности по атомной энергетике, созданный сразу после повторного ввода АрмАЭС в эксплуатацию. Основной функцией Совета является выработка рекомендаций Президенту страны по выявлению первостепенных задач, связанных с повышением безопасности АрмАЭС, и по развитию атомной энергетики в республике. В состав Совета входят представители разных стран, широко известные в мире специалисты в области ядерной энергетики.

- На сегодняшний день уровень безопасности Армянской АЭС в основном соответствует международным стандартам и не уступает
уровням безопасности аналогичных энергоблоков, эксплуатируемых в России, Болгарии и Словакии.

- Правительство Армении рассматривает вопросы, связанные с последующим снятием АрмАЭС с эксплуатации. Выделены средства на строительство второй очереди сухого хранилища отработанного ядерного топлива станции. В рамках технической помощи Евросоюза и Соединенных Штатов разрабатывается регулирующая и нормативная документация по снятию АрмАЭС с эксплуатации.

В программе развития энергетики на период до 2030 года в качестве альтернативы строительству тепловых блоков рассматривается вариант развития атомной энергетики на базе современных реакторов с повышенными показателями безопасности и надежности. В этой связи:

1. Разработан и опубликован TECDOC -1404 МАГАТЭ «Изучение вопросов планирования развития энергетики, в том числе ядерной, в Республике Армения». Согласно этому документу, замена существующего ядерного энергоблока новым современным ядерным энергоблоком повышенной безопасности, экономически сопоставим с вариантом ввода тепловых энергоблоков. Однако, с учетом энергетической безопасности и независимости страны, экологических аспектов (выбросы парниковых газов в атмосферу), а также принимая во внимание социальные аспекты этой проблемы, такие как наличие соответствующих инфраструктур, опытных кадров, институтов по подготовке и переподготовке специалистов в данной отрасли, специализированных организаций, делают «ядерный» вариант предпочитительным.

2. В ближайшие годы мы предполагаем начать разработку технико-экономического обоснования строительства новых ядерных энергоблоков в долговременной перспективе.
3. Армения готова начать обсуждение вопросов развития ядерной энергетики с финансовыми организациями и потенциальными поставщиками ядерного оборудования.

Существенное содействие развитию ядерной энергетики Армении окажет наличие традиционной школы подготовки специалистов-ядерщиков в учебных и научных организациях, высоко квалифицированных и авторитетных специалистов, участвующих в различных научно-исследовательских международных проектах.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Armen Movsisyan
Minister of Energy

ARMENIA
Armenian GDP growing
## The Power Sector

### Installed generation capacity

<table>
<thead>
<tr>
<th>Plant Type</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armenian NPP</td>
<td>815(440) MW</td>
</tr>
<tr>
<td>Hrazdan TPP</td>
<td>1100 MW</td>
</tr>
<tr>
<td>Yerevan TPP</td>
<td>550 MW</td>
</tr>
<tr>
<td>Sevan-Hrazdan cascade of HPPs</td>
<td>550 MW</td>
</tr>
<tr>
<td>Vorotan cascade of HPPs</td>
<td>400 MW</td>
</tr>
<tr>
<td>Small HPPs</td>
<td>80 MW</td>
</tr>
</tbody>
</table>
The Power Sector

The bar chart shows the comparison of generation and consumption in the power sector from 2002 to 2004. The generation values are as follows:

- 2002: 5524 million kWh
- 2003: 5497 million kWh
- 2004: 6030 million kWh

The consumption values are:

- 2002: 3400 million kWh
- 2003: 3656 million kWh
- 2004: 3992 million kWh
For the design of the Energy Strategy until 2030, the following main indicators were considered:

- Annual electricity generation up to 12 billion kWh;
- Natural gas delivery up to 4.5 billion cub.m;
- Improvement in energy saving and energy efficiency will pent in the energy demand growth;
- Annual consumption of electrical energy will reach the level of about 3 000 kWh per capita.
The Government of Armenia attaches utmost importance to energy projects of national significance, which ensure reasonable level of energy security and independence, guarantee social and economic growth, contribute to the process of reform and commercialization of the Energy Sector.
Energy security implies uninterrupted energy supply in a long-term and short-term perspective. With this respect, it assumes uninterrupted power supply even in peak load, mitigation of interruption risk in short-term perspective, as well as guaranteed provision of required amounts of energy resources at affordable prices in a long-term perspective.
Implementation of the Energy Strategy is aimed at:

- Ensuring reliable energy supply to consumers at reasonable tariffs;
- Excluding any possibilities of adverse impact on energy security and economic growth;
- Improving continuously the Metzamor NPP’s safety until its decommissioning;
- Ensuring the ecological safety of energy sector;
- Establishing financially sustainable Power Sector;
- Preparation and implementation of a Target Program, which should consider utilization of modern technologies and new technical solutions.
Implementation of the Energy Policy

In terms of ensuring the necessary level of energy security and independence, the Energy Strategy focuses on the following projects:

- Construction of the Iran-Armenia gas duct;
- Modernization and expansion of the underground gas storage;
- Construction of Meghry HPP on the Arax river;
- Utilization of domestic renewable energy resources;
- Large-scale implementation of energy saving activities;
- Enhancement of the Iran-Armenia interconnection and rehabilitation of inter-connections with neighboring systems;
- Parallel operation with integrated international power systems;
- Participation in the establishment of inter-regional Energy Markets.
Improving of the Armenian NPP safety

- In 1998 Armenia joined the IAEA Convention “On Nuclear Safety”,
- On the base of TECDOC-640 the “List of Technical Activities for Unit 2 of the ANPP Safety Upgrading” was developed and coordinated with IAEA and WANO,
- Since 1996, the Council on Nuclear Energy Safety is acting at the President of Armenia. The main function of the Council is to develop the recommendations concerning the ANPP safety upgrading, as well as on the development of nuclear energy sector in the Republic.
- Now the safety level of the ANPP in general meets the requirements of international standards,
- The Government of Armenia considers the items relevant to the further decommissioning of the ANPP. Funds have been allocated for construction of the second stage of the spent fuel dry storage.
- In the frame of EC and USA technical assistance, the regulating and normative documentation for the ANPP decommissioning is being developed.
Nuclear energy development

- It was developed and published the IAEA TECDOC -1404 “Energy and Nuclear Power Planning Study for Armenia”.
- According to this Study, replacement of the existing nuclear unit with the new modern nuclear unit is economically feasible.
- The “nuclear” option is preferable taking into account country’s energy security and environmental issues, as well as existence of appropriate infrastructures, experienced personnel, institutions for teaching and training.
- We suppose to initiate the development of the Feasibility Study for the construction of new nuclear power units in long-term prospects.
- Armenia is ready to begin discussions on the issues of nuclear energy development with the financial organizations and potential suppliers of nuclear equipment.
International Ministerial Conference:
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Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Hassan Ahmad Younes
Minister for Electricity and Energy

EGYPT
Statement of Egypt

Ladies and Gentlemen

First, I would like to express my sincere appreciation to our host country, France, for making possible this meeting. Also, I would like, to commend the efforts of International Atomic Energy Agency in cooperation with Organization for Economic Cooperation and Development in organizing this important conference.

Egypt was one of the developing countries to realize from the early days of nuclear power, that it could be utilized to overcome two challenges, supply of electricity and water. Egypt was interested in cogeneration Nuclear Power Plants as early as 1964.

This attempt was followed by two other opportunities in 1974 and 1983. All previous attempts did not materialize due to many factors.

Egypt was motivated to consider the introduction of nuclear power by the following factors:

* Steadily increasing demand for electricity and water.
* Insufficient proven national fossil energy resources.
* New and renewable energy resources, such as solar and wind energy are abundant but are not economically competitive.

Egypt is largely dependent on the River Nile for the supply of its fresh water needs. Due to the increase of population and the limited availability of fresh water resources, the annual renewable fresh water per capita decreases, and expected to continue in the future. Therefore, it is expected that Egypt's
dependence on desalination technologies to mitigate deficit in potable water supply will increase.

Egypt electricity and water demands will continue to increase in the foreseeable future with a rate which is expected to be higher. The peak load and the electrical energy generated within the year 2004 were 15500 MW and 97 TWhr and it is expected to reach 44000 MW and 275 TWhr by year 2022.

Electricity sector in Egypt went through reform process started with splitting Generation, Transmission and Distribution. Then formed Power regulator since four years ago, 13% of the generation capacity is private sector, the market is open for private producers and distributors to sell directly to the customers.

Egypt endowed with wind and solar potentials, and we are implementing programs for wind energy, the first solar thermal power plant (150 MW) will be scheduled to start implementation in the next year.

Evidently, the expected high demand will require substantial electricity expansion and in the same time, will drive us to invest in the possible economical and feasible options for energy resources. On the other hand, our efforts to maximize the return on available fossil fuel resources, like exporting natural gas and meeting the needs for gas dependant industries, led us to consider other suitable sources of energy to meet our future demands.

Following Chernobyl accident, Egypt decided to postpone the implementation of its nuclear power program. Meanwhile, we carried out studies to re-evaluate the economic, technological aspects and associated safety of the nuclear power option for electricity generation coupled with potable water production.
The following facts were considered in developing these studies:

1- Increase the quantities of natural gases discovered recently in Egypt and the confirmation of proven reserves.

2- Rapid technology development for conventional alternatives in combined cycle power plants and energy efficiency.

In fact the Egypt's decision to postpone the implementation of its nuclear power program was not meant to be a step towards the cancellation of the program; rather it was a chance to rearrange priorities especially after many discoveries of natural gas in Egypt. This includes but not limited to:

- Develop and implement the infrastructure master plan of El-Dabaa site.
- Carrying out a program to develop the human resources capabilities.
- Establish a nuclear regulatory body and issue the basic regulations.
- Prepare the required quality program of the owner.
- Carrying out an economic and technical feasibility study of nuclear power and desalination plant.
- Develop and implement an Egyptian local participation and manufacturing program for power plants. Currently, local participation reached 42% in the conventional plants.

The majority of these activities have been supported by the IAEA through technical cooperation programs. Egypt highly appreciates the continuous technical support from the IAEA.
and is looking forward to continue this fruitful cooperation in areas of peaceful uses of nuclear energy.

Currently, Egypt is carefully following up the technological developments in nuclear power and desalination designs and performance on the optimal nuclear reactor type(s) and desalination system(s) that are suitable for the national requirements.

To insure that, our choices should be based on reality. Egypt is currently constructing an experimental pilot unit for seawater desalination at El Dabaa site. This unit will test the optimal pre-heating of feed water for reverse osmosis desalination technology.

Finally, we share the view that the nuclear power may be a promising option in many countries that can meet the sustainable development. However, one of the challenges we face, is assuring the nuclear security and non–proliferation. I would like to remind you that, Egypt since early stage is strongly supporting the non – proliferation system, in this regard, president Mubark launched in April 1990 an initiative to make the Middle East free zone from the weapons of mass destruction. We believe that the non – proliferation with full transparency, verification and cooperation shall encourage the developing countries to share the benefits of the peaceful uses of the nuclear energy and its applications.

Ladies and gentlemen

I am sure that this conference offers good opportunity for fruitful exchange of information and discussions on various aspects of the challenges for nuclear power and that it will pave the way for promising and bright future for the peaceful uses of nuclear energy in the 21 century.
I look forward with all of you to a successful conference.

Thank you all for your attention.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

H.E. Mr. Le Dinh Tien
Vice-Minister
Ministry for Science and Technology

VIETNAM
A Perspective for the Need and Application of Nuclear Power in Vietnam

Dr. Le Dinh Tien

Deputy Minister, Ministry of Science and Technology, VIETNAM

Since 1986 Vietnam has initiated the innovation which shifts its centrally planned economy to a market one. As a result, Vietnam's economy has developed steadily with an averaged growth rate of 8% per annum since 1990. The economic development leads to an increase in energy consumption with annual growth rate of 11.1% for the period 1990-2001. The economic development of the country for the period 2006-2020 may follow three scenarios: High, Base and Low ones. In the low scenario, the GDP annual growth rate will be 7.2% for the period of 2006-2020.

Based on three scenarios of the future socio-economic development, the electricity demand and supply forecast has been performed and the results show that the electricity production without nuclear power can meet the demand up to the year 2015 for the low and base scenarios. However, there will be a shortage of electricity supply by the year 2015 for the high scenario and by the year 2020 for all scenarios.

Based on national energy resources and the balance of energy demand and supply, the indigenous energy resources will be used mainly for the future electricity generation mix of the country. The priority in electricity expansion development plan in the future is given to hydro power first, followed by gas-fired power in the South, coal-fired power in the North, the import electricity from neighboring countries, the imported coal - fired power in the North, and then an active preparation for the introduction of nuclear power plants.

Nuclear power obviously is one of the various technological options for producing electricity. Vietnamese experts view the nuclear energy with advantages and a potential contribution to the country's balance of energy demand and supply, the security of energy supply and the diversity of energy sources, the global environment reservation - sustainable development, and the economical energy production. The result obtained from the studies made by MOI and MOST has shown that, from the year 2017, Vietnam will need about 2,000-4,000 MWe capacity of nuclear power. The concrete results are as follows:
1. For the base scenario: To meet the demand of 201 TWh for the year 2020, the total power of plants should be 35,000 MWe of which nuclear power is 2,000 MWe operating in 2019 sharing 5% of the total power.

2. For the high scenario: To meet the demand of 230 TWh for the year 2020, the total power of plants should be 44,800 MWe of which nuclear power is 4,000 MWe operating in 2017 sharing 8.9% of the total power.

Being aware of the role of nuclear energy for the country’s energy security and sustainable development, Vietnam has been carrying out preparation studies for introduction of nuclear power. This preparation includes the pre-feasibility study for construction of the first nuclear power plant, the establishment of a long-term program for nuclear development, and the study on important issues related to nuclear power development in Vietnam. The preparation also include the activities in the areas of R&D, regulatory framework development, human resources development and public acceptance for nuclear power.

During the last 10 years, the Government’s direction and national projects show a consistent consideration and interest of Vietnam on nuclear power introduction for the future sustainable development of the country. In March 2002, The Steering Committee for Nuclear Power was established by Prime Minister. The Committee is composed of two key ministries MOI and MOST and some other ministries. In December 2002, the National Assembly approved the 2002-2007 Legal Development Program including the Project on Elaboration of Nuclear Energy Law. In March 2003, The Prime Minister assigned MOST to coordinate the elaboration of Nuclear Energy Law. The final draft of nuclear energy law is planned to be submitted to the Vietnamese Parliament for its approval in 2007.

Furthermore, the development and use of nuclear energy for peaceful purposes have been reflected in some important government documents. In the Strategy for development of science and technology in Vietnam to the year 2010, that was approved by the Prime Minister in 2003, atomic energy is considered as the one of the eight science and technology directions of the most importance for the socio-economic development, and utilized for both power and non-power applications in the country. The strategy for Vietnam electricity development in the period of 2004-2010 with a vision to the year 2020, that was approved in 2004, states that “To invest in the study and preparation of necessary conditions for being able to build the first nuclear power plant in Vietnam with the installed capacity of about 2000 MWe and to put into operation after the year 2015”. Recently, in the final draft of the long term program of nuclear development, which has been prepared by MOST, the general policy is stated as: (1) To use atomic energy for peaceful purpose; (2) To ensure nuclear safety with the top priority in all activities for research, development and utilization of atomic energy; (3) To utilize atomic energy for both non-power and power applications; (4) To develop human resources with a long term and advance care; and (5) To attach special importance to the development of
infrastructures and nuclear science and technology capability.

Being an IAEA member state, Vietnam has taken an active part in the activities of IAEA and has obtained an effective assistance from IAEA. Vietnam is also a signatory member to NPT-Non Proliferation Treaty (since 1982), International Safeguards (1989), Convention on Early Notification of a Nuclear Accident (1986), Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1987), SEANWFZ - South East Asia Nuclear Weapons Free Zone (1995), CTBT (since 1996). At the present, Vietnam is in the active preparation to ratify CTBT and to sign the additional protocol (AP).

The development and use of nuclear energy for peaceful purposes, especially to developing countries, requires the preparation for a high-qualified manpower, advanced infrastructures, large financial resources and a strong national effort and commitment, etc. So this requires the regional and interregional cooperation while each state is free to define its national energy policy in accordance with international law, and the IAEA has an essential role in promotion, facilitation and international safeguard in this regard./.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Ministerial Presentation

Mr. Anil Kakodkar
Chairman
Atomic Energy Commission

INDIA
Energy in India for the Coming Decades

March 22, 2005, Paris, France
Population, Per Capita CO₂ Emission and Electrical Energy Generation in INDIA

CO₂ Emissions per capita in tonnes per year

<table>
<thead>
<tr>
<th>Party</th>
<th>Emission</th>
<th>Population (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrialised Countries</td>
<td>11.4</td>
<td>21.9</td>
</tr>
<tr>
<td>China</td>
<td>2.7</td>
<td>21.7</td>
</tr>
<tr>
<td>India</td>
<td>1.0</td>
<td>16.5</td>
</tr>
<tr>
<td>All developing countries</td>
<td>2.0</td>
<td>78.1</td>
</tr>
<tr>
<td>Least developing countries</td>
<td>0.2</td>
<td>9.6</td>
</tr>
<tr>
<td>World</td>
<td>4.1</td>
<td>World 83.25%</td>
</tr>
</tbody>
</table>

Human Development Report 1998
Three Stage Nuclear Power Programme

Stage – I PHWRs
- 12- Operating
- 6 - Under construction
- Several others planned
- Scaling to 700 MWe
- Gestation period being reduced
- POWER POTENTIAL \(\equiv 10,000 \text{ MWe}\)

LWRs
- 2 BWRs Operating
- 2 VVERs under construction

Stage - II
Fast Breeder Reactors
- 40 MWth FBTR - Operating since 1985
  Technology Objectives realised
- 500 MWe PFBR - Under Construction
- POWER POTENTIAL \(\equiv 530,000 \text{ MWe}\)

Stage - III
Thorium Based Reactors
- 30 kWth KAMINI - Operating
- 300 MWe AHWR - Under Development

POWER POTENTIAL IS VERY LARGE
Availability of ADS can enable early introduction of Thorium on a large scale
• Considering India’s energy resources and projected growth in energy requirements, it is clear that nuclear energy has to play a very significant role in the later half of this century and the country has to start preparing for it right now.

• To realize the growth in electricity generation, it is necessary to deploy fast breeder reactors on a large scale.
Projected Installed Power Capacity

- Fossil
- Hydro
- NonConv
- Nuclear
- Total

<table>
<thead>
<tr>
<th>Year</th>
<th>Installed capacity (GWe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>104.73</td>
</tr>
<tr>
<td>2012</td>
<td>27.78</td>
</tr>
<tr>
<td>2022</td>
<td>138.73</td>
</tr>
<tr>
<td>2032</td>
<td>275</td>
</tr>
<tr>
<td>2042</td>
<td>150</td>
</tr>
<tr>
<td>2052</td>
<td>1344</td>
</tr>
</tbody>
</table>
### Indian Nuclear Power Programme

<table>
<thead>
<tr>
<th>REACTOR TYPE AND CAPACITIES</th>
<th>CAPACITY (MWe)</th>
<th>CUMULATIVE CAPACITY (MWe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 14 reactors at 6 sites under operation</td>
<td>2,820 @</td>
<td>2,820</td>
</tr>
<tr>
<td>Tarapur, Rawatbhata, Kalpakkam, Narora, Kakrapar and Kaiga</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ŷ 6 PHWRs under construction at</td>
<td>1,960</td>
<td>4,780</td>
</tr>
<tr>
<td>Tarapur (2x540 MWe), Kaiga (2x220 MWe), RAPS-5&amp;6(2x220 MWe)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ŷ 2 LWRs under construction at</td>
<td>2,000</td>
<td>6,780</td>
</tr>
<tr>
<td>Kudankulam(2x1000 MWe)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ŷ PFBR under construction at</td>
<td>500</td>
<td>7,280</td>
</tr>
<tr>
<td>Kalpakkam (1 X 500 MWe)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; Projects planned till 2020</td>
<td>13,900</td>
<td>21,180</td>
</tr>
<tr>
<td>PHWRs(8x700 MWe), FBRs(4x500 MWe), LWRs(6x1000 MWe), AHWR(1x300 MWe)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; TOTAL by 2020</td>
<td>21,180 MWe</td>
<td></td>
</tr>
</tbody>
</table>

@ Includes 50 MWe to be added after MAPS-1 EMCCRP in X Plan
A Compact High Temperature Reactor being designed at BARC serves as a stepping stone in the direction of development of Indian HTRs for Hydrogen production.

- The reactor can supply process heat at 1000 °C
- Special materials
- Special fuel
- Passive systems for safe operation of the reactor

- Heat Exchange Vessels
- Heat Pipes
- Gas Gap Filling System
- Upper Plenum
- Fuel Channel
- Beryllia Moderator and Reflector
- Graphite Reflector
- Lower Plenum
- Passive Power Regulation System
Accelerator Based Energy Technology

- Growth with Thorium systems
- Transmutation of long lived radionuclides

LONG TERM R&D EFFORTS NEEDED
Participation in ITER being negotiated

Schematic of the prototype fusion breeder reactor
q Closed fuel cycle with short doubling time in fast reactors and eventual switch over to thorium utilization – sustainable long term strategy for nuclear energy

q Early deployment of advanced technologies such as high temperature reactor systems, ADS and fusion energy through accelerated R&D.

q Import, if feasible as an additionality.
Thank You
“...growth in capital stock together with growth in factor productivity will yield output growth of 5.4 percent. Over the next 20 years, the working age population is projected to grow at 1.9 percent per year. If educational attainment and participation rates remain unchanged, labor growth will contribute another 1.3 percent, yielding an aggregate growth rate of 6.7 percent per year, or a per capita growth rate of 5.3 percent. This is a lower bound estimate and, even so, would be significantly greater than the per capita growth rate of 3.6 percent achieved in the 1980s and 1990s. Over a 40-year period, a 5.3 percent growth rate would increase the income of the average person nearly 8-fold”

Electricity growth rate – a scenario

<table>
<thead>
<tr>
<th>Period</th>
<th>Primary energy % annual growth</th>
<th>Electricity % annual growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-2022</td>
<td>4.6</td>
<td>6.3</td>
</tr>
<tr>
<td>2022-2032</td>
<td>4.5</td>
<td>4.9</td>
</tr>
<tr>
<td>2032-2042</td>
<td>4.5</td>
<td>4.6</td>
</tr>
<tr>
<td>2042-2052</td>
<td>3.9</td>
<td>3.9</td>
</tr>
</tbody>
</table>

![Graph showing per capita generation (kWh)](image)
Discussion

N. Bendjaballah (Algeria): This Conference is underlining the contribution which nuclear power could make to worldwide development coupled with protection of environment, and clearly everyone should be in favour of an expansion of nuclear power generation.

However, the technology of nuclear power generation is very sophisticated and there are numerous constraints which hinder the mastery of that technology.

That being so, is there not a risk that promoting nuclear power will increase the gap between industrialized and developing countries?

I believe that more emphasis should be placed on nuclear technology transfer to developing countries so that they may embark on the construction of nuclear power plants.

C. Mandil (OECD/International Energy Agency): I think it should be borne in mind that in recent years nuclear power generation has been expanding mainly in developing countries.

That having been said, I believe that there is a need to promote the transfer to developing countries not just of nuclear technology, but of all technologies necessary for reducing greenhouse gas emissions.

In the case of nuclear technology, of course, it is important to avoid nuclear weapons proliferation, which means that the technology transfer must be accompanied by the application of IAEA safeguards.
P.E.J. Govaerts (Belgium): In his opening address, the French Minister of Industry, Mr. Devedjian, said that France was aiming to reduce its CO\textsubscript{2} emissions by a factor of four by 2050. Was that statement based on a feasible scenario or on wishful thinking?

P. Gadonneix (World Energy Council): The only scenario presented today – by Mr. Mandil – went up to 2030. We have to think about what will happen after 2030, and with a substantial expansion of nuclear power generation there could be a substantial reduction of CO\textsubscript{2} emissions, but I do not have any figures in mind.

C. Mandil (OECD/International Energy Agency): The ultimate goal is to reduce CO\textsubscript{2} emissions almost to zero, and it is to be hoped that a target of a decrease by a factor of four in CO\textsubscript{2} emissions by 2050 is feasible.

O. Gherman (Romania): Great emphasis has been placed on the greenhouse effect of CO\textsubscript{2}. What about the greenhouse effect of nitrogen compounds?

J. Stone (Canada): I focused on CO\textsubscript{2} because it is the most important greenhouse gas - apart from water vapour.

I could also have talked about methane, which is a stronger greenhouse gas than CO\textsubscript{2}. However, it is emitted in smaller amounts, and the concentration of methane in the atmosphere seems to be stabilized.

In addition, I could have talked about nitrous oxide (N\textsubscript{2}O). However, it is associated mainly with agriculture – not with energy production.

O. Gherman (Romania): What can be done about our heavy dependence on petroleum as the main source of fuel for use in transport?

C. Mandil (OECD/International Energy Agency): We are going to use petroleum-based fuels in transport on a massive scale for a long time.

What can we do given the fact that their use is associated with CO\textsubscript{2} emissions and the fact that in the very long term the quantity of petroleum being produced in the world will decline? We must continue our efforts to increase energy use efficiency – perhaps more in the transport sector than in any other sector. In addition, there are partial substitutes that must be borne in mind. The most immediate one, although it will not take us very far, is biofuels, which have become more competitive as a result of recent technical advances. In the long term there is hydrogen, provided it is produced without the emission of CO\textsubscript{2} – for example, by means of nuclear power or with CO\textsubscript{2} sequestration.

D.J. Gonzalez Gomez (Spain): I should be interested in hearing Mr. Mandil’s opinion about the predictions of the Association for the Study of Peak Oil and Gas (ASPO).

C. Mandil (OECD/International Energy Agency): The members of ASPO are serious people with whom we maintain a dialogue. However, for reasons that would take too
long to go into now, we do not share their views – we believe that their thinking is basically flawed.

Of course, a peak in oil production – or at least in conventional oil production – will be reached one day, but we think that day will come much later than they do.

N. Botarfa (Algeria): If an installed capacity of about 5000 GW is necessary in 2030 in order to meet the world’s total electrical energy demand, for a reduction of 30 000 million tons in CO$_2$ emissions we shall need an installed nuclear capacity of about 4200 GW, as nuclear power seems to be a better economic option than – say – solar power, wind power and CO$_2$ sequestration.

That being so, does Mr. Mandil believe that the world’s developing countries will be able to make a significant contribution to the attainment of the CO$_2$ emission reduction goal when their electrical energy demand accounts for 60% of the overall demand increase?

C. Mandil (OECD/International Energy Agency): Perhaps I did not make it clear in my presentation that, in my opinion, the goal of a very substantial decrease in CO$_2$ emissions will not be achieved through the use of just one technology – be it nuclear power generation, CO$_2$ sequestration, the use of renewables, or whatever. All these technologies – and others – will be needed, and all countries will have to participate to the best of their ability and in the light of their public opinion situations.

In my presentation, I did not mean to imply anything about whether a country like Algeria should embark upon a nuclear power programme.

If, in spite of using all currently competitive technologies, we do not succeed in reducing CO$_2$ emissions enough, the price of CO$_2$ emission permits will rise and other technologies will become competitive, and they will have to be used as well.

J. Frot (France): As a member of the organization Ecologists for Nuclear (EFN), I have made some calculations of the cost of a major expansion of nuclear power generation.

Let’s assume that in 2100 the overall per capita energy consumption of the world’s population of – say – 10 000 million people will be half of the present per capita energy consumption in the OECD countries, which is about 4 tons oil equivalent per annum. Then, global energy consumption in 2100 will be twice today’s figure of 10 000 million tons oil equivalent.

Let’s assume that 20% of that global energy consumption is covered by renewables (including hydropower) and 40% by hydrocarbons (including coal). Then, 40% will have to be covered by nuclear power.

Let’s assume that the cost of the complete nuclear power generation cycle – minerals explorations, ore extraction and processing, fuel fabrication, reactor construction, reactor decommissioning and waste management – will be $3/W, approximately the cost (in
constant US dollars) of the French nuclear power programme during the period 1974-2000. Then, the annual investment in nuclear power over the next 100 years will be less than 2 ‰ of the foreseeable global gross product – compared with 4 ‰ in the case of the French nuclear power programme during the period 1974-2000.

P. Gadonneix (World Energy Council): Over the very long term, forecasts tend to be wrong, largely owing to unpredictable innovations. Nuclear power generation is an area where there will be innovation, but I agree with the general thrust of Mr. Frot’s analysis.

G. Tshelane (South Africa): The issue of public acceptance has not yet been addressed at this conference. To what extent is it a central issue?

C. Bataille (France): Public opinion about nuclear power tends to fluctuate in line with the fluctuation of oil prices – when oil prices are low, the public tends to regard nuclear power as a diabolical energy source. I use the word “diabolical” because there is a kind of religious element in the rejection of nuclear power by people who are wary about its highly technical nature.

Clearly, there must be dialogue, and we politicians should play a major role in arranging for it. That is not easy in the face of irrational opposition to nuclear power. We must take account of public opinion, but we should not bow to minority groups seeking every opportunity to hamper the expansion of nuclear power. That applies especially in parliamentary democracies. In France, for example local populations of a few thousand should not be allowed to dictate decisions affecting over 60 million people. The challenge is to organize dialogue in such a way that local public opinion is represented but not given excessive weight.

M.R. Srinivasan (India): I should like to offer a perspective from another part of the world.

In India, the chief ministers of nearly all State governments are constantly urging the central Government to authorize the construction of nuclear power plants in their respective States. They do so because they appreciate the importance of an assured electricity supply and know that India’s nuclear power plants have been operating well for long periods.

As regards public opinion in general, we have launched a public awareness campaign, inviting – for example – college teachers to visit our nuclear power plants.

There is an antinuclear movement in India, but it is not highly organized. Some university professors – including even scientists – are antinuclear, but we believe that the main reason for their opposition is resentment at not being included in the process of consultation and decision-making. We need to involve them in order that they stop thinking in “them and us” terms.
Our overall conclusion is that, if the product is demonstrably good, the seeds of dissent will be killed.

J. Stone (Canada); I believe that the public acceptance issue should be addressed more broadly. We should be thinking in terms of giving members of the public the information they need in order to make wise choices. The dialogue should be an informed dialogue about the level of risk that people are willing to accept.

Every form of energy production has an associated risk – for example, the burning of coal is associated with air quality problems and hydrogen is a very dangerous fuel. If the public dialogue is restricted to nuclear power, it will be distorted.

P. Gadonneix (World Energy Council): All energy sources have an environmental impact and give rise to some negative reactions.

In France, as in India, there are nuclear power plants that have been operating well for long periods. The public should be made more aware of that, through the provision of objective information by independent bodies.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Round Table 1

Issue 1 – World energy needs and resources

Mr. Claude Mandil
Executive Director

International Energy Agency
International Ministerial Conference
Nuclear Power for the 21st Century
21 March 2005

“World Energy Needs and
Resources and Environmental
Challenges of the 21st Century”

Claude Mandil
Executive Director
International Energy Agency
Fossil fuels will continue to dominate the global energy mix, while oil remains the leading fuel.
Almost all the increase in production to 2030 occurs outside the OECD.
Growth in World Energy Demand and CO₂ Emissions

Average carbon content of primary energy increases slightly through 2030 – in contrast to past trends.
Global emissions grow 62% between now & 2030, with developing countries’ emissions overtaking OECD’s in the 2020s.
This is not Sustainable!

But the Future Is Not Predetermined…

World Alternative Policy Scenario
World Alternative Policy Scenario

- Analyses impact of new environmental & energy-security policies worldwide
  - OECD: Policies currently under consideration
  - Non-OECD: Also includes more rapid declines in energy intensity resulting from faster deployment of more-efficient technology
- Impact on fuel mix, CO₂ emissions & investment needs
- Basic macroeconomic & population assumptions as for Reference Scenario, but energy prices change
In Alternative Scenario, use of nuclear power goes up in absolute terms but still falls as portion of total consumption.
OECD CO₂ Emissions in the Reference and Alternative Scenarios

OECD CO₂ emissions peak around 2020, 25% higher than in 1990
Global CO$_2$ Emissions in the Reference & Alternative Scenarios

CO$_2$ emissions are 16% less in the Alternative Scenario in 2030
Contributory Factors in CO₂ Reduction
Alternative vs. Reference Scenario
2002-2030

Improvements in end-use efficiency contribute for more than half of decrease in emissions, and nuclear for 10%
Avoiding 1 Billion Tons of CO$_2$ per Year

<table>
<thead>
<tr>
<th>Technology</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>Replace 300 conventional, 500-MW coal power plants with “zero-emission” power plants, or ...</td>
</tr>
<tr>
<td>CO$_2$ Sequestration</td>
<td>Install 1000 Sleipner CO$_2$ sequestration plants</td>
</tr>
<tr>
<td>Wind</td>
<td>Install 200 x current US wind generation in lieu of unsequestered coal</td>
</tr>
<tr>
<td>Solar PV</td>
<td>Install 1300 x current US solar generation in lieu of unsequestered coal</td>
</tr>
<tr>
<td>Nuclear</td>
<td>Build 140 1-GW power plants in lieu of unsequestered coal plants</td>
</tr>
</tbody>
</table>

To meet the energy demand & stabilize CO$_2$ concentrations unprecedented technology changes must occur in this century

[Adapted from Pacala & Socolow, Science 2004]
Outlook for Nuclear Power

- Existing plants are expected to have a longer life and higher capacity factor.
- Competition still very challenging for new nuclear:
  - Short term vs. natural gas
  - Medium term vs. coal
  - Long term vs. renewables/CO₂ sequestration?
- Prospects improve with carbon value.
- Finland example very interesting.
Competitiveness of Existing Nuclear Plants

- Relatively high capital, low operating costs - best suited for baseload operation
- Nearly all existing plants can compete:
  - Capital costs are sunk
  - A few high cost plants have shut down
  - Performance is improving
  - Power output is being raised
  - Life extensions expected
Financial Risks of Nuclear Power

- All investments contain a degree of risk...
- ... But three uncertainties in particular increase risks of new nuclear power investments
  - Long lead time for projects
  - High up-front capital cost/lack of flexibility
  - Waste disposal and decommissioning costs
Conclusions

- Projected global market trends raise serious concerns
- More vigorous policies would curb rate of increase in energy demand and emission significantly
- But a truly sustainable energy system will call for faster technology development & deployment
- Urgent and decisive government action needed
- Nuclear energy has to play an important role as part of the global energy mix… but industry and governments must make this happen
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Round Table 1

Issue 1 – World energy needs and resources

Mr. Pierre Gadonneix
Deputy Chairman
World Energy Council

President and CEO
Electricité de France (EDF)
II ne s'agit pas ici d'opposer aux scénarios de l'AIE d'autres scénarios, même ceux du CME, de les comparer ou de les évaluer. On compte aujourd'hui, dans le monde, près de 500 scénarios énergétiques. Les travaux de l'Agence Internationale de l'Energie sont une référence en la matière ; leur qualité et leur contribution au débat énergétique sont reconnues. Toutefois, l'horizon retenu (2030) est à mon sens limité : cet horizon me semble trop rapproché pour que l'on puisse réellement sentir le poids des contraintes auxquelles nous allons être confrontées. Les évolutions tendancielles ne révèlent pas encore leurs contradictions ou leurs impossibilités.

Un horizon plus lointain, 2050 par exemple, est à mon sens beaucoup plus pertinent car de nombreuses contraintes deviennent vives ; réfléchir à cet horizon nous oblige, par un exercice de « backcasting », à formuler dès aujourd'hui des choix de politiques ou de stratégies cohérents avec un développement
énergétique durable, intégrant les contraintes environnementales comme la contrainte climatique ou celles liées à la disponibilité des ressources énergétiques. Il ne s’agit pas seulement de donner notre vision de demain, il faut être capable de décrire le chemin pour y parvenir.

Dans la lignée des scénarios déjà réalisés par le passé et auxquels beaucoup se réfèrent, l’Assemblée Exécutive du CME, en septembre 2004, a décidé de construire des « Scénarios pour 2050 » à partir d’hypothèses réactualisées sur les principaux déterminants de l’offre et de la demande d’énergie, scénarios qui seront présentés au Congrès de Rome en novembre 2007. Un tel exercice bénéficie d’atouts importants : organisation mondiale, non commerciale et non gouvernementale, représentant toutes les énergies, le CME compte des comités membres dans 95 pays, dont les deux tiers sont des pays en développement. La construction des scénarios est faite par des itérations entre le niveau mondial et le niveau régional, ce qui assure la cohérence et la pertinence des scénarios.

Il n’est évidemment pas possible, alors que commencent les travaux, d’anticiper le résultat. Mais je peux vous donner quelques indications sur les grandes
orientations de ces scénarios, à partir de la Déclaration 2005 du CME, qui précise les enjeux et les opportunités de la mise en œuvre d’un développement énergétique durable.

Le premier constat, partagé par tous je crois, est que face à la croissance de la demande d’énergie, indissociable du développement économique et du progrès social, la recherche d’une plus grande efficacité énergétique doit être notre première préoccupation.

Du côté de la demande, la technologie, associée à l’évolution des comportements des consommateurs, permettra d’emprunter des sentiers de croissance sobres en énergie ; un résultat extrait d’un rapport du Conseil sur les technologies illustre cela : par rapport à une consommation tendancielle, on évalue à 25% les économies d’énergie supplémentaires que l’on pourrait faire en 2020 en mettant en œuvre des technologies performantes ; et ce chiffre est de 40% en 2050 ce qui confirme d’ailleurs l’intérêt de regarder à un horizon lointain.

Du côté de l’offre, un autre rapport récent du Conseil estime que la mise en œuvre de meilleures pratiques d’exploitation dans les centrales électriques entraînerait des économies d’énergie qui se traduiraient en une
économie d'investissement de 80 milliards de dollars par an.

L'un des messages forts du Congrès de Sydney est d'affirmer que toutes les options énergétiques doivent rester ouvertes : les systèmes propres de combustibles fossiles (charbon, fioul, gaz naturel), le nucléaire bien sûr, l'énergie hydraulique (petites et grandes installations) et les autres sources d'énergie renouvelables. Chaque option est soumise à des incertitudes importantes mais on ne peut se permettre de rejeter une option, même en ayant amélioré l’efficacité énergétique de nos économie de façon substantielle. Le meilleur « mix », pour répondre aux besoins mondiaux croissants, dépendra des spécificités locales et des progrès technologiques : l'industrie nucléaire, jeune au regard du temps industriel, réalisera à n’en pas douter des progrès importants. Le choix pour un pays ou une région pourra être différent de celui d'une autre région, en raison de dotations différentes ou d'opinions publiques ayant des attitudes différentes : nous devons intégrer ces dimensions.
Dans un exercice prospectif, il est important de savoir où l’on veut aller et, plus précisément, définir des objectifs. Comment caractériser un développement énergétique durable ? Le Conseil Mondial de l’Énergie retient trois critères :

β une énergie accessible : fournir à tous des services énergétiques modernes,

β une énergie disponible : maintenir la continuité et la qualité des approvisionnements,

β une énergie acceptable : prendre en compte les aspects sociaux et environnementaux

Un rapport du CME sur les évaluations de cycles de vie, publié en juillet 2004 apporte un point de vue intéressant. L’une des conclusions de ce travail, qui a analysé un très grands nombres d’études disponibles, a été l’évaluation à l’aune des trois critères précédents de la position – favorable, intermédiaire, défavorable - des différentes filières de production d’électricité : le charbon, le pétrole, le gaz, la biomasse, le nucléaire, l’hydroélectricité, l’éolien et le solaire. Deux filières seulement obtiennent la meilleure évaluation pour les trois critères : l’hydroélectricité et le nucléaire.

<ici il serait utile que le président dispose du rapport et l’offre par exemple à Claude Mandil>
J’ai, comme Vice-président du CME, la responsabilité de la région « Europe ». Le jeudi 10 mars, lors d’une réunion regroupant des représentants des 34 comités nationaux européens du CME, le CME a lancé une étude sur le rôle du nucléaire en Europe. Si le nucléaire représente environ 16% de la production d’électricité mondiale, ce chiffre est de plus de 30% en Europe. Le CME constate que les conditions de développement du nucléaire, en termes de technologie, finances, compétitivité, sûreté, respect de l’environnement sont satisfaites. Mais si les pouvoirs publics et les grands consommateurs d’énergie sont souvent favorables au nucléaire, les opinions publiques y sont parfois hostiles, ou à tout le moins réticentes. L’étude que nous avons lancée a pour objectif de mieux comprendre les conditions d’un développement du nucléaire sur le marché de l’électricité européen ; elle abordera sans complaisance toutes les dimensions de cette question essentielle. J’ai eu l’après-midi du 10 mars l’occasion, lors d’un séminaire commun Commission Européenne-CME, de présenter au Commissaire Piebalgs et à la délégation de la Commission ce projet : ils ont été très intéressés.
Voilà ce que je souhaitais vous dire en tant que représentant du conseil mondial de l’énergie.

Je voudrais maintenant conclure mon propos sur une note plus personnelle.

En tant que praticien de l’énergie, j’ai une double conviction sur le nucléaire :

- le choix de la France en faveur du nucléaire, fait dans les années 70 était un bon choix. Et un choix courageux.

- J’ai également la conviction que la croissance du nucléaire s’imposera ; en effet, ce début de XXI siècle est marqué par la fin du discours démagogique sur l’énergie bon marché et sur la prise de conscience du changement climatique.

Ces convictions je les ai depuis de nombreuses années, et pas seulement depuis 6 mois que je dirige EDF.
Le projet industriel que je présente aujourd'hui aux futurs actionnaires d'EDF comporte plusieurs investissements :

- dans le nucléaire, tout d'abord, avec l'EPR à Flamanville, dont j'ai pris la décision dès mon arrivée. Dès que j'ai pu faire le constat que cette décision trop souvent reportée, était nécessaire et raisonnable,

- mais EDF a également décidé de ré-investir dans d'autres moyens de production qui viennent utilement compléter le parc d'un électricien comme EDF ;

L'heure est clairement aujourd'hui aux choix et aux décisions d'investissement pour préparer le renouvellement des parcs de production européens : je nous souhaite d’être courageux, convaincants et ouverts !
International Ministerial Conference:
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Paris

21 - 22 March 2005

Round Table 1

Issue 1 – World energy needs and resources

Mr. M.R. Srinivasan

Member
Atomic Energy Commission
Government of India
Round Table – 1  
Issue 1: The world’s energy resources and needs

M R Srinivasan

Power Sector in India

Certain facts about the energy situation in the world are well known. The world’s population crossed the 6 billion mark in the year 1999. It is estimated that the population will touch 9 billion by the middle of the century and all this increase will take place largely in the developing countries. Since employment in urban areas is available with comparative ease, the increase in population is accompanied by migration from rural to urban areas. At the same time the inequality in the living standards is widening and continues to be worrisome. The inequality can be seen in the per capita income, in the level of education, in primary energy consumption, in electricity consumption and in all similar parameters. While the world average per capita electricity consumption is about 2500 kWh per annum, for OECD countries the corresponding number is about 8000. This large inequality is undesirable and needs to be addressed in a manner that is sustainable from the point of view of continued availability of energy resources and burden on the environment.

I would like to touch upon the scene in India in some detail. First, I’ll give some key facts and statistics about the power sector in India.

- The total generation capacity of India stands at about 111 GW. Of this, the major share – 78 GW – or 70 per cent is thermal. The share of hydro is about 26 per cent. The remaining is nuclear (2.5 per cent) and wind power (1.5 per cent). Ten years ago, the installed capacity was 77 GW, but the per cent distribution by fuel type was almost the same as at present.

- The average PLF is 72.7 per cent. It was as low as 60 per cent ten years ago.

- Captive power capacity in India is also quite large – about 30 GW and operates at a capacity factor of about 40 per cent.

- The all-India average energy shortage is 8.8 per cent, while the all-India average peaking shortage is 12.2 per cent.

- Households with access to electricity – a key focus area for the government – are also a low 55 per cent.

- Use of non-commercial energy sources (firewood, charcoal, agricultural and animal residues and derived fuels etc.) continues to be very high – 29 per cent and is worrisome because of associated inefficiencies and health hazards, apart from loss of tree cover.

- Of the 586,000 villages in the country, about 120,000 are yet to be electrified. Biofuels are used by 90% of the rural households for cooking. As a result, women in the rural households,
who are engaged in cooking, are exposed to Respirable Suspended Particulate Matter for long hours and suffer from respiratory and eye diseases.

• After accounting for captive power and non-commercial energy, the ratio of electricity to total primary energy in India is about 40 per cent.

• The power policy in India has three main missions: power availability for all by 2012, electrification of all villages by 2009, and access to electricity for all households by 2012. This entails a capacity addition of 100 GW by the end of the Eleventh Five Year Plan that is by the year 2012, integrating the regional grids into the national grid with 30 GW of interregional transfer capacity, and access to power for the remaining 45 per cent of households.

• This is targetted to take the installed capacity to 145 GW by the end of the Tenth Five Year Plan that is by the year 2007. But it is unlikely that the 41 GW capacity addition target for the Tenth Plan (2002-2007) will be achieved. The capacity addition target for the Eleventh Plan is an even more ambitious 65 GW.

• Under the 50 GW Hydro Initiative by 2017, 162 potential hydro sites have been identified. Feasibility reports for about 68 projects worth about 27 GW reveal that many of these projects can deliver power at a reasonable cost.

• Broadly, it is estimated that total investments worth around $180 billion will be required till 2012. Half of this would be for generation, while the other half would be for transmission and distribution and rural electrification.

• Coal fired thermal plants are the main stay of the power sector in India, but inadequate coal supplies are creating a problem. These are due to several reasons including inadequate mining capacity and problem of coal transportation over long distances. Also many coal bearing areas are under protected forest.

• By the middle of the century, India’s population could rise to 1.5 billion. Annual generation of 8000 TWh (corresponding to an installed capacity of 1250 to 1350 GW) would provide only a little above 5000 kWh per capita per annum. While 8000 TWh may sound as very large, in the context of India, it is on the low side.

The plans for the power sector by the Government of India are very ambitious. And the power sector is looking up. The Electricity Act-2003 has a lot to do with it. It has introduced competition in every segment, - in generation, transmission and distribution. It has provided viable options to independent power producers. The act provides for open access. An independent power producer can sell electricity to any customer of choice. The Government has also made policy provision for captive coal mining for power producers to alleviate coal shortages. The Government is also open to coal imports. However, the landed price of coal is much higher than the domestic coal and would add to the cost of electricity.

However, all this is not enough. If a populous country like India expands installed electricity capacity based on coal fired plants to reach a level of per capita electricity consumption
comparable to OECD countries, the effect on environment at the local as well as at the global level could be staggering. Keeping in view the environmental consequences, it is desirable that India goes in for nuclear energy in a big way and meets at least a quarter of its electricity requirements from nuclear power plants. This would correspond to an installed nuclear capacity of about 275 GW. Considering its large electricity requirements and modest uranium resources, India is pursuing a closed cycle approach and has launched the construction of a fast reactor only a few months back. This is accompanied by intensifying research on development of fuels having short doubling time to enable a rapid increase in installed nuclear capacity. Cooperation amongst all countries, on a bilateral basis or multilaterally facilitated by the IAEA is desirable to ensure that nuclear power development takes place in an economical manner with due regard for safety and sustainability.
International Ministerial Conference:
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Round Table 1

Issue 2 – Environmental challenges for the 21st century

Mr. John Stone

IPCC Working Group Climate Change

Canada
John Stone Speaking notes

Slide 1

-Good afternoon. It is a privilege to be asked to give you this brief overview of the climate change issue. Much of what I will talk about comes from the 3rd Assessment Report of the Intergovernmental panel on Climate Change (IPCC).

- It has been known for a long time that the presence of certain gases in the atmosphere creates conditions that allows for human civilization to exist on this planet. These gases, known as greenhouse gases, trap heat and raise the temperature of the Earth by as much as 33 °C. They significantly affect our climate.

- The climate has always changed, driven mainly by the path of the Earth around the Sun, but in a slow, predictable manner. By contrast, the changes we have seen recently have been unusually rapid.

- We see evidence of this change in physical and biological systems such as the shrinking almost everywhere of alpine glaciers, the lengthening of the growing season, and the decline in the extent of the Arctic sea-ice.

- We have good evidence that the changes are mostly caused by the increase in the concentrations of greenhouse gases in the atmosphere as a result of human activities - mainly the burning of fossil fuels.

- We may not be able to predict exactly how the climate will change, how it will be seen and where it will be felt more acutely. However, we know enough to recognize that the threat of climate change is real and we must act.

Slide 2

- Let me begin with what is the root cause of the issue – the increase in the concentrations of greenhouse gases – and particularly carbon dioxide - in the atmosphere. As you can see from the left-hand panel of this slide, the atmospheric concentrations of carbon dioxide has increased significantly by more than 30% over the last 150 years – roughly since the beginning of the industrial era. By looking at the isotopic ratios of carbon dioxide in the atmosphere we can indeed see that this increase has been largely due to our burning of fossil fuels.

- When we go back even further we can see that we have now taken the concentration of carbon dioxide in the atmosphere to levels that we have not see for almost half a million years. The right hand side of this slide shows results from an ice-core drilled into the Antarctic. The ice captures in its crystals samples of the air at the time snow was deposited. Each layer records the atmospheric concentration of the time. As you can see, the concentration has varied over time. It has been lowest during an ice age and highest during an interglacial period. The most important point to register is that the atmospheric concentration of carbon dioxide has stayed within two bounds, never going above about 280 ppm. Today we are at 380 ppm and still increasing. We are taking the atmosphere into uncharted territory.

Slide 3

- We can already see changes in the climate. Let’s look at the temperature record. This slide shows a reconstruction of annual surface temperatures averaged over the Northern Hemisphere during the last 1000 years.

- The most recent period is from thermometer readings. There has been a considerable amount of work to make sure the temperature record is homogeneous and devoid of spurious effects such as enhanced warming in cities.

- For earlier periods we have to rely on carefully calibrated proxy-data such as tree-rings and ice-cores. The uncertainty, of course, increases as we go back in time – as shown by the grey shading. There is still some uncertainty with how best to interpret proxy data; some only record the climate during summer or winter and the coverage is not uniform spatially or temporally. There is also some uncertainty in the magnitude of century-scale variability – it may be larger than shown here.
• As you can see, the surface temperatures have recently increased. This increase has not been smooth but has been most noticeable over the last few decades.
• Globally, temperatures have risen by about 0.6 °C over the last century.
• It is very likely that the recent warming is outside of the natural variability of the climate. Furthermore, as the Intergovernmental Panel on Climate Change, the IPCC, said in its 3rd Assessment Report in 2001: There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities.

Slide 4
• The changes we have already seen are expected to continue. Part of the reason is the commitment we have made to the climate as a result of past emissions.
• But greenhouse emissions are expected to continue to increase – at least for the foreseeable future. In 2000 the IPCC developed a series of emission scenarios. These were based on projections in the literature of future trends in population, technology as well as social and economic development.
• This slide shows future projections of carbon dioxide emissions. Some scenarios, which rely on the introduction of clean and resource-efficient technologies, do eventually show a drop in emissions.
• Today’s global annual emissions of CO2 are around 8 Gt C (Giga tonnes of carbon). By 2025 the projected emissions of CO2 range between 8 and 15 Gt C. By 2100 the range is much larger and is as high as 30 Gt C.
• It has to be remembered that these scenarios include no specific policies to address climate change. They represent different views of “business as usual”. What they do show quite clearly is that different social, economic and technological policies can, mainly through energy use, influence future emissions of GHGs. This illustrates an important point, which is becoming increasingly recognized, that policies to address climate change need to be seen in the context of development.

Slide 5
• Feeding these scenarios into models of the carbon cycle we can translate these emissions into atmospheric concentrations and inputting these concentrations into models of the climate system we can make projections – not predictions – of what the future climate might look like. These models integrate our knowledge of the climate system. They represent the numerous processes that take place in the atmosphere, oceans, the cryosphere and the land surface. Because some processes occur at scales that cannot be represented in the models there are by necessity approximations. Over the last five years our confidence in these models has increased. By and large they do a reasonable job of reproducing today’s climate.
• Let’s just focus on temperature. The results are shown on this slide where we have matched the projected temperatures up to 2100 with those observed over the past 1000 years.
• The different colours represent the emission scenarios that were used. The bars at the side show the range of temperature increase produced for each emission scenario by the different climate models that were used.
• The full range is between 1.4 and 5.8 °C. Most of the results of these models overlap around 3 °C. This increase is five times larger than we have seen over the last 100 years.

Slide 6
• But climate change is more than a steady global rise of temperature. There will be spatial and temporal variations.
• The changes in temperature are expected to be greatest over the continents, particularly in northern latitudes during winter - perhaps some 40% more than the global average.
• In addition, from simple statistics, we can expect changes in the frequency and severity of extreme events as this figure shows. Physical considerations also suggest that as the climate system warms and becomes more energetic there will be more extremes. To my mind, this is much more of a concern. It is often the extreme events, short though they may be in duration, that cause the most damage.
• Generally, we must be prudent in attributing every climate or weather extreme to climate change. The heat wave experienced in Europe in 2003, for example, while outside the range of natural variability cannot yet be attributed unambiguously to anthropogenic climate change. You can see just how unusual it was from the lower part of the figure.

• There has been a significant increase in the damages from such events over the last 50 years. In a recent Economist article it is claimed that the frequency of weather disasters has tripled since the 1960’s and insured losses have risen ten-fold. One must be equally careful not to attribute all this to climate change for there are other factors to consider – for example a dramatic increase in exposure and value of property in flood plains and coastal areas.

Slide 7

- The climate system is known to exhibit “tipping points” where change can be rapid and possibly irreversible. They are properties of the climate system. Our science is such that we cannot identify precisely at what atmospheric concentration levels of GHG they will occur. They constitute surprises.
- The Greenland ice-sheet is expected to decline if there is a local warming of 2.7 °C; this may be triggered by even modest stabilization targets and such a deglaciation may be irreversible.
- Once the West-Antarctic ice-sheet begins to break-up – which has been observed recently around the Antarctic Peninsula, likely by warming of the Southern ocean - it triggers mechanisms that seem to accelerate the process. The cork has been removed from the bottle.
- With “business as usual” emission scenarios there is a 2 in 3 chance of a collapse within the next 200 years of the Thermohaline Circulation (THC) which brings warm waters to the North Atlantic and keeps Western Europe much warmer than similar latitudes in Eastern Canada.
- The probability of such abrupt changes occurring increases with the rate of forcing of the climate, that is to say the rate of increase of GHG concentrations is important.
- Finally, most projections suggest a transition from a global carbon sink to a source at about twice pre-industrial levels of CO₂. This saturation point could well occur during this century.

Slide 8

- What are the ramifications of trying to stabilize the atmospheric concentrations of greenhouse gases?.
- Let us take an example. The diagram shows some idealise curves. If we sought to stabilize CO₂ concentrations at roughly twice pre-industrial levels which according to some now almost inevitable, global emissions would have to peak in the next 2 or 3 decades and drop below 1990 levels by 2050. Such a stabilization level, which would be reached by 2150, implies an eventual temperature rise of between 2 and 3 °C. This may give us enough time to adapt to many but not all changes. But the important point to register is that it is very unlikely this could be achieved by industrialized countries alone. A globally inclusive regime is necessary.

Slide 9

It has been argued that we already have the technologies to maintain GHG emissions at today’s levels for the next 50 years. Today’s emissions are equivalent to some 7 Giga tonnes of carbon dioxide. If we continued on our current “Business as Usual” path this could rise to 14 Giga tones by 2050. Achieving this target is roughly consistent with eventual stabilization at twice pre-industrial levels although tougher reductions will be required afterwards.
- Professor Robert Socolow of Princeton University has suggested that we consider a series on 1 Giga tonne “wedges”. Each wedge corresponds to a particular technology. It is important to recognize that there is no single “silver-bullet”. Rather a portfolio of technologies will be required and it is too soon to pick winners.
- Improvements in energy efficiency and conservation offer the greatest potential and will come from literally hundreds of innovations. A 1 Gt C/year wedge can be achieved by displacing coal-generated power for example through a 50-fold increase in the current deployment of wind energy and a 700-fold increase in photovoltaic electricity – both requiring large areas of land. Nuclear power is also considered and it is argued that if the global pace of nuclear power plant construction over the past 25 years were continued to 2050 another 1 Gt C/year could be saved.
- Delaying action could produce greater GDP growth and newer technologies and hence more wealth and options to address climate change. However, it would make achieving any stabilization target more of a challenge, possibly more costly, it would make adaptation more difficult, particularly of natural systems, and we may exceed the point where some changes may be irreversible. A 20 year delay in beginning to reduce emissions could require between 3 to 7 times as much effort later and at greater costs.
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Round Table 1

Issue 2 – Environmental challenges for the 21st century

Mr. John Stone

IPCC Working Group Climate Change

Canada
Addressing the Threat of Climate Change


John M R Stone - Canada
Into Uncharted Territory: The Earth out of Balance

![Graph showing CO₂ trapped in Ice Cores (ppm) over time with Vostok Record and IPCC Projection.](image)

- CO₂ (ppm)
- Radiative forcing (W/m²)
- Carbon Dioxide
- ppmyr
- IPCC Projection
- Vostok Record
- IPCC Scenario
- Current (2003)
Climate Change: It Is Already Occurring

An increasing body of observations gives a collective picture of a warming World.

There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities.
What Does the Future Hold
Those with the least resources have the least capacity to adapt and are the most vulnerable, especially to extreme events.

Climate change is thus likely to increase the disparity between rich and poor countries and this disparity will only increase with climate change.
More than Global Warming

Changes in Extremes

Summer 2003 in Europe
Surprises are Possible

Response of the Greenland ice sheet

Response of the Greenland ice sheet

What is the THC?

Warm water goes north, Cold water goes south → heat transport into N. Atlantic
Role of salinity is complex: transient brake, long-term accelerator?
What Needs to be Done to Stabilize Concentrations

(b) CO₂ concentration (ppm)

(a) CO₂ emissions (Gt C)

(c) Global mean temperature change (°C)
Technologies Exist to Begin to Take Action

Nuclear Electricity
Effort needed by 2054 for 1 wedge: 700 GW (twice current capacity) displacing coal power.
Phase out of nuclear power creates the need for another half wedge.

Solar thermal power via concentrators (toughs and dishes) is produced at high efficiency, like PV.

Photovoltaic Power
Effort Needed by 2054: 2000 GW_{peak} (700 times current capacity)
2 million hectares

R Socolow, Science 2004
Weather and climate are changing.
   Ŷ Human-induced changes are exacerbating natural climate variability.

Climate change is a long-term challenge that will require global action.
   Ŷ The changes we have already seen are outside our experience and will become larger.
   Ŷ We should not plan for tomorrow on the basis of yesterday.

There is an urgency to begin to tackle this threat.
   Ŷ Earlier action will likely be less costly.
   Ŷ The time to act to decarbonize our energy systems is now.
   Ŷ There is no “silver bullet” – a portfolio of technologies is required.
   Ŷ It is too soon to pick winners.

Conclusions
International Ministerial Conference:
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Round Table 1

Issue 2 – Environmental challenges for the 21st century

Mr. James Lovelock

Environmentalist

United Kingdom of Great Britain and Northern Ireland
Distinguished persons, ladies and gentlemen,

It seems probable that we face huge environmental disturbances as this century evolves. Of course, there are no certainties about the future, only probabilities; there might be a series of large volcanoes interrupting that sequence, or the United States might act by putting up space mounted sunshades in heliocentric orbits. Either way by now the almost irreversible temperature rise might be averted. But to continue with business as usual and expect that something or other will save us is as unwise as it would be for a heavy smoker to assume that good genes or good luck would save him from its consequences.

I speak to you today as a scientist and as the originator of Gaia Theory, the earth’s system science which describes a self regulating planet which keeps its temperature and its chemical composition always favourable for life. I care deeply about the natural world, but as a scientist I consider that the earth has now reached a state profoundly dangerous to all of us and to our civilisation. And this view is shared by scientists around the world. Unfortunately, governments, especially in Europe, appear to listen less to scientists than they do to Green political parties and to Green lobbies. Now, I am a green myself, so I know that these greens are well intentioned, but they understand people a lot better than they understand the earth, and consequently they recommend inappropriate remedies and action.

The outcome is almost as bad as if the medieval plague returned in deadly form and we were earnestly being advised to stop it with alternative not scientific medicine. Alternative medicine has its place, and when we are healthy it is good to avoid strong drugs for minor ailments, and many find relief in acupuncture or homeopathy. But, when we are seriously ill, we need something stronger.

Now that we’ve made the earth sick it won’t be cured by alternative Green remedies like wind turbines or biofuels, and this is why I recommend the appropriate medicine of nuclear energy as a part of a sensible portfolio of energy sources.

In the last year, we’ve increasingly grown aware of the threat from global heating. In the Arctic, climate change is now more than twice as fast as here in the tempered latitudes and in summer time, torrents of melt water plunge down from Greenland’s kilometre high glaciers. The complete dissolution of Greenland’s icy mountains will of course take time. But by then the sea will have arisen seven metres, enough to make uninhabitable all the low line coastal cities of the world, including London, Venice, Hamburg, Calcutta, New York, Tokyo and many others.
The floating ice of the Arctic Ocean is even more vulnerable to heating, and in 30 years much of its snow-covered white reflecting surface, an area the size of the United States, will become a dark sea that absorbs the summer heat and hastens further the end of Greenland’s ice.

North Pole, goal of so many explorers, will then be no more than a point on the ocean surface. Not only the Arctic is changing, the climatologists warn that a four degree rise in temperature is enough to eliminate the vast Amazon forests, in a catastrophe for their people, the biodiversity and for the world, which will loose one of its air conditioners. The scientists who form the Intergovernmental Panel on Climate Change predicted, in 2001, that global temperatures would rise between 2 and 5° Celsius by 2100. To judge from the observations and model forecasts reported at a meeting at Exeter, in the United Kingdom in February, even this grim forecast could be an underestimate. Antarctic ice is now adding to the sea level rise. The ocean is becoming dangerously acid for marine life, and the excessive heat of the 2003 summer in Europe, when over 30 000 died, was no unusually hot spell, but the first taste of overheating to be expected as this century evolves.

There are still sceptics of global heating, and influential among them is that most talented novelist Michael Crichton. His stunningly good novel “State of Fear” denies global heating. The public, unfortunately, are always much more moved by fiction than by scientific papers. So what we badly need is a good pro-nuclear novel and Hollywood film to follow.

What makes me think global warming is so serious and so urgent is that Gaia is trapped now in a vicious cycle of positive feedback. Extra heat from any source, whether from GHG, the disappearance of Arctic ice, the changing structure of the ocean surface or the destruction of tropical forests is amplified and their combined effects are more than additive. It’s almost as if we’ve left a fire to keep warm and failed to notice as we piled on the fuel that the fire was out of control and the furniture ignited. When that happens, there is little time left to put out the fire before it consumes the house itself. Global heating, like a fire, is accelerating and there is almost no time left to act. Climate scientists are sure that when the carbon dioxide rises in the air about 400 to 500 parts per million, the earth crosses a threshold beyond which global heating becomes irreversible. We are now at 380 parts per million and at the present rate of increase it could reach 400 parts per million in a shorter time than 7 years. We have so damaged the atmosphere of the earth and destroyed its natural ecosystems to provide farmlands for our growing numbers, that already the world is diseased and will not recover for thousands of years. Every year we carry on business as usual, increases the harm done. We can hardly claim to be civilised if we think of ourselves alone. It is not the miseries of the first few skirmishes with Gaia through this century that should most concern us. It is the thought that our heedless indulgence now, if unchecked, will leave ruins for future generations.

We will do our best to avoid catastrophe but sadly I cannot see the United States or the emerging economies of China and India cutting back in time, and soon they will be our main sources of emission.
I fear that the worst may happen and our survivors will have to adapt to a hot and uncomfortable world. To retain civilisation then, they will need more than ever a secure and reliable source of energy to power the adaptation and for this there is no sensible alternative to nuclear energy.

As the earth changes to its new hot state there will be fast geographic and demographic changes. Civilisation is energy intensive and we cannot turn it off without crashing. Though we need something much more effective than the Green ideology of the Kyoto agreement, I suspect that we will do little until the catastrophes of the intensifying greenhouse becomes frequent enough to make us pull together as a global unit with a self restraint to stop burning fossil fuel and abusing Gaia. I believe that meanwhile the world nuclear industry will continue to supply electricity in a safe and reliable manner and that this supply will give civilisation the chance to survive through the difficult time soon to come.

We have to stop thinking of human needs and rights alone. Let us be brave and see that the real threat comes from the living earth, which we have harmed and is now at war with us. We have to make our peace with Gaia and remember we are part of it. And it is indeed our home.

Thank you.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Round Table 1

Issue 2 – Environmental challenges for the 21st century

Mr. Pertti Simola
President and CEO
TVO

Finland
IAEA International Ministerial Conference on "Nuclear Power for the 21st Century"
Paris on 21-22 March 2005

Pertti Simola
President and CEO
Teollisuuden Voima Oy
Teollisuuden Voima Oy (TVO)

- **Company**
  - Privately owned generating company
  - Established in 1969
  - Personnel about 600
  - Revenue some million 200 €
  - Sells electricity only to the shareholders at cost basis

- **Existing Nuclear Power Plant Units (Olkiluoto 1 and 2)**
  - 2 x 840 MW, BWR, Westinghouse Atom
  - commercial operation 1979 and 1982
  - modernization and upgrade in 1994…1998

- **New Nuclear Power Plant Unit (Olkiluoto 3)**
  - 1x1,600 MW, PWR, Framatome/Siemens consortium
  - Commercial operation in 2009

- **Coal Condensing Power Plant Unit (Meri-Pori)**
  - 257 MW stake in 565 MW coal condensing unit

- **Subsidiaries**
  - Posiva Oy (60 %) responsible for the final disposal of spent fuel
  - TVO Nuclear Services Oy (100 %) specialized in know-how consulting
Nuclear Power Plants in Finland

Olkiluoto
- OL1: BWR 840 MW 1978
- OL2: BWR 840 MW 1980

Loviisa
- LO1: PWR 488 MW 1977
- LO2: PWR 488 MW 1979

Helsinki
Net Supplies of Electricity

Source: Finergy

Responsible energy
Teollisuuden Voima Oy

P. Simola/PSG
21 March 2005
Total Consumption of Electricity

Source: Finergy

TVO

Responsible energy
Teollisuuden Voima Oy

P. Simola/PSG
21 March 2005
Arguments for a New Nuclear Plant Unit

- Covers partly the additional electricity demand and replaces old power plants
- Enables, together with renewables, the fulfilment of the Kyoto commitments
- Secures stable and predictable electricity price
- Reduces the dependence on electricity import
Olkiluoto 3 Project

Investment decision: 18.12.2003

Commercial operation: May 2009

Supplier: Consortium formed by Framatome ANP and Siemens

Reactor type: EPR (PWR)

Reactor thermal power: 4,300 MW

Net electrical output: 1,600 MW

Investment cost: 3 billion €

Operating personnel: 150
During 1995-2003 the capacity of Finnish electricity production has grown less than 15% while the electricity consumption has increased by 22%.

Source: VTT
Greenhouse Gas Emissions in Finland

Figures 1990-2001 according to official reporting. 2002-2010 schematic estimates

Source: Finergy
CO$_2$-emissions of Electricity Production in Finland during 1970-2004

Source: Finergy
Waste Management in Finland

Interim storage of spent fuel
- Loviisa 1983
- Olkiluoto 1987

Final repository for low and intermediate level waste
- Loviisa 1997
- Olkiluoto 1992

Final repository of spent fuel
- Olkiluoto site selected 1999
- Government Decision in Principle ratified by the Parliament in May 2001
- Kick-off of the excavation work in the summer 2004
Final Disposal of Spent Fuel at Olkiluoto

Final disposal facility

Final disposal capsule
Schedule for Final Disposal of Spent Nuclear Fuel

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<td>Construction (ONKALO, final repository)</td>
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<td>Encapsulation and final disposal, Olkiluoto 3</td>
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<td>Decommissioning and sealing of disposal facility</td>
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International Ministerial Conference:  
“Nuclear Power for the 21st Century”  
Paris  

21 - 22 March 2005

Round Table 1

Issue 2 – Environmental challenges for the 21st century

Mr. Christian Bataille  
Member of the French Parliament  

France
Les grands types de déchets radioactifs et leurs volumes

<table>
<thead>
<tr>
<th>Type de déchets</th>
<th>Volume fin 2002</th>
<th>référence</th>
<th>Volume annuel</th>
<th>référence</th>
<th>% de la radioactivité totale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Déchets HA-VL</td>
<td>1 639 m³</td>
<td>côté : 12 m</td>
<td>110 m³ / an</td>
<td>côté : 5 m</td>
<td>96,0 %</td>
</tr>
<tr>
<td>Déchets MA-VL</td>
<td>45 359 m³</td>
<td>côté : 36 m</td>
<td>600 m³ / an</td>
<td>côté : 8,5 m</td>
<td>3,9 %</td>
</tr>
<tr>
<td>Déchets FMA-VC</td>
<td>778 322 m³</td>
<td>côté : 92 m</td>
<td>28 000 m³ / an</td>
<td>côté : 30 m</td>
<td>0,1 %</td>
</tr>
</tbody>
</table>
Axe 1 : séparation transmutation
Axe 2 : stockage en formation géologique profonde
Axe 3 : conditionnement et entreposage de longue durée
Ch. I : Le constat scientifique

L’axe 1 : La séparation et la transmutation

• La **séparation** des actinides : démontrée scientifiquement
• L’**industrialisation** de la séparation : vers 2040

• La **transmutation** des actinides mineurs : démontrée scientifiquement
• L’**industrialisation** de la transmutation : vers 2040
Ch. I : Le constat scientifique

L’axe 2 : Le stockage réversible en formation géologique profonde

- le stockage géologique : la référence internationale

- Axe 2 : recherches sur l’argile effectuées par l’ANDRA à Mol (Belgique), au Mont Terri (Suisse) et au laboratoire de Meuse/Haute-Marne (Bure) – surface, puits, niche

- La réversibilité : une nécessité et une possibilité technique sur une longue période
Ch. I : Le constat scientifique

L’axe 3 : Le conditionnement et l’entreposage à long terme

- le conditionnement des déchets : des progrès importants

- la standardisation des colis : un gage d’efficacité et de sûreté

- l’entreposage de longue durée : un objectif de 100 à 300 ans de durée de vie (durée de vie de conception entreposages industriels : 50 ans)
Ch. I : Le constat scientifique

La complémentarité des trois méthodes de gestion

1950 → 2015
Entreposage industriel

2015 → 2025
Entreposage industriel → Entreposage de longue durée

2025 → 2040
Entreposage industriel → Entreposage de longue durée
Stockage géologique

2040 →
Entreposage industriel → Entreposage de longue durée
Stockage géologique → Séparation-Transmutation

Les nouvelles options de gestion des déchets radioactifs et leur calendrier d’entrée en service
Ch. II : Les conclusions politiques

I.- L’information et le débat : des améliorations indispensables

• Le **CLIS** (Comité local d’information et de suivi) du laboratoire de Meuse/Haute-Marne

• La **CNE** (Commission nationale d’évaluation)

• Le rôle central du **CEA** et de l’**ANDRA** en termes d’information

• La **CNDP** (Commission nationale du débat public)

• Le dialogue avec les élus
II.- La recherche : l’impulsion du Parlement pour continuer les recherches

- Le rôle du Parlement pour impulser les recherches sur la gestion des déchets : un rôle décisif

- La poursuite des recherches : indispensable sur les 3 axes

- Des jalons rapprochés dans le temps pour l’évaluation : utiles

- les besoins de financement : importants (Séparation, Génération IV, ADS, stockage géologique)
Ch. II : Les conclusions politiques

III.- Les retombées : La valorisation des recherches, un gisement à exploiter

• le haut niveau des recherches sur la gestion des déchets et des activités industrielles correspondantes : un effet d’entraînement potentiel

• la création de Pôles scientifiques et technologiques : Marcoule, Meuse/Haute-Marne, Cadarache

• L’implantation d’activités économiques et la création d’emploi
Ch. II : Les conclusions politiques

IV.- Les méthodes de gestion : 3 décisions de principe prises par le Parlement

Les grandes dates et objectifs de la gestion des déchets radioactifs que la loi de 2006 pourrait viser
Ch. II : Les conclusions politiques

V.- La logique d'ensemble : le PNGDR-MV pour l’exhaustivité et la cohérence de la gestion des déchets radioactifs

• l’exhaustivité et la cohérence de la gestion des déchets : le PNGDR

• du PNGDR au PNGDR-MV : un entreposage de longue durée pour les combustibles UOx non retraités immédiatement et pour les MOX usés

• le cas des déchets de moyenne activité
Ch. II : Les conclusions politiques

VI.- Le financement : Le fonds dédié d’État (FGDR) pour garantir le financement à long terme

Quelques mécanismes envisageables pour un fonds dédié d’État pour les déchets radioactifs
Ch. II : Les conclusions politiques

VII.- L’agence nationale : L’élargissement des missions de l’ANDRA

• Une nouvelle ère pour l’Agence nationale des déchets radioactifs

• La simplification des structures

• Un financement plus clair par le fonds dédié FGDR

• Une mission élargie à l’entreposage de longue durée
Ch. II : Les conclusions politiques

**Conclusion**

- **Responsabilité / générations futures**

- Continuer la *recherche* mais prendre des *décisions*

- Inscrire l’action dans la *longue durée*

- Le rôle du *Parlement* : décisions de principe et suivi
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Round Table 1

Issue 2 – Environmental challenges for the 21st century

Mr. Robert Adam
Director General
Ministry of Science and Technology

South Africa
Nuclear Power: Environmental and political challenges in the 21st Century
Adam, R.M. & Mehlomakulu, G.B.
Department of Science & Technology, Republic of South Africa

1. Introduction
The aim of this paper is to examine the key environmental challenges of the 21st century and to sketch what role nuclear power could play in addressing these challenges. The geopolitical implications of a global shift from hydrocarbon fuels towards a nuclear/hydrogen combination are also considered.

2. Environmental challenges
It is common cause that the environmental challenges in the 21st century are becoming progressively delocalized and hence require global responses. The most prominent threats to the environment in the 21st century include (1-3):

2.1 Climate change and chemical pollution
There is increasingly convincing evidence that increased concentrations of gases such as methane and carbon dioxide in the atmosphere are long term causes global warming. These ‘greenhouse gases’ are produced by human activities, such as the use of oil, coal and wood for energy, deforestation and the substitution of natural vegetation by agricultural crops. Some of the predicted adverse impacts of climate change include droughts, floods, rising sea levels and extinction of species. The industrialization and urbanization of the planet poses other chemical threats to life. Persistent organic pollutants are now found in animal tissues in the remotest corners of the world. Fertility levels of many species, from frogs to humans are declining, while genetic abnormalities are increasing.

2.2 Population Growth
The earth’s human population increased exponentially during the 20th century. This expansion coupled with the economic activities required to support it, places increasing pressure on the environment and its ability to support livelihoods.

2.3 Contamination of Freshwater Sources
The world’s available fresh water, less than one-half of 1 percent of all the water on earth, is disappearing because of unsustainable practices, including production agriculture, increased industrial use, urbanization, deforestation, water diversion and solid waste disposal.

2.4 Loss of Biological Diversity
Biological diversity, the total variety contained by the earth’s genes, plant and animal species, and ecosystems is considered a global important resource since it forms the basis of human needs such as food, fibre and medicines. Much of the developing world is purely dependent for their livelihood on the biological diversity of their habitat.
2.5  **Land degradation and deforestation**
Millions of people in developing countries are dependent on subsistence agriculture for survival. Declining soil productivity and environmental health, increasing poverty and disasters such as droughts, floods and famine are challenges that need to be addressed for sustainable development. Erratic rainfall, possibly associated with long-term climate change, has a profound effect on the productivity of ecosystems, water and food security.

2.6  **Industrialization**
The expanding industrial activity projected in various economic growth scenarios imply that toxic emissions could triple by 2050 and increase nearly five-fold in the developing regions, posing potential ecological and human health threats.

2.7  **Poverty and food insecurity**
Africa moved from a position of food self-sufficiency to a hungry, undernourished, impoverished continent in the space of 30 years from 1960 to 1990. Persistent poverty has negative implications both for sustainable development and for sustainable management of natural resources.

3.  **The Impact of Nuclear Power**
Energy generation and use impacts on all these threats and the challenge is to model the integrated effects of various energy sources on the environment. However, the most obvious potential effects (positive and negative) of nuclear power are on climate change, pollution and the contamination of freshwater sources.

Regarding pollution and freshwater contamination, nuclear waste has a lifetime significantly longer than human life; the chance of leakages from buried waste containers/canisters is expected to increase over time, creating hazardous environmental conditions. However, new technologies such as vitrification will significantly reduce this risk. The problem of high level waste disposal is increasingly a political one as opposed to a technological one.

Views on the suitability of nuclear power for reducing emissions of greenhouse gases, acid gases, particulates, and metals are highly charged. There is no question that producing an increased share of electric power using nuclear fuels in lieu of fossil fuels will reduce greenhouse gas emissions (4). Substantial replacement of fossil fuels would result in substantial declines in acid gas emissions and if coal is replaced, particulate and solid waste production. Such changes would increase the volume of nuclear spent fuels that must be disposed.

In practice it is necessary to conduct an integrated assessment (E-linkage) in terms of energy source, environment and economics to answer the following: 1) What level of emissions reductions is desired, 2) What are the costs of obtaining the emissions reductions by using nuclear power when compared to other methods, 3) Do any costs involved in switching to nuclear power (such as spent fuel disposal) offset any
environmental gains from the displaced emissions? Table 1 provides an assessment of the main energy sources in this regard.

Table 1: The E-Linkage Analysis (5)

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Cost in €/cents/kWh</th>
<th>Max. GHG Emissions CO₂/kWh</th>
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<tr>
<td>Coal</td>
<td>4</td>
<td>1306</td>
</tr>
<tr>
<td>Gas</td>
<td>4</td>
<td>688</td>
</tr>
<tr>
<td>Nuclear</td>
<td>4</td>
<td>21</td>
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<tr>
<td>Wind</td>
<td>4-9</td>
<td>48</td>
</tr>
<tr>
<td>Biomass</td>
<td>5-8</td>
<td>400 est.</td>
</tr>
<tr>
<td>Solar</td>
<td>10-15</td>
<td>280</td>
</tr>
<tr>
<td>H₂ PEM Fuel Cell</td>
<td>200-500 est.</td>
<td>0, H₂ from H₂O</td>
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4. Hydrogen and geopolitics
Although hydrogen (see Table 1) is an extremely expensive energy source in terms of current extraction technologies, it has the potential to solve two major energy challenges that dominate E-Linkage today: reducing dependence on petroleum imports and reducing pollution and greenhouse gas emissions. The transition to hydrogen as a major fuel in the next 50 years could significantly change global energy economics, reducing air emissions and expanding domestic energy resources. However, reductions in oil imports and carbon dioxide emissions are likely to be minor during the next 25 years. The growing political tensions around oil resources will increasingly influence the future energy resources debate. The current geopolitical weighting of countries and regions is clearly a function of petroleum reserves -see Figure 1.
The emerging hydrogen economy will potentially move the focus from the oil producing countries to Platinum producing countries, because of the role of platinum in fuel cell catalysis - see Figure 2.
An intriguing picture emerges with Southern Africa playing a similar geopolitical role to that currently played by the Middle East. This picture is sharpened by the consideration that hydrogen only realizes its CO\textsubscript{2} emission free potential when it is generated using hydrocarbon free sources of energy. In particular, Generation IV nuclear power sources are able to catalytically crack water as a byproduct of electricity production using waste heat above 950\textdegree C. Promising prototypes of such reactors are being investigated in South Africa, China and France currently.

5. Conclusion
This article has sketched very briefly some of the key environmental challenges of the 21\textsuperscript{st} century. The choices we make with respect to some of these challenges will influence the sources of energy we use. This, in turn, has the potential to profoundly change the current geopolitical landscape.

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Mr. Robert Adam
Director General
Ministry of Science and Technology

South Africa
Nuclear Power: Environmental and political challenges in the 21st Century

Dr R.M. Adam & Dr G.B. Mehlomakulu
Department of Science & Technology, Republic of South Africa
Environmental Challenges

- Climate change and chemical pollution
- Population growth
- Contamination of freshwater sources
- Loss of biological diversity
- Land degradation and deforestation
- Industrialization
- Poverty and food insecurity

Nuclear Power has implications for at least two of the above challenges
Climate: The challenge of stabilization

• The scale of climate change mitigation is hard to grasp – fossil fuels industry is one of the largest on the planet
• Full life-cycle analysis of energy sources needed
Freshwater: The challenge of long term storage of nuclear waste

- Radioactive element half lives >> human lives
- Technology largely solved but political management not
Greenhouse Gases generated by different energy sources

Greenhouse Gas Emissions from Electricity Production

- Indirect, from life cycle
- Direct emissions from burning
  Twin bars indicate range

grams CO₂ equivalent / kWh

Source: IAEA 2000
## The E-3 Linkage
### Energy source vs Environment vs Economics

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<td>O, H₂ from H₂O</td>
</tr>
</tbody>
</table>
Security of supply & Terrorism

- Politics in Oil
- Protection of resources
- The transition to Hydrogen
The powers associated with oil

Proved oil reserves at end 2002
Thousand million barrels

<table>
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<th>Region</th>
<th>Reserves</th>
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<td>Asia Pacific</td>
<td>38.7</td>
</tr>
<tr>
<td>North America</td>
<td>49.9</td>
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<tr>
<td>Africa</td>
<td>77.4</td>
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<td>Europe &amp; Eurasia</td>
<td>97.5</td>
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<tr>
<td>S. &amp; Cent. America</td>
<td>98.6</td>
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</tbody>
</table>
The regional power...conflicts

- Saudi Arabia: 30%
- Iran: 12%
- Kuwait: 12%
- United Arab Emirates: 8%
- Venezuela: 6%
- Russia: 7%
- Libya: 4%
- China: 3%
- Nigeria: 4%
- Libya: 4%
- Iraq: 14%
- Kuwait: 12%
- Iran: 12%

Oil conflicts, wells set alight, environment degraded
Will platinum fuel economies… and change the politics of energy.

SUMMARY AND CONCLUSION OF ROUND TABLE 2 “Driving Factors for Nuclear Industry strategies and choices and Governance”
By R. O. Cirimello, Chairman

- Base on the reliable operation of present nuclear systems and the maturity of the nuclear industry extension of life of numerous NPP has been done worldwide. The next 30 to 40 years will be under this scenario where present technology and evolutive one will be leading. NFC services including Pu recycling, demonstration of Waste Management and final disposal will be of most importance for the credibility of Nuclear Energy as an option.
- Standardization and international certification will play a significant role while the introduction of passive safety and reduction of human exposure will be claimed as main achievements. An important challenge for the nuclear industry will be to make attractive nuclear energy for the societies stressing the consideration on sitting, extend the primary source of Uranium by using fast reactors and the avoid any uncertainty on the security of supply of NFC services.
- Innovation seems to be the answer for the second half of the century where an enhanced level of economic competitiveness, inherent safety, non-proliferation and size of systems will be in place to respond to a flexible market. Present International Projects, namely Gen IV and INPRO satisfy the aims of the nuclear community in terms of the effort made toward a reliable and competitive future nuclear energy.
R&D and D should be based on governmental effort as well as they should identify suitable technologies and bring a collaborative international platform for the projects.

Governments should also take care of the security of supply, safety and non-proliferation for a healthy nuclear energy.

Development of a global nuclear regime will be a main challenge for nuclear activities while an adequate framework should be implemented for the preservation of nuclear knowledge and the education of new generation.

In view of the absence of the international credit for nuclear projects a convincing effort should be made by the nuclear community for obtaining financing and investment especially in developing countries where hard currency is scarce.

Since governance is the art of leading societies and its organizations the credibility of public opinion is based on a democratic dialogue where the technical knowledge is shared and any possibility of secrecy is abandoned while all relevant information is submitted to the governments for evaluation.

The possibility of proliferation and nuclear accidents should be excluded from the governance of nuclear energy by strong international agreements. Risk management is also a matter of governmental organization. Regional organizations for material control and safety are of most valuable contribution in this matter and its practice should be extended.

Market alone can’t guarantee the competitiveness of nuclear energy for all the components of the societies. Governments should intervene for making energy available for all the population.

The need of a well-based nuclear program is of fundamental importance for the governance of new nuclear energy capacity in a country. An adequate legislative framework for waste management and final disposition will be beneficial and also required.

As a final conclusion can be quoted:

- The nuclear industry, both private and governmental, are well prepared for the operation and supply in the short and medium term of nuclear system based on present proved technologies and the evolutive ones. This scenario included the NFC services supply will prevail in the first half of this century.
- The international cooperation nucleated in the Generation IV International Forum and INPRO will play an important role for the future of nuclear energy together with an effort for common standards and international certification.
The present nuclear activities mainly the performance of NPP requires the prevention of any possibility of a nuclear accident that may be deadly for the nuclear industry. The communication to the public of incidents and the teaching on the nature and the impact of controlled nuclear incidents will result in gaining confidence in the actors of nuclear activities.
A. Djaloeis (Indonesia): I should like to see at future conferences of this kind more time allotted to general discussion in which all conference participants can join and thereby provide feedback.

My country is a developing country with a population of over 220 million that is still growing. It has hydrocarbon resources, but we believe that they should not be used only for energy production – that they should also be put to high-value-added uses such as the production of chemicals. We therefore need nuclear power in order to enjoy the benefits of electricity at an affordable price.

That being so, I would be interested in hearing the views of Mr. Ritch and other Round Table speakers about the following: how to efficiently address public concerns regarding nuclear power; how to establish a decision-making process that will ensure that appropriate policies and strategies for a sustainable nuclear power programme are adopted; how to accelerate the development of the necessary scientific-technical, industrial and regulatory infrastructures; and how to obtain assistance in overcoming the financial and legal problems.

J.B. Ritch (World Nuclear Association): That enumeration of tasks facing the government of any country wishing to embark on nuclear power generation underscores a point which I made just now – namely, that there is a need to re-orient major international development institutions such as the World Bank and the United Nations Development Programme (UNDP). In my view, the principal donor countries supporting those institutions should be pushing and large developing countries like Indonesia should be pulling in an effort to bring about a change of course in favour of the ‘clean energy revolution’. The World Nuclear Association stands ready to assist them in that effort.

A. Lauvergeon (France): I agree with Mr. Ritch – the major international development institutions are still reluctant about supporting an expansion of nuclear power generation.

France is cooperating with a number of other countries in the nuclear power field, not only through the construction of reactors but also through the provision of safety- and security-related services and of training. Also, it is making the political authorities in developing countries aware of what is happening in other countries, in order to assist them in their decision-making based on national concerns.

R. Cirimello (Argentina): My country embarked on the development of a nuclear power programme in the 1950s, and the process of establishing the necessary infrastructures was a lengthy one. It is
possible for a country to accelerate that process by learning from the experience of other countries, much of which is reflected in documents published by the IAEA.

A.C.O. Barroso (Brazil): Each country is entitled to choose its path to nuclear power, and in my view that path need not include the establishment of infrastructures as elaborate as those of countries like Argentina and Brazil, which wish to be international suppliers of nuclear power technology.

Y. Sokolov (IAEA): At the IAEA, we consider that developing countries wishing to cross the nuclear power generation threshold must take at least the following steps: carry out an energy planning exercise that takes account of their real energy needs and their available resources – an exercise for which the IAEA provides tools that have already been used by over 30 Member States; and establish the necessary regulatory and other infrastructures – which Member States can do with assistance provided through the IAEA’s technical cooperation programme.

Knowledge sharing is very important in this connection, and the IAEA’s International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO), in which 22 Member States are now participating, is a good example of knowledge sharing by technology holders and technology users.

S. Soentono (Indonesia): Ms. Lauvergeon referred in her presentation to the fact that nuclear power is not included in the Kyoto Protocol clean development mechanism (CDM). I believe that it should be included.

A. Lauvergeon (France): It should definitely be included. We cannot effectively combat climate change without nuclear power and large-scale nuclear power.

J.B. Ritch (World Nuclear Association): In my view, the exclusion of nuclear power from the CDM is symptomatic of what is wrong with the international process whereby climate change is being addressed – many of those involved in that process have an antinuclear bias.

The CDM is part of a structure that is at present completely inadequate. Nuclear power should be included in it, and the major international development institutions should be persuaded to support the use of nuclear power.

Mr. Sokolov just mentioned the assistance provided by the IAEA with energy planning and the establishment of necessary infrastructures. Just imagine if the IAEA were part of a team of United Nations institutions offering both technical expertise and large-scale financial support for nuclear power development. At present, unfortunately, we have compartmentalization – with some institutions virtually at war with others. The international community is fiddling while the Earth is warming.

K.-D. Grill (Germany): As a member of the Opposition in Germany’s Federal Parliament, I believe that Europe cannot become one of the world’s economically most dynamic regions without low energy prices and will not be able to achieve its CO\textsubscript{2} emission reduction target without nuclear power.

In my view, nuclear power will be reinstated in Germany if the nuclear waste disposal issue is resolved. Also, I believe that by 2008 at the latest we shall see the operating lives of existing nuclear power plants being extended in Germany, because it is widely recognized that Germany’s CO\textsubscript{2} policy cannot be implemented without those plants.

There is a discussion taking place in Germany about the future of nuclear power in our country, but it is not very noticeable owing to the German Government’s position on nuclear power.

E.A. Jörle (Sweden): As Director of Public Communication at the Swedish Nuclear Power Inspectorate, I could not help noticing that there has been a lot of talk at this conference about the benefits of nuclear power but very little about its vulnerability. It is absolutely certain that somewhere
in the world a nuclear accident is at present waiting to happen, as a result of – say – a crack in a piple or negligence on the part of an operator, but here people are talking as if nuclear accidents belong to a past age.

We need to talk with the public about nuclear accidents not only after one has occurred but also before.

R. Kondo (Japan): You are right. That is a point which I make when talking with operators and regulators.

D. Maillard (France): I don’t think we have been displaying foolish optimism about the safety of nuclear power at this conference – the importance of nuclear safety culture has been strongly emphasized.

The nuclear industry has in recent years done more than any comparable industry to improve safety and increase transparency in the safety area, but that does not guarantee that no nuclear accidents will occur in the future. However, the risk is very low – as in the case of air transport, and many participants in this conference have come to Paris by air and will return home by air. Certainly the risk of a nuclear accident is no reason for renouncing nuclear power, and I am amazed that nuclear power has been excluded from the Kyoto Protocol CDM. In my view, its exclusion was due to the fact that the general public has not been provided with the information necessary in order to dispel the misconceptions about nuclear power.

A. Lauvergeon (France): We in the nuclear industry are very conscious of the risks associated with nuclear power generation and take nothing for granted. That is the essence of nuclear safety culture.

When we design a reactor like the EPR, we draw on the experience of 50 years, and we even take into account the possibility of – for example – an aircraft crashing into the reactor. Our aim is to propose intrinsically safer and safer solutions, based on evolution rather than revolution. We believe in continuity and do not take ill-considered risks.

A. Vidal-Quadras Roca (European Parliament): I believe that public confidence in nuclear power in Europe would be increased if the nuclear power issue were addressed within a European framework, with a European regulatory regime based on European directives relating to nuclear safety and radioactive waste management.

E.A. Jörle (Sweden): My country has been rather reluctant about addressing issues within a European framework, perhaps because the EU countries of northern Europe have less confidence in the EU than those of southern Europe.

[Vidal-Quadras Roca shouted off-mike “That’s why it’s so important – a change of best practices”. I don’t know what to make of that remark]

A. Molin (Austria): Nothing has been said here about regional cooperation in the area of emergency preparedness – something that is particularly important in regions such as central Europe, where there are many small countries.

I. Ronaky (Hungary): Some time ago the IAEA launched a project on the harmonization of emergency preparedness in central and eastern Europe, but I do not know whether Austria is participating in that project.

A. Molin (Austria): How does one reconcile the realities of liberalized energy markets with the need for long-term planning in a stable environment without violating the rules of fair competition?
A. Lauvergeon (France): When energy market liberalization began, many people believed that nuclear power would not be able to compete with other energy sources. Today we see that it can compete with all other energy sources, including fossil fuels, and that – for example – on Wall Street those electricity utilities which operate nuclear power plants have a better listing than those which do not, partly because there is less long-term uncertainty about costs in the case of nuclear power.

L. Xingwana (South Africa): As South Africa’s Deputy Minister for Minerals and Energy and a member of the South African Parliament, I believe that, in developing countries, parliamentarians could play an important role in informing the general public about nuclear power. Of course, in order to do so, they would first have to inform themselves, and I believe that one way in which they could familiarize themselves with the issues involved in nuclear power generation would be to discuss them with European parliamentarians.

In speaking to the general public about nuclear power, we should, in my view, draw attention to success stories like the approximately 20-year accident-free operation of South Africa’s Koeberg nuclear power station.

Although South Africa has been engaged in nuclear power generation for some time, it still needs international assistance with training, and the training needs of developing countries that have still to embark on nuclear power generation are at least as great.

Turki Al-Saud (Saudi Arabia): I should like to draw attention to some concerns of my country – and of many other developing countries – regarding the utilization of nuclear energy.

We are concerned about: the credibility of the nuclear non-proliferation regime, which we believe should be completely non-discriminatory; the absence of an international regime for monitoring nuclear installations in general; nuclear activities which are not totally transparent and not under international supervision, some being completely ignored by the IAEA; the export of nuclear waste to developing countries that are being used as dumping grounds; and discrimination among countries as regards participation in nuclear fuel cycle activities.

[I am not including Cirimello’s summary. Shier and Gherman spoke later, while we were waiting for Minister Demerjien to arrive.]

J. Shier (Canada): As a member of OECD’s Trade Unions Advisory Committee (?) and a representative of the Canadian Nuclear Workers Council (?) and the International Nuclear Workers Union Network, I should like to emphasize the readiness of the organized workers in the nuclear industry to participate in the public debate about the future of nuclear power. We look forward to the construction of many more nuclear power plants.

O. Gherman (Romania): Attending this conference, held in Paris, I am reminded that Madame de Pompadour, a favourite of Louis XV of France, is believed to have said “Après nous le déluge”. That has not been the motto of this conference, where there has been very strong emphasis on the role of nuclear power in sustainable development. I am very grateful to the French Government for hosting this conference.

D. Maillard (France): I thank Mr. Gherman for that comment, as some people say that nuclear power has no part to play in sustainable development. Nuclear power may not be the ideal energy source that humankind will be using in 200-300 years time, but it is unquestionably the energy source that can enable humankind to make the transition.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Round Table 2

Issue 3 – Driving factors for nuclear industry strategies and choices

Mr. Shunshuke Kondo
Chairman
Atomic Energy Commission

Chairman
Science Council

Japan
A three-tier action plan for sustainable promotion of nuclear energy

Shunsuke Kondo
Chairman, Japan Atomic Energy Commission
Tokyo, Japan

Japan’s 53 nuclear power plants supply about a third of the country’s electricity, becoming a safe, reliable and competitive energy source. Nuclear power contributes to the energy security: Japan’s degree of self-sufficiency in primary energy supply is about 20%, of which 16% comes from nuclear power. Nuclear power is considered as a practical and effective mean to cope with Kyoto Protocol in the electricity generation sector, as evidenced by the fact that though electricity generation rose by more than 21% since 1990, associated carbon dioxide emissions increased less than 7%. The electric utility companies are committed to reducing the carbon dioxide emissions, and are continuing construction of three nuclear power units and preparing to build seven additional ones, though more than ten years will be taken before the completion of the latter.

The Japan Atomic Energy Commission (AEC) believes that we are at the break of dawn for nuclear power to become a major player in the world. Therefore the AEC is asking relevant administrative organizations and industries to pursue coordinated strategic efforts, sharing the vision that safe, economical, and reliable nuclear energy technology will contribute as a mainstay of electricity and heat generation technology, fostering economic growth, providing security and fuel diversity, and enhancing environmental quality in many parts of the world.

To put it concretely, the AEC has recommended actions across three different time frames; short term, mid-term and long-term. Although existing nuclear power plants are recognized as a safe, reliable and competitive power source in many countries, various actions are taken rightfully to improve their performance, utilize the plutonium recovered from the spent fuel by reprocessing, securing adequate interim storage capacity for spent fuel waiting for the reprocessing, and search the site for geological disposal of vitrified high-level radioactive

wastes from the reprocessing. The time frame of these actions is short term as they aim at using existing assets as efficiently as possible.

Examples of actions for the improvement of the performance of existing plants are as follows;
(1) Develop and apply advanced technologies for increased output of existing unit, those for its longer-term reliable operation, and those for economical dismantling of the nuclear facilities and economical management of radioactive waste generated in the process:
(2) Develop and implement technologies for high burn-up fuel:
(3) Improve the economy of operation, employing risk-informed maintenance and accountability-conscious quality management system so as to maintain a high level of safety:
(4) Improve the economy of the operation of fuel cycle facilities and reduce the amount of wastes generated in these facilities.

These actions should be promoted with toughness, resolution, and the consideration to details as they would directly impact the performance of existing assets. Although major investment for these activities should come from plant operators, government should support the R&D of generic nature to ensure that a broad range of technologies that promise to enhance the long-term performance of existing facilities are developed.

It is also important for government to facilitate the mutual understanding on the health and safety aspect of high-level radioactive waste disposal between residents living in potential areas for the site and the organization to carry out the disposal activity as the difficulty in the determination of the site is a major source of uncertainty in the promotion of nuclear energy supply.

In the age of technological innovation, the competitive operation of current design units and facilities does by no means guarantee the adoption of the facilities of the same design as existing ones for their replacement or the addition of new units. In addition, the deregulation of electricity market has altered the financial landscape for utilities, which are no longer guaranteed a fixed return on investment. Therefore it is essential for nuclear power plant suppliers to pursue the improvement of the performance of current designs incessantly if they want to win new orders of construction in tomorrow’s market. As the time-frame for actions to be taken for this purpose should continue for 30 years or so, we call them as mid-term actions, which should aim at;

(1) reducing capital cost by shortening licensing and construction time through standardization of design, sharing one-time engineering and licensing cost, developing
modular cost-effective construction technologies, and developing associated planning and information management tools that reduce the labor intensity of these complex construction projects:

(2) improving robustness in maintaining safety and reliability by adoption of passive safety features, enhancing easiness of inspection, and minimizing environmental impact by reducing volume of radioactive waste during both operation and decommissioning of the facilities.

(3) improving human consciousness by pursuing low occupational exposure; low work-load in operation, maintenance, and emergency situation; and low man-power need for inspection and maintenance.

The size of the improved plants to be pursued should be larger than or equal to the maximum of the current plants. Nonetheless, due consideration should be devoted to possible existence of a niche for medium size plants due to the grid capacity for some utilities if the improvement of current medium size plants will result in competitive ones.

The government and utilities should keep it in mind that these improvements can be successfully realized only in consultation with qualified suppliers of nuclear equipment and components, contractor and architect engineer/engineering organizations with the personnel, skill, and experience in nuclear design, engineering, and construction and that the continuity of plant construction programs provides an environment conducive to the promotion of these improvement. Although private sectors should be responsible for this continuous improvement, government funding for the development and transfer of relevant generic technology platforms in a timely fashion will both stimulate and leverage much larger private sector investment for these actions. Therefore government should identify and characterize good elements of the technology platforms related to the improvement mentioned above through constant collaborative planning with industry, being mindful of the importance of maintaining such innovation for the sound development of nuclear power supply capacity.

We should take it for granted in the strategic planning for future that over the long-term, not just new but truly radical new energy technologies will appear and address effectively the challenges of air pollution, climate change and energy supply insecurity while expanding energy service availability to all on the globe. Therefore the goal of long-term actions for nuclear industry should be to develop innovative nuclear energy supply systems which can compete in such new energy market, making nuclear energy technology sustainable in terms of social acceptability as well as safety, economy and environmental protection.

Actions to be taken to attain this goal should aim at developing nuclear energy systems which
can provide (1) manageable nuclear waste, effective fuel utilization, and increased environmental benefits, consistent with such national goal of pursuing zero emission society through reducing, reusing and recycling of wastes. (2) competitive economics, (3) enhanced safety and reliability performance consistent with the requirement of neighbor friendless and (4)sufficient security in terms of proliferation resistance and physical protection.

Government should carry out long-term R&D activities aiming at developing these systems as a part of portfolio of the R&D for pursuing the sustainable development of mankind. It is clear that international cooperation among countries with similar vision as to the use of nuclear energy for sustainable development of the world such as activities within the framework of the GIF is quite beneficial since we can enjoy the benefits derived from such economies of scale and of specialization as the joint use of test facilities, sharing of information and results, and the pooling of resource, efforts and experience.

In conclusion, it is a must for us nuclear community to be flexible to adapt our nuclear energy systems to a new paradigm to be emerged in future if we want nuclear energy to survive as expected in our vision. The AEC has recommended actions across three different time frames; short term, mid-term and long-term for the continuous adaptation in this respect. One final caution should be that, although there are two primary gateways to control the development and flow of technology from either a push or pull standpoint, the growing universality of technology now makes successful innovation much more frequently driven by the pull of technology which is basically the pull of the basic human needs than it is technological push. Therefore we should make the process of R&D more transparent to the public and get its feedback on the R&D direction so as to help strengthening the public acceptance of the products.
International Ministerial Conference:  
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21 - 22 March 2005

Round Table 2

Issue 3 – Driving factors for nuclear industry strategies and choices

Mr. Shunshuke Kondo  
Chairman  
Atomic Energy Commission

Chairman  
Science Council

Japan
Present Status of Nuclear Power in Japan

- 53 operating units produce about one-third of electricity generated in Japan
- Contribute to 16% increase in Japan’s degree of self-sufficiency in primary energy supply
- Contribute to the reduction of CO2 emission/GDP
- Three units under construction and seven units in preparation for construction
Policy for Sustainability

- Sharing the vision that safe, economical, and reliable nuclear energy technology will contribute as a mainstay electricity and heat generation technology to fostering economic growth, providing security and fuel diversity, and enhancing environmental quality in many parts of the world.

- Recommends actions across three different time frames: short-term, mid-term, and long-term.
Short-term Actions

- The existing nuclear power plants are recognized as a safe, reliable and competitive power source in many countries.
- Their performance should be improved to maintain high levels of public, investor and regulatory confidence in the nuclear energy supply sector.
- The actions for this purpose should be promoted with toughness, resolution, and the consideration to details.
- Government should support the R&D of generic nature to ensure that a broad range of technologies are developed and applied.
Short-Term Actions Taken

- Develop and apply advanced technologies for increased output and longer-term operation.
- Develop and implement technologies for high burn-up fuel.
- Implement effective and efficient measures to economically maintain a high level of safety.
- Promote the closed fuel cycle to separate high-level radioactive waste from valuable nuclear material and recycling the latter into fuels.
Mid-term Actions

- The competitive operation of current design units and facilities by no means guarantees the adoption of the same type of plants and facilities for replacement of retiring units or for addition of the capacity, as deregulation of electricity market has sharply altered the financial landscape for utilities, who are no longer guaranteed a fixed return on investment.

- Nuclear power plant suppliers should pursue the improvement of the performance of current designs incessantly for 20-40 years so as to win new orders of construction in tomorrow’s market.
Mid-term Actions Taken

- Reduce capital cost by standardization of design, and developing modular cost-effective construction technologies
- Improve robustness in maintaining safety and reliability by adopting passive safety features, and enhance easiness of inspection
- Minimize environmental impact by reducing volume of radioactive waste from operation and decommissioning of the plants
- Improve human consciousness of the design by pursuing low occupational exposure, low work load, and low man power need
Mid-term Actions: the Role of Government

- These mid-term R&D activities should primarily be sponsored by private sector as in the case of near-term actions.
- However, it is important for government to fund for the development and transfer of relevant generic technology platforms in a timely fashion.
- Government should identify and characterize good elements of the technology platforms related with various improvements through constant collaborative planning.
Long-term Actions

- Over the long-term, radical new energy technologies will appear and address effectively the challenges of air pollution, climate change and energy supply insecurity while expanding energy service availability to all on the globe.

- Explore, through R&D, innovative nuclear energy system concepts which can compete with new and radical non-nuclear energy technologies in the long run with a view to making nuclear energy system sustainable in terms of social acceptability as well as safety, economy and environmental protection.
Long-term Actions Taken

- Develop nuclear energy systems which can provide
  - manageable nuclear waste, effective fuel utilization, and increased environmental benefits, consistent with such national goal of pursuing zero emission society through reducing, reusing and recycling of wastes.
  - competitive economics,
  - enhanced safety and reliability performance consistent with the requirement of neighbor friendless
  - sufficient security in terms of proliferation resistance and physical protection.
Long-term Actions; the Role of Government

- Government should carry out long-term R&D activities aiming at developing these systems desirably with international partners with similar vision as to the use of nuclear energy for sustainable development of the world as in the case of the GIF framework, which is quite beneficial since we can enjoy the benefits derived from such economies of scale and of specialization as the joint use of test facilities, sharing of information and results, and the pooling of resource, efforts and experience.
There are two primary gateways to control the development and flow of technology from either a push or pull standpoint.

The growing universality of technology now makes successful innovation much more frequently driven by the pull of technology which is basically the pull of the basic human needs structured by Maslow in the ladder form.

We should make the process of R&D transparent to the public and get its feedback on the R&D design so as to maintain and strengthen the public acceptance of our products.
International Ministerial Conference:
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Round Table 2

Issue 3 – Driving factors for nuclear industry strategies and choices

Ms. Anne Lauvergeon
Chairman
AREVA
France
Mr. Chairman, ladies and gentlemen

It is a great pleasure for me to address such a distinguished and international audience, with representative from so many countries.

I wish to take this opportunity to thank the IAEA for their effective work to support the awareness and the development of nuclear energy.

Yesterday, during the first round table, the increasing need of energy in the world and the challenge of climate change have been extensively discussed. The benefits of nuclear energy in this respect have been highlighted.

From the industry side, our mission is to make these nuclear energy systems available and attractive.

[The first challenge: adapt to a changing market environment]

And one of the first challenges is to have them attractive in a fast-changing market environment.
In several countries, market liberalization is a major trend, reshaping the energy landscape.

Europe is providing a good example:

- Utilities which were vertically integrated must separate their generating assets from their transmission assets
- They are moving out of their border, often through total or partial acquisition
- Mergers, partnership, privatization are common

Accordingly, utilities are revising their goals and their strategy.

*The role of the States also is changing. The States still need to care for security of supply, safety, environmental policies. But their tool is now longer the direct control of a national utility; it comes through carefully drafted regulations.*

The industry has proven to be flexible enough to align its products and services to the new expectations of their customers, and to the new regulatory framework set-up by the State.

*[Improved economics is a fact]*
Now, one of theses expectations is common to both of them, and remains of key importance: economics.

In short:

Utilities need to supply cost-competitive and reliable electricity to their end-users, industries as well as households. It is especially true in a competitive, liberalized market.

And for the State, affordable and stable supply of energy is a favorable condition to its economical development.

The industry delivered on this expectation.

I trust that improved economics is the first reason of the renewed interest in nuclear energy, before the Climate Change factor.

The US is a case in point, where better operation and upgrading of reactors have added to the grid the equivalent of more than 20 nuclear power plants!

At the same time, the expectations on safety have constantly increased.

Now safety means also reliability and higher power availability. It goes with economics, not against.
So, how are we getting such achievements?

**[Innovation is key to success]**

Innovation is the answer. Indeed, we are continuously developing our products, integrating the feed-back of experience, making the best use of new technologies.

To illustrate:

- the performance of fuel has significantly increased, with burn-up for LWRs reaching today more than 70,000 GWd/t and a very small failure rate; it allows better utilization of uranium, higher load factor of the reactor and optimized cycles.

- digital technology is becoming a standard for Instrumentation and Control, translating in better operational control; and also enhanced safety

- Now the best illustration is the recent “new build” decisions in Europe. Finland, as well as France, have taken their decision after a thorough cost / benefit analysis, where nuclear proved competitive. The EPR was an adapted answer to their needs.
[Innovation in services]

Technology is one part, but the answer is also in services. Here again, the industry is bringing innovative solutions, reacting fast to align its offers to the customers new strategy.

To illustrate: more and more utilities are contracting out globally to large vendors the performance of outage. These “win-win” solutions allow the utilities to concentrate on running the plant, while the suppliers optimize the utilization of resources and ensure the sharing of best practices between their teams.

It does allow for shorter outage and optimized maintenance, with a direct positive effect on load factor and the cost of kWh.

[Industry is preparing the future]

I highlighted the current vision of the market, taking examples from recent situations. Now, solutions are here today because we did invest to prepare the future. And this never stops.

I don’t want to repeat what you heard yesterday: the hydrogen economy, desalination, etc… But I can tell you it is part of our mid-term to long-term
vision. For instance, the industry is involved today in developing the
Generation IV reactors, HTR technologies being a prime example.

[A level playing field: Nuclear shall be recognized as any CO2 free
ergy]\n
Yes, it is fine to have a good product, it is even better to offer an
outstanding service. But using nuclear energy remains a choice.

And, what we are calling for here is a level playing field.

The fact is that nuclear energy is CO2 free. It would be only fair that all
CO2 free energies are treated the same way.

It seems obvious, but it is not the case today!

For instance, the Clean Development Mechanism of the Kyoto Protocol
offers the potential of a win-win solution: it brings benefits to the
receiving countries and at the same time offers a complementary action
path to the developed country.

Therefore the second round of Kyoto implementation mechanisms shall,
in my view, restore nuclear energy as an acceptable technology.

[Transparency will enhance development of nuclear]
Climate change, good economics, security of supply: these are several reasons for a development of nuclear energy.

Now, to make it happen there are still some concerns to answer:

- demonstrate a solution for final waste management
- and get “public acceptance”

The industry has also a role to play here: we shall establish a dialogue with all stakeholders, in an open, transparent and honest manner.

And more broadly, I firmly believe that the more the energy and environmental debate will be a citizens’ debate, the more nuclear energy will benefit.

[Conclusion]

I am positive on the future. The new challenge that our industry is facing is a nice one: the expansion of nuclear energy.

And we are investing to be there on time!
International Ministerial Conference:
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Round Table 2

Issue 3 – Driving factors for nuclear industry strategies and choices

Mr. K.P. Lau
Director Office of International Nuclear Cooperation

US Department of Energy
Mr. Chairman, distinguished delegates, ladies and gentlemen, Mr. Bill Magwood sends his regrets for not being able to be with you today. He was detained unexpectedly in Washington, DC due to policy deliberations.

It is now an exciting time to be in nuclear business! After thirty years of hiatus, nuclear power is on the brink of a comeback in the US.

If you recall from Secretary Bodman’s statement which was so eloquently delivered by Ambassador Morella yesterday, the US government and the private sectors are working together in trying to bring new nuclear power plants into operation.

We understand that for a successful revival of the nuclear industry, we have to address the economic issue, as well as technological, environmental and proliferation concerns to win over Wall Street and the confidence of the general public.

First of all, please allow me to review with you the current status of the US nuclear industry with you. Although no nuclear plants have been built in recent years and we have had a moderate load growth, nuclear power continues to produce 20% of the electricity generated in the US.

The recent electricity market de-regulation has had some surprising and unexpected result with regard to nuclear power. Nuclear power has thrived instead of being driven out of competition as people initially anticipated in this new competitive environment.

First, there has been a market consolidation in nuclear power plant ownership. Today, of the 103 operating plants, there are only 27 power plant licensees down from 46 before the electricity market de-regulation. Companies who owned one or two units of nuclear plants decided to unload them, and large operating companies began to acquire them. The end result is that fewer operators remain in business, but they operate plants more efficiently and safely.
The obvious sign of the improvement is that the average capacitor factor for the nuclear power plants jumped from 70% a few years ago to over 90% in 2004. The price of nuclear electricity is the lowest in the market place. Some regions report that nuclear electricity costs are as low as 1.7 cents per KWH vs. 1.7-2 cents per KWH for coal and 5-6 cents per KWH for oil and gas.

Nuclear power plant owners, instead of contemplating shutting down existing plants, are pursuing plant life extensions. Today, after witnessing three plants receive their plant license extension for another 20 years, as many as 30 of the plant owners, with confidence in the licensing process, have applied for life extension with the US Nuclear Regulatory Commission (NRC).

A recent study by the University of Chicago’s Department of Economics cites the high over night capital cost for new nuclear power plants as the major impediment for building new nuclear plants. It concludes that nuclear electricity can compete with electricity generated by coal and gas once the extra cost of building the first plant is absorbed.

One of the main reasons for the high cost is the uncertainty of licensing process for new nuclear power plants. The new NRC plant licensing process, as mandated by the 1992 US Energy Policy’s Act, is commonly known as the “One-Step” licensing process. It has not been demonstrated since no new plant has been built in the last thirty years.

Understandably, the nuclear industry is concerned about this untested licensing process. Along with this uncertainty, comes the higher risk and thus higher financial costs.

The US DOE’s Nuclear Power 2010 program (NP2010) was established to partner with the private sector on a 50/50 cost share program to test this new license process. Currently, there are three consortia, which have a combined 63% of the nuclear generation, participating in NP2010, namely, NUStart, Dominion, and Entergy. These consortia are working toward a decision date by 2008.

Meanwhile, TVA is working with GE in trying to re-start its Bellafonte Plant which was mothballed many years ago.

In a surprising development, Duke Power announced last month that it intends to build a new nuclear plant solo in its service territory. A decision date may be as early as 2007.

As for technology in the near term, the US NRC issued the Final Design Approval (FDA) for the AP1000 and has begun the public comment stage for the issuance of Design Certification (DC). The next in line to be reviewed by NRC will be GE’s Economic Simplified Boiling Water Reactor (ESBWR). Likewise, AREVA has recently approached NRC for preliminary discussion on certifying its EPR.

For the long-term, research and development (R&D) on advanced nuclear energy systems under Gen IV program promotes development of environmental responsible systems that
will offer improvements in safety, reliability, economic competitiveness, proliferation resistance and physical protection.

The Generation IV International Forum (GIF) is an international initiative to advance R&D work on the next generation systems by focusing on advancing the development of six system designs.

We have also embarked on the Advanced Fuel Cycle Initiative (AFCI) program. The mission for AFCI is to develop and demonstrate technologies that will enable the transition to a stable, long-term, environmentally, economically and politically acceptable advanced fuel cycle. It intends to develop proliferation-resistant fuel cycle technologies for application to current operating commercial reactors and the next generation reactors.

In conclusion, the US is supporting the expansion of nuclear power from the top down under the leadership of President Bush. This level of support provides credibility to the initiative enabling others within the government and industry to confidently proceed with planning.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Round Table 2

Issue 3 – Driving factors for nuclear industry strategies and choices

Mr. S.N. Ivanov
Deputy Director General
ROSENERGOATOM

Russian Federation
Состояние производственных мощностей АЭС, входящих в концерн «Росэнергоатом», в 2003 году

Действуют 10 АЭС мощностью – 22 ГВт, Объем производства – 140 млрд. кВт.ч

Северо-Запад
- Ленинградская 4 ГВт
- Кольская 1,8 ГВт

Центр
- Смоленская 3 ГВт
- Нововоронежская 1,8 ГВт
- Курская 4 ГВт
- Калининская 2 ГВт

Юг
- Волгодонская 1 ГВт

Поволжье
- Балаковская 4 ГВт

Дальний Восток
- Билибинская 0,05 ГВт

Территория (ОЭС)’’ Доля в производстве электроэнергии

| Россия | 16% |
| Европейская часть | 21% |
Динамика нарушений в работе АЭС России

С 1998 г. введены новые правила учета нарушений в т.ч. 2 КУР - 3, 1 ЛЕН - 2 после модернизации и 3 КЛН - 1.

Всего из них:

- Важные для безопасности
- Прочие
- 1 КУР
Динамика стоимости электроэнергии, вырабатываемой АЭС концерна «Росэнергоатом» (с учетом инвестиционной составляющей)

Прогнозные показатели по индексам-дефляторам

Динамика соотношения, установленных ФЭК России для АЭС и ТЭС
Динамика соотношения тарифов, установленных ФСТ России для АЭС и ТЭС

<table>
<thead>
<tr>
<th>Год</th>
<th>Тарифы ГРЭС (на шинах)</th>
<th>Тарифы АЭС (с учетом эксплуатирующей организации, включая инвестиции)</th>
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<tbody>
<tr>
<td>2002</td>
<td>242 руб./МВтч</td>
<td>310 руб./МВтч</td>
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<tr>
<td>2003</td>
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<td>366.4 руб./МВтч</td>
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<td>429.91 руб./МВтч</td>
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<td>2005</td>
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<td>2006</td>
<td>555.59 руб./МВтч</td>
<td>600 руб./МВтч</td>
</tr>
<tr>
<td>2007</td>
<td>512.33 руб./МВтч</td>
<td>555.59 руб./МВтч</td>
</tr>
</tbody>
</table>

Примечание: руб./МВтч — российские рубли за мегаватт-час.
Динамика соотношения сопоставимых тарифов АЭС и ТЭС

Диаграмма показывает развитие тарифов ГРЭС на шинах и АЭС без учета инвестиций с 2000 по 2005 год.

Сравнение тарифов по годам:
- 2000 год: ГРЭС - 210,16 руб./МВтч, АЭС - 362,94 руб./МВтч
- 2001 год: ГРЭС - 210,20 руб./МВтч, АЭС - 366,4 руб./МВтч
- 2002 год: ГРЭС - 220 руб./МВтч, АЭС - 512,33 руб./МВтч
- 2003 год: ГРЭС - 269,04 руб./МВтч, АЭС - 555,59 руб./МВтч
- 2004 год: ГРЭС - 283,59 руб./МВтч, АЭС - 650,53 руб./МВтч
- 2005 год: ГРЭС - 368,28 руб./МВтч, АЭС - 650,53 руб./МВтч

Наибольшее различие в ценах отмечено в 2002 году, когда тарифы АЭС были значительно выше, чем ГРЭС.
Баланс мощностей 2001-2004 гг.

- Сохранено в работе (ПСЭ) – 2738 МВт;
- Снятие ограничений ГАИ – 600 МВт;
- Дополнительные мощности за счет повышения КПД – 285,3 МВт;
- Ввод новых мощностей – 2000 МВт

ИТОГО: 5623,3 МВт
В том числе в 2004 г. 2873,8 МВт
Завершение работ по продлению срока эксплуатации энергоблоков суммарной установленной мощностью 2 024 МВт (в период с 2005 по 2008 гг.)

<table>
<thead>
<tr>
<th>Блок АЭС/тип реактора</th>
<th>Мощность (брутто, МВт)</th>
<th>Поколение</th>
<th>Срок ввода (год)</th>
<th>Исчерпание назначенного 30-летнего срока службы (год)</th>
<th>Продолжительность доп. срока службы, лет (прогноз)</th>
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<td>12</td>
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<td>15</td>
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<td>1976</td>
<td>2006</td>
<td>15</td>
</tr>
<tr>
<td>1КУР РБМК-1000</td>
<td>1000</td>
<td>I</td>
<td>1976</td>
<td>2006</td>
<td>15</td>
</tr>
<tr>
<td>2ЛЕН РБМК-1000</td>
<td>1000</td>
<td>I</td>
<td>1975</td>
<td>2005*</td>
<td>15</td>
</tr>
</tbody>
</table>

* - завершение запланированной модернизации 2ЛЕН в 2006 г.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Round Table 2

Issue 3 – Driving factors for nuclear industry strategies and choices

Mr. John Ritch III
Director General

World Nuclear Association
ACCELERATING THE NUCLEAR RENAISSANCE:
CRUCIAL ROLES
FOR GOVERNMENT AND INDUSTRY

Round Table Presentation
International Ministerial Conference
“Nuclear Power for the 21st Century”
Paris
21-22 March 2005

John Ritch
Director General
World Nuclear Association

Ten years ago, the phrase “nuclear renaissance” conveyed only a cautious hope within a narrow community of dedicated professionals. Today, the rebirth of nuclear energy has become an unmistakable reality that is gathering speed and momentum on the full world stage.

This revitalisation is a composite of several developments:
- Continuing evolutionary advance in reactor technology
- Multinational research efforts to produce quantum leaps in technology
- Unprecedented levels of efficiency and capacity utilisation in key countries
- A robust and accumulating record of operational safety, backed by the emergence of a global nuclear safety culture
- Political progress in implementing the scientifically sound concept of waste disposal using deep geological repositories
- And the truest barometer – expansive growth planning for nuclear power in major nations in both the developed and developing worlds.

In countries representing the preponderance of world economic activity and world population – from North America across much of Europe to Russia and on to the leading countries of South and East Asia – the value of nuclear power has been reviewed and reaffirmed. Major countries without nuclear power – such as Poland, Turkey, and Vietnam – stand on the threshold of introducing nuclear energy for the first time; and even Italy, the one nation ever to suspend nuclear generation, now plans to reconsider.

To be sure, anti-nuclear convictions can still be found:
- In the mythologies that motivate many environmental groups
- In the assumptions of environmental journalists and bureaucrats
- In the rhetoric of some small countries like Denmark and Austria that are not inhibited by the hypocrisy of importing nuclear electricity, and
- In the case of Germany, in the declaratory policy of a major country where a governing coalition is temporarily beholden to a small minority party.

But all of these reactionary forces, taken together, are receding under the onslaught of facts that are too strong to be forever distorted or denied. All around the world, old-school anti-nuclear environmentalism is being eclipsed by a new realism that recognises nuclear energy’s essential virtue: its capacity to deliver cleanly generated power safely, reliably, and on a massive scale.

The True Environmental Problem: Nuclear Growth is Too Slow

For the nuclear industry – from uranium miners to technology vendors to plant constructors – this expansive outlook offers a promising future. But for serious environmentalists, current projections can provide little comfort – not because nuclear energy is growing but because it is not yet growing fast enough to play its needed role in the clean-energy revolution our world so desperately needs.
The urgent imperative of a global clean-energy revolution is now evident to any literate person who is not in a state of psychological or political denial.

Today, fossil fuel combustion is pouring carbon dioxide into the atmosphere at the rate of 25 billion tonnes a year – or 800 tonnes a second – and this rate has not yet been slowed by either rhetoric or negotiation.

Our best climate experts tell us that we are now heading rapidly toward a point of irreversible, catastrophic climate change that could bring:

- Rising global sea levels eventually reaching 40 feet
- An end to the Gulf Steam and its benign warming effect on North America and Europe
- An accelerating loss of biodiversity throughout the world
- Widespread drought and extreme weather turbulence
- A global epidemic of pestilence and disease, and
- In consequence, a fundamental disruption of human civilisation.

These warnings come not from fear-mongers but from scientists, who have judged that our only hope of averting this calamity is to shrink worldwide greenhouse emissions by 50-60% over the next 50 years. And we must accomplish this amidst an enormous surge in human population and economic development that will triple world energy consumption.

If history is a river, we have reached the white water. We face a challenge unprecedented in human experience. Meeting it will require every ounce of political will and human ingenuity we can muster through the combined forces of industry and government.

Our starting point for action must be agreement on a basic premise that emerges from every authoritative analysis:

*Humankind cannot conceivably achieve a global clean-energy revolution without a huge expansion of nuclear power – to generate electricity, to produce hydrogen for tomorrow’s vehicles, and to desalinate seawater in response to the world’s rapidly emerging fresh-water crisis.*

We must ask two crucial questions:

- First, where do industry and government stand in meeting legitimate public concerns about nuclear energy?
- Second, what must now be done to accelerate the nuclear renaissance?

**Meeting Legitimate Public Concerns**

As to the “public concerns” so often cited in daily journalism, a fair assessment shows that not one poses a reasonable obstacle to a global expansion of nuclear power.

1) **Proliferation.** Nuclear proliferation, of course, remains a global concern, and much can be said about how best to deal with the few rogue nations that may seek atomic weapons by constructing facilities that can produce weapons-usable material. The industry stands ready to work with the IAEA and national governments in exploring ways to curtail this risk.

But the essential truths are these:

- The proliferation danger inheres in nuclear knowledge and the intent of governments
- The global non-proliferation and safeguards system – one of the greatest achievements in diplomatic history – effectively curtails any link between civil and military programmes, and actually helps to detect and deter illicit nuclear activity, and
- Most fundamentally, whatever proliferation risk we face would be unaffected even by a 20-fold increase in the global use of safeguarded nuclear reactors to produce clean energy.

2) **Operational Safety.** Second, the industry has met the challenge of operational safety through technological advance and a global nuclear safety culture that draws on some 12,000 reactor-years of practical experience.

If the NPT is a great feat in traditional diplomacy, the creation of WANO – with its network of safety cooperation encompassing every power reactor worldwide – represents an historic attainment in private-sector diplomacy.

The nuclear industry’s greatest responsibility is to maintain and build on its already impressive record of nuclear safety.
3) **Cost Reduction.** On the cost front, the industry’s steady reductions in both operational and capital costs are fast carrying us into a future in which nuclear power will emerge as a clear winner on the field of affordability.

These gains are occurring even without any consideration of environmental effects. Once governments begin to introduce serious emissions penalties – through emissions trading or carbon taxes – the balance will tilt even faster. Today nuclear power can easily dominate any market that imposes a real price for environmental damage.

4) **Waste Management.** As to waste, industry and government have the joint task of building public recognition that, contrary to common perception, waste is nuclear power’s greatest comparative asset – precisely because the volume is minimal and can be safely managed without harm to people or the environment.

For its part, the industry has amassed an impressive record that includes:

- Safe disposal of all low-level waste
- Safe interim storage of all other end products from nearly a half century of nuclear power plant operations
- Safe transport of radioactive waste, with more than 20,000 containers of high-level waste and used fuel having travelled safely over a total distance of 20 million miles without a single instance of a serious radioactive release.

Where major responsibility lies now is with governments. A strong scientific consensus favours deep geological repositories as a safe and affordable means of achieving long-term storage of nuclear waste and used nuclear fuel. It is the duty of governments – following the lead of Finland, Sweden, and the USA – to summon the political will to implement this crucial component of the nuclear fuel cycle.

**Accelerating the Nuclear Renaissance**

Meeting legitimate public concerns about nuclear energy is clearly necessary – but not nearly sufficient to drive a nuclear renaissance that must attain global dynamism if we are to achieve a clean-energy revolution.

In three distinct areas, governments must take decisive action to grow an industry that now stands – in terms of operational and technological maturity – fully primed for the major growth our environmental challenge so clearly demands.

1) **Construct a Comprehensive Global Regime.** The first necessity is to move beyond Kyoto to construct a truly comprehensive, long-term climate regime that yields strong political signals – and economic incentives – for a worldwide transformation to clean-energy technology.

To be both effective and politically feasible, any such treaty must include all major nations, developed and developing, and must embody some variation on the principle of “contraction and convergence”.

“Contraction” means that the agreement must produce, over a span of decades, a global reduction in greenhouse emissions on the order of 60%. “Convergence” means that the agreement must adopt the principle of equal per-capita emission rights.

The principle of equal emission rights is far from utopian:

- First, as a matter of political reality, it is the only feasible principle for a global agreement, and actually involves a concession from South to North by taking as “water under the bridge” the considerable environmental damage already done by the developed countries.
- Second, the gap between actual emissions and emissions rights provides the potential for a dynamic international trading mechanism that will promote universal efficiency in clean-energy investment while producing a large net flow of such investment from North to South.

From a Northern perspective, this economic assistance will be the most cost-effective in history if it helps to prevent the globally destructive growth in greenhouse emissions that might otherwise occur in the developing world.

For years, economists have developed models of “win-win” welfare maximisation among parties with very different characteristics. A global climate change regime must now apply this body of learning to produce collective action aimed at the most dangerous security challenge ever faced by humankind.

2) **Elevate Nuclear Investment to a National and International Policy Priority.** The second necessity is to shape national policies and international institutions to directly support nuclear investment.
Over the long-term, nuclear power is competitive. But two factors now weigh against nuclear investment: the short-term bias of deregulated energy markets and the fact that 21st century nuclear reactors have not been built in sufficient numbers to achieve economies of scale.

As a step toward energy independence and as an urgent environmental imperative, it is essential that national governments take the steps necessary to incentivize immediate nuclear investments. This pump-priming can be achieved by a temporary production subsidy, by absorbing some first-of-a-kind-engineering costs, or just by redistributing these costs from pioneers to those who follow.

Among the tools to be used are loan guarantees, accelerated depreciation, and production and investment tax credits. For the last decade, such tools have been widely used to subsidise politically correct renewables. It is now time to apply the same tools to a technology that can deliver clean energy on a massive scale.

The goal, it bears emphasis, is not to subsidise long-term nuclear operations but simply to accelerate the nuclear renaissance for reasons of national interest and the global environment.

A similar rationale applies, at the international level, among the global institutions we established a half-century ago to meet urgent developmental needs. Today it is a fundamental failing of the UN system that, at this crucial juncture, all of its major development institutions continue to embrace, or to be intimidated by, old-school anti-nuclear environmentalism. The IAEA stands isolated and alone in working to promote the peaceful uses of nuclear energy. While an unprecedented global crisis intensifies, others fiddle in a safe cocoon of political correctness.

Governments must now direct the World Bank and the UN Development and Environment Programmes to act in pursuit of a clean-energy vision in which nuclear power holds a central role.

3) Preparing the Nuclear Profession for a Nuclear Century. A third imperative on which governments must act is to apply the concept of nuclear investment to the human level – by actively stimulating and supporting enrolments in the study of nuclear science and technology. The nuclear profession must be readied for a nuclear century.

There is today an enormous disparity between the fact of the unfolding nuclear renaissance and the pace at which we are educating a new generation of nuclear scientists and engineers. In many nations, the decisions of students choosing career paths are not yet being informed by recognition of the value of nuclear energy and the inevitability of its sharply expanding use worldwide.

Eventually, market forces will rectify this disparity between the demand and supply for skilled nuclear personnel. But a failure to be pro-active in stimulating nuclear education will make the correction inefficient and thereby delay the nuclear renaissance.

To help point the way toward a globalising nuclear profession, the World Nuclear Association has worked with the IAEA, WANO, and the NEA to create the new World Nuclear University. The aims of this worldwide partnership of leading institutions of nuclear learning are:

- To enhance nuclear coursework at participating institutions worldwide
- To establish widely accepted global standards in academic and professional qualification, and
- To elevate the prestige of the nuclear profession.

To support this institutional cooperation, what is urgently needed is a major global infusion of scholarship funds for study in nuclear science and technology. Governments around the world should marshal their own resources – and summon the support of the great philanthropies – if we are to build the professional global cadre that can apply nuclear technology successfully to meet a desperate world need.

At a Perilous Point in History, a Technology and a Profession of Indispensable Value

Today technology is spurring a growth in world population and energy consumption that jeopardizes the very future of our biosphere. But the technological ingenuity that is propelling a world crisis can also be our salvation – if we use it wisely.

The global nuclear industry today is the repository of a technology that will be indispensable if humanity is to preserve the very environment that enabled civilisation to evolve. Governments must now emerge from postures of timidity and equivocation to act decisively in support of that industry.

Our world is in dire peril, and we have no time to lose.
International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Round Table 2

Issue 3 – Driving factors for nuclear industry strategies and choices

Mr. John Ritch III
Director General

World Nuclear Association
Accelerating the Nuclear Renaissance: Crucial Roles for Government and Industry

John Ritch
Director General
Nuclear Renaissance: A Global Reality

- Continuing evolutionary advance in reactor technology
- Multinational research to produce quantum leaps in technology
- Unprecedented levels of efficiency & capacity utilisation in key countries
- A robust and accumulating record of operational safety, backed by a global nuclear safety culture
- Political progress in implementing the scientifically sound concept of waste disposal using deep geological repositories
- The truest barometer: expansive growth plans for nuclear power in major nations in both the developed and developing worlds
A Fading Resistance to Reality

Anti-nuclear convictions can still be found:

- In the mythologies that motivate many environmental groups
- In the assumptions of environmental journalists and bureaucrats
- In the rhetoric of some small countries like Denmark and Austria that are not inhibited by the hypocrisy of importing nuclear electricity
- In the case of Germany, in the declaratory policy of a major country where a governing coalition is temporarily beholden to a small minority party
The New Realism

All around the world, old-school anti-nuclear environmentalism is being eclipsed by a widening recognition of nuclear energy’s essential virtue:

Its capacity to deliver cleanly generated power safely, reliably, and on a massive scale
The True Environmental Problem

Nuclear power is not yet growing fast enough to play its needed role in the clean-energy revolution our world so desperately needs.
Catastrophic Climate Change

- Rising global sea levels eventually reaching 40 feet
- An end to the Gulf Steam and its benign warming effect on North America and Europe
- An accelerating global loss of biodiversity
- Widespread drought and extreme weather turbulence
- Worldwide epidemics of pestilence and disease
- In consequence, a fundamental disruption of human civilisation
The Crucial Premise for Action

Humankind cannot conceivably achieve a global clean-energy revolution without a huge expansion of nuclear power -

• to generate electricity
• to produce hydrogen for tomorrow’s vehicles
• to desalinate seawater in response to the world’s rapidly emerging fresh-water crisis
The Two Essential Questions

1) Public Concerns: Where do industry and government stand in meeting legitimate public concerns about nuclear energy?

2) Acceleration: What must now be done to accelerate the nuclear renaissance?
Public Concern #1: Proliferation

• Joint Responsibility (Industry & Government)
  - Cooperate to develop a system that denies rationale for any spread of weapons-usable facilities

• Government
  - Continue to strengthen a global safeguards system that has de-linked military and civil programmes
  - Act against proliferators
Public Concern #2: Operational Safety

• Industry
  - ITS GREATEST RESPONSIBILITY:
    Continue to build the global nuclear safety culture and a robust record in safe reactor operation

• Government
  - Ensure that safety oversight supports, rather than impedes, excellence in industry efficiency and plant management
Public Concern #3: Cost

- **Industry**
  - Continue to lower operational and capital costs (emphasising simplified, standardised reactor designs)

- **Government**
  - A MAJOR RESPONSIBILITY: Impose serious cost on environmental and health effects of emissions via trading or taxes
Public Concern #4: Waste Management

• Joint Responsibility (Industry & Government)
  - Build public understanding that waste -- minimal and manageable -- is nuclear power’s greatest asset

• Industry
  - Continue safe disposal of LLW and safe interim storage of ILW, HLW, and used nuclear fuel
  - Continue record of safe transport of nuclear materials

• Government
  - A MAJOR RESPONSIBILITY: Implement deep geological repositories
The Global Imperative

Governments must take decisive action to accelerate the renaissance of a nuclear industry now primed for major global expansion to meet the clean-energy crisis.
Accelerating the Nuclear Renaissance

1) Construct a Comprehensive Global Regime
   - Must employ “contraction & convergence” concept

2) Elevate Nuclear Investment to a National and International Priority
   - Temporary pump-priming at the national level (via production subsidy, loan guarantees, FOAKE costs)
   - Focus UN development agencies on nuclear energy

3) Build the Nuclear Profession
World Nuclear University

A Global Partnership of institutions of nuclear learning

Founding Supporters: WNA, IAEA, NEA, WANO

WNU Mission:

• To enhance nuclear coursework
• To establish widely accepted professional and academic standards
• To enhance prestige of the nuclear profession
Accelerating the Nuclear Renaissance

1) Construct a Comprehensive Global Regime
   - Must employ “contraction & convergence” concept

2) Elevate Nuclear Investment to a National and International Priority
   - Temporary pump-priming at the national level (via production subsidy, loan guarantees, FOAKE costs)
   - Focus UN development agencies on nuclear energy

3) Build the Nuclear Profession
   - Massive scholarship support from governments and philanthropies
Meeting History’s Greatest Challenge

- Nuclear technology and the nuclear profession are mature and capable of massive expansion
- Governments must end timidity and take decisive action, nationally and internationally, to accelerate the nuclear renaissance
International Ministerial Conference: 
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Round Table 2

Issue 4 – Governance

Mr. Dominique Maillard
Director for Energy and Raw Materials

France
Énergie nucléaire et Gouvernance

M. Dominique MAILLARD
Directeur général de l’Énergie
et des Matières premières

Paris, 22 mars 2005
Quelle mission pour l’État ?

Les buts des politiques énergétiques :

1. l’approvisionnement sûr et suffisant ;
2. la compétitivité des prix de l’énergie ;
3. le développement durable : le « triptyque » environnement - social - économie.

Les 4 spécificités de l’ énergie nucléaire
I - Garantir les intérêts économiques de long terme.

Le nucléaire est compétitif mais comporte une structure de coûts spécifique.

I - Garantir les intérêts économiques de long terme.

1°) Préserver l'investissement pour répondre à la demande :

I - Garantir les intérêts économiques de long terme.

2°) Surveiller la constitution de réserves pour faire face aux charges de long terme:
   - Démantèlement des installations ;
   - Gestion des déchets.

3°) Assurer la recherche et le développement.
   *Importance de la coopération internationale.*
II - Gérer le risque nucléaire.

4 Sûreté des installations.
4 Radioprotection : population et environnement.
4 Sécurité physique.
4 Responsabilité civile des exploitants.

È Assurer réglementation et inspections.
È Indépendance des autorités de sûreté.
È Promouvoir une « culture de sûreté ».
III - Garantir l’utilisation pacifique.

Une condition de la coopération internationale pour les technologies nucléaires.
IV - Permettre des choix démocratiques éclairés.

4 La compétence technique n’est pas toujours un gage de la qualité du dialogue démocratique.
IV - Permettre des choix démocratiques éclairés.

É Mettre en place des outils et des procédures spécifiques pour :

1 l’information du public et

3 l’appréciation par les pouvoirs publics.
IV - Permettre des choix démocratiques éclairés.

4 Mais le débat citoyen et les efforts de transparence permettent une meilleure information.


Source: Observatoire de l’énergie, Baromètre d’opinion sur l’énergie (OE-CREDOC)
IV - Permettre des choix démocratiques éclairés.

4 Les déchets :

Un enjeu démocratique important pour l’avenir de l’énergie nucléaire.

- Mettre en place une démarche rationnelle et transparente de résolution des problèmes.
- Déterminer les étapes et les jalons du processus de dialogue avec la société civile.
Conclusions

4 Une double mission pour les États :

• Garantir ce que le marché ne peut garantir seul ;
• Préserver et concilier les mécanismes de la compétitivité et du développement durable.

4 Compétitivité des marchés et responsabilités énergétiques, environnementales et sociales doivent aller de pair.

International Ministerial Conference:
“Nuclear Power for the 21st Century”
Paris

21 - 22 March 2005

Round Table 2

Issue 4 – Governance

Mr. Dominique Maillard
Director for Energy and Raw Materials

France
“Nuclear Power for the 21st Century”

Nuclear Power & Governance

Mr. Dominique MAILLARD
Director General for Energy and Raw Materials

Paris, 22 March 2005
What is the role of the Governments?

Aims of Energy Policies:

1. Secure and adequate supply;
2. Competitiveness of energy prices;

Four specific requirements for a nuclear power policy
1 - Ensuring long term economic interests.

Nuclear power is competitive, but has a particular cost structure.

I - Ensuring long term economic interests.

1°) Protecting investment in order to address needs:

I - Ensuring long term economic interests

2°) Watching over financial reserves in order to face long term liabilities:

- Dismantling of the installations;
- Management of nuclear waste.

3°) Ensuring research and development.

Importance of international cooperation.
II - Nuclear risk management.

4 Safety of the installations.

4 Radioprotection: population and environment.

4 Security and protection.

4 Liability of operators in case of nuclear damage.

- Ensure legal framework and safety inspections.

- Independence of Safety Regulators.

- Promoting a “safety culture”.
III - Guaranteeing the use for pacific purposes.

A condition for international cooperation in the field of nuclear technologies.
IV - Allowing enlightened and democratic choices.

4 Technical knowledge is not always a guarantee for high quality democratic dialogue.
IV - Allowing enlightened and democratic choices.

- Putting in place specific tools and procedures for:
  1. Public information & education,
  2. Assessment by governments.
IV - Allowing enlightened and democratic choices.

4 But democratic debate and transparency provide for better public awareness.

“Does the choice of nuclear power to produce three quarters of electricity in France create advantages or disadvantages? (in %, January 2005)

Source: Observatoire de l'énergie, Baromètre d'opinion sur l'énergie (OE-CREDOC)
IV - Allowing enlightened and democratic choices.

4 Nuclear waste:

An important democratic issue for the future of nuclear power.

- Setting up a rational and transparent approach to solve the issues.
- Setting up the different stages of the process of the dialogue with civil society.
Conclusions

4 Dual role for governments:
   • Guaranteeing what the market alone cannot guarantee;
   • Protecting and reconciling competitiveness and sustainable development mechanisms.

4 Competitiveness of the markets and responsibilities in energy, environment and social welfare must go hand in hand.

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Round Table 2

Issue 4 – Governance

Mr. Dominique C.O. Barroso
Former Chairman
CNEN

Governor IAEA

Brazil
Governance of the Nuclear Industry – Personal Comments and Some Aspects of the Brazilian Case

Antonio C. O. Barroso IPEN – CNEN/SP

The main issue for the nuclear industry

Nuclear Industry is very specific with respect to its quality, safety and safeguards requirements and also very broad concerning the number of knowledge fields and industrial specialties involved. The nuclear cycle from mine to final waste repository is perhaps the dorsal spine of this industry long range viability, but even among the more important players (encouragers and believers) there is no consensus on what the best solution is.

The inherent political sensibility of the nuclear issues brings very strong constrains and drivers, that escape a sensible technical assessment, making a widely accept “solution vision” very difficult to achieve. It is my understanding that the solution space for this problem is at the global or at least at the multi-regional level in a self coordinating fashion. Even large countries alone cannot achieve an optimal solution, because an integrated global solution can have large comparative advantages in terms of scale, land characteristics, political maturity and so on.

In short the governance problem of the nuclear industry has to do with steering the multiple players, in the global decision processing, to pursue the endeavour of a achieving a shared vision on the above mentioned problem.

The concepts that we are dealing with

There are many good and elegant definitions of governance and some widely accepted core meanings. Since I am about to make some candid comments, it is interesting to trek along a minimum set of definitions just to bring the mind frame and illustrate the complexity of the problems.

**Governance** is as a social function focused on handling the interdependencies between and within human societies, and between human activities and natural systems. It includes the functions of government to regulate society and promote sustainable development. It includes the market as a means of coordinating the production and distribution of goods and services. And it extends to a range of other functions, including those performed by business, churches, educational institutions, and other participants in civil society at all levels, from local to global.

**Governance** is the art of steering societies and organizations as a result of the interactions among structures, processes and traditions that determine how power and responsibilities are exercised, how decisions are taken, and how citizens or other stakeholders have their say. Fundamentally, it is about power, relationships and accountability: who has influence, who decides, and how decision-makers are
held accountable. The concept may be usefully applied in different contexts – global, national, institutional and community.

Drawing from the wisdom of many authors, I might summarize by saying that Governance is about taking decisions about direction and that it has to do with power relationships and accountability. From another point of view, Governance is the art of steering societies and organizations, through the interactions of their structures to fulfill some purposes.

Getting to the point

Nuclear Industry governance has to be discussed at the global level for at least three good reasons:
- Accidents consequences can extrapolate the borders of the Country where the installation are;
- Proliferation and nuclear weapons reduction are, since long ago, international issues; and
- Nuclear power cannot achieve its full potential without international cooperation and cycle integration.

This is the domain of our “solution space”: a world with no government at the global level, with an increasingly complex and ever changing society in which states remain important actors, but where the actions of non-state actors and even global civil society movements have emerged as major forces. Therefore steering these forces, and coordinating the actions of multiple actors, is thus a considerable challenge for any global organization, even for those of the UNO system, that to some extent have legitimacy to hold forums and steer discussions among the representatives of the major players.

It is important to notice that governance of the nuclear industry is inherently participatory since the situation is such that the most desired outcomes cannot be achieved by one organization or Country operating alone and also the decision making-process and/or outcomes have to be partially shared with others.

Purposes of nuclear industry governance

Inspired by the pillars of the IAEA, one might state that the main purpose is: “nuclear power for sustainable development under the guidance and constrains of safety and non proliferation”. It would not be very difficult to get a consensus on this statement, but an exponential degree of difficulty appears as soon as one try to go down on the steps of detailing what is meant by and what are the practical implications of this statement.

Let me address the issue from the viewpoint of its outcomes, and then I think the question is: “What would be the best international collaborative scenario configuration to make an undisputable case for nuclear power in the 21st century”.
My wishful vision

It is my thinking that with the proper international collaboration, agreements and conventions a globally optimized multi tier cycle could be feasible and it would enable a solution with the following attributes: (a) optimal match between economy and resource conservation performance; (b) optimal sensible material flow logistics; (c) increased market size; and (d) significant improved safety and non proliferation characteristics.

In general lines, the “ultimate” solution for the 21st century should address and include a lot of facts and considerations, some of which I try to mention below:

- The optimization of integrated multi tier cycles should consider, among other things, current inventories of spent fuel, legacy reactors, possible incoming Pu from reductions in military stocks.

- Recycling should be designed to extract “clean waste” (just fission products) and produce “dirt fuel” (actinides and remaining fissile material. Addition of enriched U or Pu would be used to tune the fuel for the reactor and core concepts that it is going to be fed in.

- Imbedded in the design requirements of next generation reactors and core upgrades for the existing ones, there should be three basic objectives: resource conservation, cost effectiveness and actinide inventory reduction.

- At the back end of the cycle, ADS or other actinide burner concepts would be operating, near the final repositories, with the dual purpose of waste depuration and cogeneration of electricity.

- As for recycling facilities, just a few regional (or global) ones should exist and operated under full international supervision, in a cost share fashion and with due royalties to the host Country. Integrated logistic between recycling facilities and repositories is also a desirable characteristic.

Under these premises, fuel supply and spent fuel return can really become a good and profitable service. Also considering that many new reactor concepts have extended reload periods (over 36 months) and lower frequency of programmed maintenance outs, these two factors together would broaden the nuclear power market to reach many small grid and low infrastructure Countries.

Additionally, new concepts are already showing sensible gains in safety, economy, capital intensiveness and staffing requirements and all of these are characteristics that add to the above arguments.

Combining the evolution of new reactor designs, core upgrades and redesigns guided by the goal of globally optimized multi tier cycles one can expect amazing gains in the nuclear power industry competitiveness, cost security, market size, transparency, accountability and public acceptance.

Is this vision a far out dream? I certainly do not know and doubt someone can assure an answer to this question, but that is why we are here to discuss. At the end, those who believe that nuclear power has an important role to play in the 21st century and have the charisma of being “opinion makers” should use the voice and the pen (key board) to construct an inspiring vision.
Generation IV, INPRO and initiatives alike are generating good seeds and making good progress towards a better future through cooperation among institutions of different Countries. Conferences like this one helps to stimulate thinkers, opinion makers and decision makers to discuss the issue. Drawing from Richard Dawkins in the “Selfish Gene”, I hope we are coining powerful “memes” that will proliferate in people’s minds and evolve as winners amidst the tough competition.

**Short comments on Brazil**

As it is known, nuclear industry in Brazil is still government owned and under state monopoly. On the other hand, electricity production, distribution and commercialization is not under the same conditions and in fact this is a sector that has gone through an increasing deregulation in the last ten years.

The two existing nuclear power plants are owned and operated by Eletronuclear, a government utility, which has only those two plants. The business operation of this utility cannot be competitive under such conditions. Also for the fuel manufacturing industry, INB, the size of the market is just too small to enable a self-sustained operation. But those are legacy industries conceived and built many years ago, when Brazil had a very ambitious nuclear power program.

Since the last seven years those in favor of keeping alive the nuclear option are trying to get a positive decision on the resumption of Angra III construction. This is a keystone step to bring a kind of equilibrium to the Brazilian nuclear industry.

The good news is that during the last 12 months, a nuclear program has been elaborated and followed through the many instances of government and is now ready to the final decision concerning its approval. This program considers many scenarios, but in all of them the go ahead with Angra III construction is recommended. Another good point is that after Angra III the tendency to consider more advanced reactor concepts is suggested.
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Round Table 2

Issue 4 – Governance

Mr. Dominique C.O. Barroso
Former Chairman
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Governor IAEA

Brazil
International Ministerial Conference
“Nuclear Power for the 21st century”

Round Table Discussion on the
“Governance of Nuclear Industry”

Governance of the Nuclear Industry – Personal Comments and Some Brazilian Aspects

Antonio Carlos de Oliveira Barroso
IPEN – CNEN/SP

Paris, France
March, 2005
Governance

Many good definitions, e.g.

A social function focused on handling the interdependencies between and within human societies, and between human activities and natural systems.

It is about power, relationships and accountability - who has influence, who decides, and how decision-makers are held accountable.

Many actors, many influences and many interactions.

Some say it is the art of steering societies and organizations, through the interactions of their structures to fulfill some purposes.
Getting to the point

Nuclear Industry Governance has to be discussed at the global level:

- Accident consequences can extrapolate borders;
- Proliferation and nuclear weapons reductions are international issues;
- Nuclear power cannot achieve its full potential without international cooperation and cycle integration.

Steering different interests and coordinating the action multiple actors makes global level governance an enormous challenge, due the absence of a strictly formal government – The role of the IAEA and of the conventions are paramount;

Governance of the Nuclear Industry should be by nature a participatory governance because the most desired outcomes cannot be achieved by the body or organisations of a Country operating alone but where the decision making-process and/or outcomes are shared with others;

Purposes of Nuclear Industry Governance?

- Nuclear Power for “Sustainable” Development under the constrains and guidance of Safety and Non Proliferation
What should be achieved?

What would be the best collaborative international scenario configuration to make an undisputable case for nuclear power in the 21st century?
My particular vision

Energy

“Future”:
Globally Optimized Multi Tier Cycles

Today:
once through

Repository

Fuel fabrication

INPRO or Generation 3 \(\downarrow\) 3.5 \(\downarrow\) 3.75 \(\downarrow\) 4 \(\downarrow\) 4.5
“Dirtier Fuel & Cleaner Waste”

ADS

Waste depuration & cogeneration

Fresh U &/or Pu

Recycling

A Few Regional Repositories

ipen

Comissão Nacional de Energia Nuclear
Desired outcomes

- Waste/Energy, Proliferation risk
- Transparency, Accountability, Competitiveness, Public acceptation, Cost security, Market size

Graph showing the transition from today to 2100, with Waste/Energy and Proliferation risk decreasing and the desired outcomes increasing.
Good signs

• Generation IV International Forum and its offspring of cooperations;
• INPRO;
• The proliferation of Conferences, Congresses and forums to discuss related issues;
• All of you who believe ...
What about Brazil?

- We could be a turning point;

- The issuing of a nuclear program document is expected in the near future;

- There is a consensus among the nuclear people that Angra III is the key stone first step;

- I am mildly optimistic
International Ministerial Conference:
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Round Table 2

Issue 4 – Governance

Mr. Poong Eil Juhn
Former Director NENP

Visiting Research Fellow KAERI

Republic of Korea
Challenges for the 21st Century &
the Role of Nuclear Energy

Paris, 21-22 March 2005

P.E. Juhn, Ph.D.
Visiting Research Fellow
Korea Atomic Energy Research Institute
Contents

• Challenges for the 21st Century Energy Supplies
• Outlook of Energy Sector in Korea
• Nuclear Technology Development in Korea
• Concluding Remarks
Challenges for the 21st Century Energy Supplies

- Growing demand for energy services
- Limited fossil reserves for energy supply
- Disparity to access the modern energy services
- Minimizing impacts on climate change
Growing demand for energy services

• By 2050, global energy demand would grow by a factor of 2 while electricity demand by a factor of 3 to 4.
• The rapid increases in demand attribute to world population increases and seeking improvement of their living standard.
• Most of new demand will take place in the developing countries.
Limited fossil reserves for energy supply

• If present consumption level is maintained, major fossil fuel reserves will be exhausted within this century.
  - Oil and natural gas will be exhausted in 41 years and 67 years, respectively.

Source: BP statistical Review of World Energy, June 2004
Disparity to access the modern energy services

• 1.6 billion people have no access to electricity
  - 80% in South Asia and sub-Saharan Africa

Source: IEA, 2002
Minimizing impacts on Climate Change

- CO₂, a major greenhouse gas is mostly emitted from fossil fuel burning. Nuclear energy produces almost no greenhouse gases.
- CO₂ levels were varied by less than 10% during past 10,000 years before industrialization. During 200 years since 1800, however, levels have risen by over 30%.
- Without specific measures, CO₂ concentration is expected to rise from current about 370 ppm to 490-1260 ppm by the year 2100.

![Graph showing g Ceq/kWh for different energy sources with ranges corresponding to differences in generation technology.](Source: IAEA, Vienna)
• Without drastic improvements in energy efficiency and technological shift to less GHG emitting technologies such as nuclear energy, the global temperature will rise by about 1.4-5.8 degrees in centigrade by the year 2100.
• Kyoto protocol has been in effect as of 16 February, 2005 with ratification of 141 countries.

<Greenland Ice Sheet Melt Extent in Summer time>
Outlook for Energy Sector in Korea

• Rapid growth in energy and electricity demand
• Growth of CO$_2$ emission
• Role of nuclear power
• Primary energy consumption in Korea will increase by 2.4%/year until 2020.
• Per capita consumption will increase to 6.4 toe by 2020.
• CO\textsubscript{2} emission from energy sector in Korea is expected to increase to 208 million ton-C in 2020 from 120 m ton-C in 2000 (growth rate: 2.3%/year).
• Electricity sector is emerging as the biggest contributor to CO\textsubscript{2} emission
- Nuclear power has played an important role during the last 2 decades.
- 19 nuclear power plants are in operation, which accounts for more than 40% of electricity supply and about 17% of total energy demand.
Nuclear Technology Development in Korea

- Nuclear R&D program
- Advanced reactor and proliferation - resistance fuel cycle development
- Sea water desalination
- Hydrogen production using nuclear energy
- International R&D collaboration
KAERI plays a major role in implementing nuclear R&D program

**History**
- National Mid- and Long-Term Nuclear R&D Program
  - Started in 1992

**Budget**
- Government-sponsored budget
- Nuclear R&D fund (Atomic Law)
- Private investment

**Goals**
- Quality of Life
- Technology
- Self-reliance
- Technological capability
### Advanced reactor and proliferation-resistance fuel cycle development

<table>
<thead>
<tr>
<th>1990s</th>
<th>2000s</th>
<th>2010s</th>
<th>2020s</th>
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<tbody>
<tr>
<td>KSNP (Korean Standard Nuclear Power plant)</td>
<td>APR-1400 (Advanced Power Reactor-1400)</td>
<td>SMART (System-integrated Modular Advanced Reactor)</td>
<td>Prototype ADS (HYPER)</td>
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<tr>
<td>SMART</td>
<td>PWR (SMART)</td>
<td>Prototype LMR (KALIMER)</td>
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<td>PWR (APR-1400)</td>
<td>Metal Fuel</td>
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<td>DUPIC</td>
<td>Spent Fuel</td>
<td>(U, TRU, Impurity FP)</td>
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<td>OREOX</td>
<td>Disposal of Radwaste</td>
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<tr>
<td>Dry Process</td>
<td></td>
<td></td>
<td>(TRU, Impurity FP, I, Tc)</td>
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</table>

**Commercial Reactor**

**Future-type Reactors**

**Proliferation-resistant Fuel Cycle**
About 15% of world population is lacking fresh water. Having fresh water is also growing concern in Korea.

Basic design of 330 MWth SMART integral PWR reactor for nuclear desalination reactor has been completed.

In parallel, a one-fifth scale pilot plant, 65 MWth SMART-P is being planned to be constructed very soon.
• Korea started long-term nuclear hydrogen development plan in 2004, aiming to produce hydrogen from VHTR to supply around 10% of domestic energy needs by 2025.
International R&D collaboration

**GEN IV Nuclear System**

- A chartered member
- Participate in Technology Roadmap and R&D Planning

**IAEA INPRO**

- A regular member state
- A leading role in proliferation-resistance and physical protection
- Evaluation methodology of DUPIC

International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO)
Concluding Remarks

• Substantial amount of energy will be needed in the 21st century, in particular in developing countries.

• Simple expansion of today’s existing energy options in the 21st century is not feasible, due to:
  - Limitation of the resources; and
  - Climate change

• Nuclear power, which currently supplies about 16% of world electricity generation, needs to play more crucial role for the production of electricity and sea water desalination in the future.

• Hydrogen production using nuclear energy will be one of the most important tasks for sustainable development in the 21st century.
International Ministerial Conference:
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21 - 22 March 2005

Round Table 2

Issue 4 – Governance

Mr. Jozef Ronaky
Director General
Hungarian Atomic Energy Authority

Member of the INSAG, IAEA
Role of the international co-operation in regulatory efficiency in a small nuclear country

Contribution to the panel discussion Issue 4 at the International Ministerial Conference “Nuclear Power for the 21st Century” Paris, France 21-22 March 2005

Jozsef Ronaky, Hungarian Atomic Energy Authority

Globalisation is one of the main characteristics of the 21st century. It is a challenge and a driving force for world economy and – within that – nuclear energy. Responsibility – on the other hand – lies on the national governments. This somewhat controversial situation is especially true for small countries with high share of nuclear production. Regulatory bodies in this countries are also small and cannot fulfil their task properly if do not utilise the advantages of international co-operation. This co-operation was very efficient in the last decades on several area:

• Internationally accepted technical documents in nuclear safety have been worked out such as fundamental safety principles and IAEA Safety Standards, technical requirements issued by international and national standardisation organisations, operator associations etc.
• International conventions on safety, emergency preparedness and security
• World-wide and regional, governmental and private organisations and, in the recent years, networks

A framework of this international co-operation and national safety infrastructures has been formed which is called Global Safety Regime by an INSAG document under preparation.
On the regulatory area this co-operation is extremely important and efficient. IAEA and OECD NEA play a leading role, but regional organisations, like Western European Nuclear Regulators Association are equally important.

Standardisation of power plant design, harmonisation of nuclear safety requirements, sharing best international practices, and operational experiences help national nuclear regulators to fulfil their task in regulation, licensing and inspection of nuclear installations.

It is worthwhile to mention as an example the WENRA effort to harmonise nuclear and waste safety levels in Europe, based on the existing IAEA Safety Standards. This harmonisation will result in commonly agreed reference levels by 2010, and offers serious advantages:

- Legally binding national regulations can be more easily revised.
- Evaluation and technical review of new reactor design can be simpler and more efficient for a national regulator in a small country, if the design has already been approved by another regulator against harmonised requirements.
- It can give sound technical basis for agreeing legally binding European nuclear safety legislation.

International peer reviews are another good practice and useful tool for a small regulatory body. I would mention an example in this area. After the fuel cleaning incident at the Paks NPP in 2003, IAEA sent an international review mission to Hungary to help Hungarian government to find the root causes of the incident and to explore organisational deficiencies in the operating organisation and in the regulatory process.
The team was sent in an extremely short term, and made an excellent job giving a large set of recommendations to improve operational, regulatory and even governmental practices. The follow-up review, which has been finished recently, gave evidence, that both the regulator and the operator successfully resolved the findings of the review, or significant improvement has been achieved.

The last example I would mention here is the informal co-operation of the regulators of four Central European countries: Czech Republic, Hungary, Slovakia and Slovenia. Former bilateral co-operation agreements were developed to an efficient regional co-operation forum for the four neighbouring and new European member countries. Development and strengthening of the already existing global safety regime is an important task and a necessary condition for the successful progress of nuclear energy in the 21st century.
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Round Table 2

Issue 4 – Governance

Mr. Alejo Vidal-Quadras Roca
Vice President

European Parliament
Why does the EU need a legislative framework on nuclear safety and waste management?
Why does the EU need a legislative framework on nuclear safety and waste management?

NUCLEAR ENERGY PRODUCTION (1)

**World’s situation** (situation as of end January 2005 – source IAEA)

- 441 reactor units
- 367,253 MW

Nuclear new build projects in India, Russia, Japan, China, Ukraine, Argentina and Iran

World energy consumption is projected to increase by 70% between 2000 and 2030

World energy mix by 2030 in terms of demand:
  - Almost 90% Fossil fuels: 34% oil, 28% coal and 25% natural gas
  - 5% Nuclear energy
  - 8% Renewables
Why does the EU need a legislative framework on nuclear safety and waste management?

NUCLEAR ENERGY PRODUCTION (2)

Europe’s situation (situation as of end January 2005 — source IAEA and WNA)
- 160 reactor units
- 134.799 MW

- Nuclear new build projects (under construction, planned or proposed) in Finland (1), France (1), Slovakia (2), Czech Republic (2) and accession countries Bulgaria (1) and Romania (4)

- Some EU countries, which mainly rely on nuclear for their electricity production (Lithuania: almost 80%), will face problems in terms of security of energy supply at closure of their nuclear power plants
Why does the EU need a legislative framework on nuclear safety and waste management?

NUCLEAR ENERGY PRODUCTION (3)

- EU-25 energy demand will rise by 19% between 2000 and 2030
- EU-25 energy mix by 2030 in terms of demand:
  - 82% Fossil fuels: 35% oil, 32% natural gas and 15% coal
  - 9.5% Nuclear
  - 8.5% Renewables
- EU-25 overall energy import dependency increases to almost 70% in 2030
- EU-25 CO₂ will exceed the 1990 level by 14% in 2030 due to the following factors:
  - Nuclear phase-out in several Member States
  - Insufficient growth of renewables to compensate for the loss of nuclear output
  - Increase of the use of fossil fuels to replace nuclear

(Source: OECD)
Why does the EU need a legislative framework on nuclear safety and waste management?

- Taking into account the above, serious concerns exist about:
  - Security of energy supply
  - Investment in energy infrastructure
  - Environmental impact of energy
  - Sustainable development

- Europe, and the world, is faced with the following:
  - Increased dependency on imports of fossil fuels due to a growing energy demand/need
  - Less production of primary energy
  - Increasing CO$_2$ emissions that contribute to the greenhouse effect
  - Missing out on opportunities for energy savings
Why does the EU need a legislative framework on nuclear safety and waste management?

RADIOACTIVE WASTE MANAGEMENT (1)

- Types of radioactive waste:
  - Low level waste (LLW): it comprises some 90% of the volume but only 1% of the radioactivity of all radioactive waste (short-lived).
  - Intermediate level waste (ILW): it makes up some 7% of the volume and has 4% of the radioactivity of all radioactive waste.
  - High level waste (HLW): arise from the use of uranium fuel in a nuclear reactor and accounts for over 95% of the total radioactivity produced in the process of electricity generation but involves a comparatively small amount of waste.
Why does the EU need a legislative framework on nuclear safety and waste management?

RADIOACTIVE WASTE MANAGEMENT (2)

- Quantities

- The European Union produces less than 50,000 cubic metres of radioactive waste per year, of which less than 1% is high-level waste (300-500 m3).
- To put the above mentioned figures in perspective it is worth mentioning that operating a 1,000-megawatt NPP for a year leads to about:
  - 60-80 m3 of LLW
  - 50 m3 of ILW (a typical garden swimming pool might have a volume of 100 m3)
  - 12-15 m3 (25-30 tonnes) of spent fuel.
- If the spent fuel is reprocessed, the amount of waste requiring final disposal would be reduced by a factor of four or five (i.e. 3 m3 of vitrified high-level waste).
Why does the EU need a legislative framework on nuclear safety and waste management?

RADIOACTIVE WASTE MANAGEMENT (3)

- Around 2 million tonnes of radioactive waste of all types are safely stored/disposed of across the EU at closely regulated and monitored sites:
  - In near-surface repositories for short-lived LLW and ILW (El Cabril, Spain)
  - At surface engineered facilities for LLW and short-lived ILW (in La Manche, France)
  - In deep repositories (50 meters deep) for LLW and ILW from reactor operations (Forsmark, Sweden), etc.

- Or will be disposed:
  - In deep geological repositories for spent nuclear fuel (Olkiluoto, Finland)
Why does the EU need a legislative framework on nuclear safety and waste management?

NUCLEAR PACKAGE BACKGROUND

- 2 proposals for Council directives on:
  - Safety of nuclear installations
  - Spent nuclear fuel and radioactive waste management

- Presented by the EC on 30 January 2003, using the EURATOM treaty as legal basis

- The proposals were the subject of two positive reports by the European Parliament who voted largely in favour of them

- Blocking minority in the Council has lead to a deadlock situation

- The EC has presented amended proposals on September 2004

- Major change in the proposals: the Decommissioning financing issue has been detached from the package and will be dealt with separately.
NUCLEAR PACKAGE PRESENT SITUATION

On-going work in the Council’s Atomic Questions Group, that proposed the creation of an additional Working Party devoted to the Nuclear safety (WPNS) where the proposals for directives are being discussed.

Concrete results not expected in the near future, however,

Discussions at a political level on waste management, safety and decommissioning financing are in progress within the European Parliament

New reports issued by the EP on the amended proposals are to be foreseen, and the organization of a public hearing on both subjects, later in 2005, is to be envisaged.
Why does the EU need a legislative framework on nuclear safety and waste management?

OBJECTIVES OF THE PROPOSALS

- Incorporate into Community legislation the basic principles and regulations concerning the safety of nuclear installations and radioactive waste:
  - without interfering with the competences of Member States, and
  - without interfering with the already existing cooperation instruments (i.e. IAEA)
- Complement the work done by the nuclear regulators (WENRA)
- Request Member States to establish programmes for radioactive waste management
- Request Member States to present reports on nuclear safety and on their established waste management programmes to peer reviews
Why does the EU need a legislative framework on nuclear safety and waste management?

OBJECTIVES OF THE PROPOSALS

The adoption of the proposals for Directives on safety and radioactive waste management would:

- Continue to encourage the use of good practices in the nuclear sector
- Bring a greater degree of transparency to the nuclear sector contributing to build up public confidence
- Ensure the equivalent level of safety for all Member States across the enlarged community
- Establish the basis for an objective non-emotional public debate on the future of nuclear energy
Your Excellencies, Ladies and Gentlemen

I would like to begin by thanking you for having taken the time to come to Paris for this Conference, which France has taken pleasure in hosting. I am very glad to see the interest aroused by this opportunity for encounter and reflection, as witnessed by the number and high level of participants, of course, but also by the quality of the exchanges on these two days. I am happy that so many personalities from all over the world are present today, demonstrating the importance attached to the energy challenges of the 21st century.

I would like in the first place to thank the International Atomic Energy Agency, since it was on its initiative, and on that of its Director General, Mr. Mohamed ELBARADEI, that this Conference on “Nuclear Power for the 21st Century” was organized. France is a major nuclear country, the second after the United States, and, in the wake of a broad national debate on energy which took place during 2003, we wished to share our concerns and the fruit of our labours with those countries which, like us, want to provide their people with sufficient quantities of economically accessible energy while conserving the environment.

I should like to highlight the excellent work done to prepare this Conference, by the International Atomic Energy Agency (IAEA) and the Organisation for Economic Co-operation and Development (OECD) and its Nuclear Energy Agency (NEA), in cooperation with the various French administrations involved.

I wish to pay tribute to Mr. Luis ECHAVARRI, Director-General of the NEA, and Mr. Roberto CIRIMELLO, Senior Adviser to the Argentine National Atomic Energy Commission and Chairman of the IAEA Standing Advisory Group on Nuclear Energy, for the quality of the discussions we engaged in during the round tables they presided over. Thanks to them, and thanks also to Mr. Claude MANDIL, Executive Director of the International Energy Agency, Mr. John STONE of the Intergovernmental Panel on Climate Change, Professor Shunsuke KONDO, Chairman of the Atomic Energy Commission of Japan, who also chairs the Science Council of Japan, and finally to
Mr. Dominique MAILLARD, Director General for Energy and Raw Materials in the French administration, and Ms. Sophie GALEY-LERUSTE.

I shall not mention the names of all the participants in the round tables and plenary sessions, but I sincerely thank every one of them for having agreed to share their experience and their thoughts with us and for their availability.

** * * * **

The preparation of the programme that resulted from this work made it possible to strike a balance between the various problem areas connected with energy policies:

- first, finding a sustainable balance between energy supply and demand in the context of fossil energy sources that will eventually become increasingly scarce;
- second, and equally important, conserving our environment;
- third, analysing the potential contribution of nuclear power in this context;
- and finally, looking at governance issues, which are crucial in the sphere of energy, given the strategic and social importance of access to energy, and even more so in the nuclear sphere in view of the specific features of this resource.

After two days of discussions and presentations, we have thus arrived at the end of this event.

Before coming to the conclusions, I would like to make a preliminary remark: this is the first time in quite a while that such a large number of countries — 74 — and international organizations — 10 — have reflected together on the role that nuclear power could or should play in their national energy policy.

This is in itself a clear signal of the renewed interest the world is taking in this energy source. The participation in this Conference of a large number of ministers who spoke officially on behalf of their countries illustrates this.

It was important to bring together the various actors in energy policy, whether they be political decision-makers, energy experts, industrial operators or citizens’ representatives. The organizers, through their joint efforts, have succeeded in this task.

** * * * **

Many different views were expressed, leading to thorough discussions during the Conference. A considerable convergence of views was noted among the participants.

In the first place, I would like to recall an important principle which this Conference has not sought to call into question: Every State is free to define its own energy policy provided it complies with its international commitments.

Next I shall state two priority objectives:

- **First:** Access to energy in sufficient quantity, as this is essential for human development;
- **Second:** Conservation of the environment, and in that context, countering the greenhouse effect; every effort must be made to reduce our production of greenhouse gases, especially CO$_2$.

In this regard, we cannot ignore the wish, expressed broadly and clearly here, that nuclear power, just like hydroelectric power, should be taken into consideration in international mechanisms to reduce greenhouse gas emissions, and that nuclear and hydroelectric power should no longer be
subject to an exclusion in this regard for which there is no justification. For, as everyone has noted, this issue of climate change is urgent, and solutions need to be found which will meet the considerable energy needs anticipated for this century.

One also cannot ignore the appeal, from the developing countries in particular, that the institutions devoted to development should take into account, in their aid programmes, the potential of nuclear power for the competitiveness of economies and the fight against climate change. This is especially true of the various institutions of the United Nations and the World Bank, which are called upon to cooperate better with the IAEA.

Thus, without wishing to present nuclear power as the only response to all the century’s challenges, the Conference recognized that it could contribute effectively to achieving these objectives by supplying electricity at a competitive and stable price without emitting CO$_2$. The utilization of this form of energy is likely to increase the security of supply in a large number of countries. In addition, it can contribute effectively to the production of potable water and hydrogen.

Nevertheless, the use of this energy source must meet special requirements:

1. First requirement: it is clear that international cooperation for the development of nuclear power cannot go ahead unless States comply strictly with their international non-proliferation undertakings and obligations and respect the actual objectives of non-proliferation.

   We must all pay particular attention to ensuring that the most sensitive nuclear material, equipment and technology, that which can be used in nuclear weapons, is not diverted from peaceful uses. This must remain a priority for the international community.

2. Second requirement: the establishment of national mechanisms is an essential condition for ensuring a high level of safety and security of nuclear material and installations, and also for ensuring safe and permanent management of spent fuel and radioactive waste, in conformity with the principles of prudence and sustainable development. To this end, it seems essential that States should coordinate their efforts and share their experience.

   In this regard, it has become clear that industry plays a vital role in maintaining a “safety culture” which must remain central to enterprises’ activities in the nuclear sector.

3. Last requirement: we need to prepare nuclear power for the future by making it even safer, more economical and more acceptable. Here, too, the magnitude of the research and development efforts required mean that these will have to be made as far as possible under international programmes.

   I think the countries gathered here need to be aware that, far from being a hindrance, the fulfilment of these requirements is a positive factor favouring the development of nuclear power.

   Moreover, I think it has emerged from this Conference that these requirements have mostly been internalized by the nuclear industry in its operations and its goals for technical progress.

   The International Atomic Energy Agency has a vital role to play in all these respects, by facilitating the development and use of nuclear energy for peaceful purposes, by ensuring compliance with peaceful-use undertakings, by helping countries maintain high levels of safety and security, by promoting international cooperation and by disseminating information on nuclear power to the public.

   I am also not forgetting the OECD’s Nuclear Energy Agency, which, in its own sphere of competence, provides valuable analyses to decision-makers.
Those I believe are the main conclusions that may be drawn from this Conference. I am happy to announce that these main elements have been picked up and developed in a final statement of the Conference — which, after a wide range of different views had been expressed, saw a broad convergence of views emerge.

Your Excellencies, Ladies and Gentlemen, thank you again for participating in this work, which I hope has been useful and will lead to future fruitful exchanges to help us complete our mission successfully.

**Press contact:**

Cabinet of Patrick Devedjian: Marie-Célie Guillaume, Communications Adviser 01 53 18 44 85
Conférence « Énergie nucléaire pour le 21ème siècle »

Discours de clôture de la conférence

Intervention de
M. Patrick DEVEDJIAN, Ministre délégué à l’Industrie

Mardi 22 mars 16h15-16h30

Messieurs les Ministres,
Monsieur le Directeur Général de l’Agence Internationale pour l’Energie Atomique,
Mesdames, Messieurs,

Je tiens d’abord à vous remercier d’avoir pris le temps de venir à Paris pour cette conférence, dont la France s’est fait – avec plaisir- l’hôte. Je suis très heureux de voir l’intérêt que cette opportunité de rencontre et de réflexion a suscité ; intérêt dont témoignent bien entendu le nombre et le haut niveau des participants, mais également la qualité des échanges de ces deux journées. Je me réjouis que tant de personnalités, provenant de toutes les régions du monde, soient présentes aujourd’hui, démontrant l’importance accordée aux défis énergétiques pour le 21ème siècle.

Je voudrais en premier lieu remercier l’Agence Internationale de l’Energie Atomique puisque c’est à son initiative et à celle de son directeur général, Monsieur Mohammed ELBARADEI, que cette conférence sur « le Nucléaire pour le 21ème siècle » a été organisée. La France est un grand pays nucléaire, le second après les Etats-Unis, et, au lendemain d’un grand débat national sur les énergies que nous avons mené au cours de l’année 2003, nous étions désireux de partager nos préoccupations et le fruit de nos travaux avec les pays qui, comme nous, souhaitent assurer à leur population une énergie en quantité suffisante et économiquement accessible tout en préservant l’environnement.


Monsieur Dominique MAILLARD, Directeur Général de l’Energie et des Matières Premières, au sein de l’administration française, ainsi que Mme Sophie GALEY-LERUSTE.

Je ne citerai pas le nom de tous les participants aux tables rondes et aux sessions plénières mais je remercie sincèrement chacun d’entre eux pour avoir accepté de nous faire partager son expérience, ses réflexions et pour la disponibilité dont il a fait preuve.

*           *

L’élaboration du programme qui en est résulté a permis d’obtenir un équilibre entre les différentes problématiques liées aux politiques énergétiques :

- tout d’abord, celle de la recherche d’une adéquation durable entre l’offre et la demande énergétiques dans un contexte de raréfaction à terme des sources d’énergie fossiles,

- en second lieu, celle, tout aussi importante, de la préservation de notre environnement,

- puis l’analyse de la contribution potentielle de l’énergie nucléaire dans ce contexte,

- enfin, les questions de gouvernance, essentielles dans le domaine énergétique compte tenu de l’importance stratégique et sociale de l’accès à l’énergie, et, plus encore, dans le domaine du nucléaire du fait des spécificités de cette ressource.

Après deux jours de débats et de présentations, nous arrivons donc à la fin de cet événement.

Avant d’évoquer les conclusions, j’aimerais faire une remarque préliminaire : c’est la première fois depuis bien longtemps qu’un nombre aussi élevé de pays – 74 – et d’organisations internationales – 10 – réfléchissent ensemble au rôle que pourrait ou devrait jouer le nucléaire dans leur politique énergétique nationale.

C’est en soi un signal clair de l’intérêt renouvelé qui est porté dans le monde à cette source d’énergie. La participation d’un grand nombre de ministres à la conférence, qui se sont officiellement exprimés à titre national, en a été l’illustration.

Il était important de réunir les différents acteurs de la politique énergétique, qu’il s’agisse des décideurs politiques, des experts du domaine énergétique, des opérateurs industriels et des représentants de nos concitoyens. Les organisateurs, en conjuguant leurs efforts, ont réussi ce pari.

*           *

De nombreux points de vue ont été exprimés, qui ont donné lieu à des discussions approfondies pendant la conférence. Une grande convergence de vue a été constatée parmi les participants.

Je voudrais, en premier lieu, rappeler un principe important que cette conférence n’a pas cherché pas à remettre en cause : **chaque État est libre de définir sa politique énergétique sous réserve du respect de ses engagements internationaux.**

Ensuite, je ferai le constat de deux objectifs prioritaires :

- **le premier** : l’accès à une énergie en quantité suffisante, car celle-ci est indispensable au développement humain,
- **le second** : la préservation de l’environnement et dans ce cadre, la lutte contre l’effet de serre ; tous les efforts doivent être faits pour diminuer notre production de gaz à effets de serre, et notamment le CO2.

A cet égard, nous ne pouvons qu’entendre le souhait, largement et clairement exprimé ici, que l’énergie nucléaire, tout comme l’énergie d’origine hydraulique, soit prise en compte dans les mécanismes internationaux de réduction d’émission de gaz à effet de serre, et que le nucléaire et l’hydraulique ne fassent plus à cet égard l’objet d’une exclusion que rien ne justifie. Car, chacun l’a constaté, il y a urgence sur cette question du changement climatique et l’on doit rechercher des solutions qui apportent des réponses aux considérables besoins en énergie qui s’annoncent pour le siècle.

On ne peut qu’entendre aussi l’appel, émanant tout particulièrement des pays en développement, pour que les institutions consacrées au développement prennent en compte, dans leurs programmes d’aide, les potentialités de l’énergie nucléaire pour la compétitivité des économies et la lutte contre le changement climatique. Cela est particulièrement vrai pour les différentes institutions des Nations-Unies et la Banque Mondiale que l’on appelle à mieux coopérer avec l’AIEA.

Donc, sans vouloir faire de l’énergie nucléaire la réponse unique à tous les défis du siècle, la conférence a reconnu que celle-ci pouvait contribuer de façon efficace à la réalisation de ces objectifs en fournissant, sans émettre de CO2, une électricité à un prix compétitif et stable. Le recours à cette énergie est susceptible d’augmenter, dans un grand nombre de pays, le niveau de sécurité d’approvisionnement. Par ailleurs, elle peut contribuer efficacement à la production d’eau potable et d’hydrogène.

Pour autant, le recours à cette source d’énergie doit s’accompagner d’exigences particulières :

1. **Première exigence**, il est clair que la coopération internationale pour le développement de l’énergie nucléaire ne peut se mettre en place que si les États se conforment strictement à leurs engagements et obligations internationales en matière de non prolifération, et respectent les objectifs mêmes de la non-prolifération.

   Nous devons être, tous, particulièrement attentifs à ce que les matières, équipements et technologies nucléaires les plus sensibles, susceptibles d’être utilisés dans des armes nucléaires, ne soient pas détournés de leur usage pacifique. Cela doit rester une priorité de la communauté internationale.

2. **Seconde exigence**, la mise en place de dispositifs nationaux est une condition indispensable pour garantir un niveau élevé de sûreté et de sécurité des matières et installations nucléaires, ainsi que pour assurer une gestion sûre et pérenne du combustible usé et des déchets radioactifs, en conformité avec les principes de précaution et de développement durable. Dans ce but, il apparaît essentiel que les États coordonnent leurs efforts et partagent leurs expériences.

   A cet égard, il est apparu que l’industrie jouait un rôle essentiel par la préservation d’une « culture de sûreté » qui doit rester au cœur de l’activité des entreprises du secteur nucléaire.

3. **Dernière exigence**, il nous faut préparer le nucléaire de demain afin de le rendre encore plus sûr, plus économique et plus acceptable. Là encore, compte tenu de l’ampleur des efforts de recherche et développement nécessaires, ceux-ci doivent être menés autant que possible dans le cadre de programmes internationaux.
Je pense que les pays ici rassemblés doivent être conscients que, loin d’être un obstacle, la satisfaction de ces exigences est un facteur positif favorisant le développement de l’énergie nucléaire.

Au demeurant, je pense qu’il ressort de la conférence que ces exigences sont en grande partie intégrées par l’industrie nucléaire dans son fonctionnement et ses objectifs de progrès technique.

L’Agence internationale de l’Énergie atomique a un rôle essentiel à jouer à tous ces égards, en facilitant le développement et l’utilisation de l’énergie nucléaire à des fins pacifiques, en s’assurant du respect des engagements d’utilisation pacifique, en aidant les États à maintenir des niveaux élevés de sûreté et de sécurité, en promouvant la coopération internationale et en diffusant auprès du public l’information sur l’énergie nucléaire.

Je n’oublie pas non plus l’Agence de l’Énergie nucléaire de l’OCDE, qui, dans le domaine de compétence qui est le sien, fournit des analyses appréciables aux décideurs.

Voilà sans doute les principales conclusions que l’on pourra tirer de cette conférence. Je suis heureux d’annoncer que ces principaux éléments sont repris et développés dans une déclaration finale de la conférence, qui, après l’expression d’une grande diversité de points de vue, a fait l’objet d’une large convergence.

Messieurs les Ministres, Mesdames, Messieurs, je vous remercie encore d’avoir participé à ces travaux et espère qu’ils auront été utiles et qu’ils donneront lieu à de futurs échanges fructueux pour nous aider à mener à bien la mission qui nous revient.

**Contact presse :**
Cabinet de Patrick Devedjian : Marie-Célie Guillaume, Conseiller communication 01 53 18 44 85
The International Conference on Nuclear Power for the 21st Century was held in Paris on 21 and 22 March 2005, attended by Ministers, high-ranking officials and experts from 74 States and 10 international organizations. This Conference was organized by the International Atomic Energy Agency (IAEA) in cooperation with the Organization for Economic Cooperation and Development (OECD) and the Nuclear Energy Agency (NEA) of the OECD, and was hosted by the French Government. Its aim was to discuss future policies with respect to nuclear power and, in particular, to examine and analyse the potential contribution of this energy source to meeting energy needs of the century while respecting social concerns and expectations.

Many views were expressed and in depth discussions took place during the Conference. There was a broad convergence of views among participants on the following:

- Each State is free to define its national energy policy in accordance with its international obligations;

- The availability of energy and access to it are essential to human development;

- The health of the planet's environment, including action to reduce air pollution and address the risk of global climate change, is a serious concern that must be regarded as a priority by all Governments;

- A diverse portfolio of energy sources will be needed in the 21st century to allow access to sustainable energy and electricity resources in all regions of the world. Efforts will be needed as well to improve energy efficiency, while limiting air pollution and greenhouse gas emissions.

A wide range of different views were expressed. In this context, a vast majority of participants affirmed that nuclear power can make a major contribution to meeting energy needs and sustaining the world's development in the 21st century, for a large number of both developed and developing countries, taking into account the following:

- Nuclear power does not generate air pollution or greenhouse gas emissions;

- Nuclear power is a proven technology, which under many circumstances provides competitively priced electricity to individuals, companies and the society, in comparison with average energy prices from other sources, thus contributing to the competitiveness of the economy;
Nuclear power contributes to security of supply and to the stability of energy prices by reducing exposure to fluctuations in the price of fossil materials;

Nuclear power can also make a valuable contribution through the production of potable water and hydrogen.

However, they recognized that the following conditions are required for nuclear power to thrive:

- States must commit themselves to prevent the proliferation of nuclear weapons, which constitute a threat to international peace and security. In order to benefit from cooperation in the peaceful uses of nuclear energy and related technologies in accordance with international law, States should comply strictly with their commitments and international obligations, including IAEA safeguards, and non-proliferation objectives, and apply criteria for physical protection and export control of nuclear material, equipment and technology, according to their respective laws, that conform to international non-proliferation objectives and relevant regimes. Particular vigilance should be exerted with regard to sensitive nuclear material, equipment and technology with proliferation potential (e.g. enrichment, reprocessing), which should not be exported to states that may seek to use them for weapons purposes;

- In order to maintain the highest nuclear safety levels, all States having or developing a nuclear power programme should give due priority to nuclear safety, taking into account the importance of international cooperation for the enhancement of nuclear safety;

- States must make the necessary arrangements to ensure the highest level of security of nuclear material and facilities;

- Solutions exist for the safe management of spent fuel and radioactive waste. The technical solutions arising from research and development into high-level waste and long-lived low and intermediate level waste, currently under way, should be implemented within the framework of progressive national processes that address the expectations and concerns of citizens. States have an obligation and responsibility to ensure appropriate options are provided for the management and disposition of nuclear fuel and must ensure that using nuclear energy does not create undue burdens or risks for future generations;

- International research and development programmes are currently carried out to develop innovative nuclear systems aiming to provide increased benefits with respect to economy, safety, waste management and non-proliferation. They can and should be oriented according to sustainable development criteria, and provide answers to the needs and concerns of society, taking into account the specific situation of each State.

The IAEA has an essential role to play in facilitating the development and use of nuclear energy for peaceful purposes, in ensuring compliance with peaceful use undertakings, in assisting States in maintaining high levels of safety and security, in fostering international cooperation and in disseminating to the public information on nuclear energy. The OECD / NEA also plays an important role with respect to nuclear energy by providing objective analysis.

De nombreux points de vues ont été exprimés, qui ont donné lieu à des discussions approfondies pendant la conférence. Une grande convergence de vue a été constatée parmi les participants sur ce qui suit :

- Chaque État est libre de déterminer sa politique énergétique, en conformité avec ses obligations internationales ;

- La disponibilité de l'énergie et l'accès à cette dernière sont des conditions essentielles du développement humain ;

- La qualité de l'environnement de la planète, y compris la réduction de la pollution atmosphérique et la réponse au risque de changement climatique au niveau mondial, est une question majeure, qui doit faire l'objet d'un traitement prioritaire par tous les Gouvernements ;

- Une grande variété de sources d'énergie sera nécessaire au 21ème siècle pour permettre un accès durable à l'énergie et à l'électricité dans toutes les régions du monde. Des efforts seront également nécessaires pour améliorer l'efficacité énergétique tout en limitant la pollution atmosphérique et les émissions de gaz à effet de serre ;

Il a été fait état d'une grande diversité de points de vue. Dans ce contexte, une vaste majorité de participants a affirmé que l'énergie électronucléaire peut apporter une contribution majeure à la satisfaction des besoins énergétiques et au développement mondial au 21ème siècle d'un grand nombre de pays, tant développés qu'en voie de développement, en prenant en compte les éléments suivants :

- L'énergie électronucléaire ne génère pas de pollution atmosphérique ou d'émission de gaz à effet de serre ;

- L'énergie électronucléaire s'appuie sur des technologies éprouvées, et fournit dans bien des cas une électricité à un prix compétitif aux personnes, aux entreprises et à la société, en comparaison du prix moyen d'énergies obtenues à partir d'autres sources, contribuant ainsi à la compétitivité des économies ;

- L'énergie électronucléaire contribue à la sécurité d'approvisionnement et à la stabilité des prix de l'énergie, en diminuant l'exposition à la volatilité des prix des combustibles fossiles ;
- L'énergie électronucléaire peut jouer un rôle appréciable pour la production d’eau potable et d’hydrogène.

Cependant, ils ont reconnu que les conditions suivantes doivent être remplies pour que l’énergie électronucléaire puisse prendre de l’ampleur :

- Les États doivent s'engager en faveur de la prévention de la prolifération des armes nucléaires qui constitue une menace pour la paix et la sécurité internationales. Pour pouvoir bénéficier de la coopération et technologies associées, en vue de l'utilisation de l'énergie nucléaire à des fins pacifiques conformément au droit international, les États doivent se conformer strictement à leurs engagements et obligations internationales y compris les garanties de l'AIEA, et aux objectifs de non prolifération, et appliquer des critères en matière de protection physique et de contrôle des exportations de matières, équipements et technologies nucléaires, en application de leurs législations respectives, qui sont conformes aux objectifs internationaux de non prolifération et aux régimes pertinents. Une vigilance particulière doit s'exercer en ce qui concerne les matières, équipements et technologies nucléaires sensibles pouvant contribuer à la prolifération (ex : enrichissement, retraitement), qui ne doivent pas être exportés vers des pays susceptibles de les utiliser pour des armes nucléaires ;

- Afin de préserver les niveaux les plus élevés en matière de sûreté nucléaire, tous les États qui ont ou développent un programme électronucléaire doivent absolument faire de la sûreté nucléaire une priorité, et reconnaître l’importance de la coopération internationale pour le renforcement de la sûreté nucléaire ;

- Les États doivent prendre des dispositions appropriées pour assurer le plus haut niveau de sécurité des matières et installations nucléaires ;

- Il existe des solutions pour une gestion sûre des combustibles usés et des déchets radioactifs. Les solutions techniques issues de la recherche et du développement dans le domaine des déchets de haute activité et des déchets de faible et moyenne activité à vie longue, en cours, devraient être mises en œuvre progressivement dans le cadre de processus nationaux qui prennent en compte les attentes et préoccupations des citoyens. Les États ont l’obligation et la responsabilité de s’assurer que des solutions appropriées sont trouvées pour la gestion et le traitement final des combustibles nucléaires, et que l'utilisation de l'énergie nucléaire ne génère pas de contraintes ou de risques inacceptables pour les générations futures ;

- Des programmes internationaux de recherche et de développement sont actuellement menés, afin de développer des systèmes nucléaires innovants qui fourniront des avantages accrues sur le plan économique et en termes de sûreté, de gestion des déchets et de non prolifération. Ils peuvent et devraient être orientés à partir de critères de développement durable, et fournir des réponses aux besoins et préoccupations de la société, dans le respect des spécificités de chaque État ;

- L'AIEA a un rôle essentiel à jouer en facilitant le développement et l'utilisation de l'énergie nucléaire à des fins pacifiques, en s’assurant du respect des engagements d’utilisation pacifique, en aidant les États à maintenir des niveaux élevés de sûreté et de sécurité, en promouvant la coopération internationale et en diffusant auprès du public l’information sur l’énergie nucléaire. L’OCDE / AEN joue aussi un rôle important dans le domaine de l’énergie nucléaire en fournissant des analyses objectives.
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<td>His Excellency Mr. Myung Oh Deputy Prime Minister and Minister Ministry of Science and Technology (MOST)</td>
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<td>Russian Federation</td>
<td>Mr. Alexander Rumyantsev Head Russian Federal Atomic Energy Agency (Rosatom)</td>
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<td>Mexico</td>
<td>Mr. Sergio AJURIA GARZA on behalf of His Excellency Mr. Jose Alberto ACEVEDO MONROY Vice-Minister in charge of Electricity</td>
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<tr>
<td>Saudi Arabia</td>
<td>Mr. Turki bin Saud bin Mohammed AL-SAUD Vice President, King Abdulaziz City for Science and Technology</td>
</tr>
<tr>
<td>USA</td>
<td>Ms. Constance Morella, Ambassador, US Permanent Representative to the OECD on behalf of US Secretary of Energy</td>
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<tr>
<td>Slovakia</td>
<td>His Excellency Mr. Pavol Rusko Minister of Economy of the Slovak Republic</td>
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<tr>
<td>Latvia</td>
<td>His Excellency Mr. Raimonds Vejonis Minister of Environment</td>
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<tr>
<td>Romania</td>
<td>Mr. Ioan Codrut Seres Minister of Economy and Commerce</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Mr. Samodra Sriwidjaja Ambassador, Permanent Representative to the UN and International Organizations in Vienna on behalf of the Minister of Research and Technology</td>
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<td>31</td>
<td>India</td>
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## Provisional Speakers List
### Monday 21st March

<table>
<thead>
<tr>
<th>Round Table 1</th>
<th>Speaker</th>
<th>Affiliation</th>
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<tbody>
<tr>
<td><strong>Chair</strong></td>
<td>Mr. Luis Echavarri</td>
<td>Director General, Nuclear Energy Agency (NEA)</td>
</tr>
<tr>
<td><strong>Issue 1</strong></td>
<td>Mr. Claude Mandil</td>
<td>Executive Director International Energy Agency (IEA)</td>
</tr>
<tr>
<td></td>
<td>Mr. Pierre Gadonneix</td>
<td>Deputy Chairman WEC Europe President &amp; CEO, Electricité de France (EDF),</td>
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<tr>
<td></td>
<td>Mr. M.R. Srinivasan</td>
<td>Member, Atomic Energy Commission, Government of India</td>
</tr>
<tr>
<td><strong>Issue 2</strong></td>
<td>Mr. John Stone</td>
<td>IPCC Working Group Climate Change, Canada</td>
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<tr>
<td></td>
<td>Mr. James Lovelock (Video Message)</td>
<td>Environmentalist, UK</td>
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<td></td>
<td>Mr. Pertti Simola,</td>
<td>President and CEO TVO, Finland</td>
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<td></td>
<td>Mr. Christian Bataille</td>
<td>Member of the French Parliament</td>
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<td></td>
<td>Mr. Robert Adam</td>
<td>Director General, Ministry of Science and Technology, South Africa</td>
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<tr>
<th>Round Table 2</th>
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<tr>
<td><strong>Chair</strong></td>
<td>Mr. Roberto Cirimello</td>
<td>Senior Advisor, National Energy Commission, Argentina, Chairman SAGNE, IAEA</td>
</tr>
<tr>
<td><strong>Issue 3</strong></td>
<td>Mr. Shunshuke Kondo</td>
<td>Chairman Atomic Energy Commission, Japan, Chairman Science Council, Japan,</td>
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<tr>
<td></td>
<td>Ms. Anne Lauvergeon,</td>
<td>Chairman, AREVA, France</td>
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<tr>
<td></td>
<td>Mr K P Lau</td>
<td>Director Office of International Nuclear Cooperation US Department of Energy</td>
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<td></td>
<td>Mr. S N Ivanov</td>
<td>Deputy Director General Rosenergoatom, Russian Federation</td>
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<td></td>
<td>Mr. John Ritch</td>
<td>Director General, World Nuclear Association (WNA)</td>
</tr>
<tr>
<td><strong>Issue 4</strong></td>
<td>Mr. Dominique Maillard General Director for Energy and Raw Materials, France</td>
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<td></td>
<td>Mr. Antonio C. O Barroso</td>
<td>Former Chairman CNEN, Brazil and Governor IAEA, Brazil</td>
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<td></td>
<td>Mr. Poong Eil Juhn</td>
<td>Former Dir NENP, Visiting Research Fellow KAERI, Korea</td>
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<tr>
<td></td>
<td>Mr. József Ronaky</td>
<td>Director General, Hungarian Atomic Energy Authority, Member of the INSAG, IAEA</td>
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<td></td>
<td>Mr. Alejo Vidal-Quadras Roca</td>
<td>Vice President, European Parliament,</td>
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Meeting Participants for I2-CN-122

International Ministerial Conference on "Nuclear Power for the 21st Century"

Paris 21/03/2005 - 22/03/2005
<table>
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<tr>
<th>Designating Member</th>
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<tr>
<td><strong>AFGHANISTAN</strong></td>
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</tbody>
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<td>State / Organization</td>
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<th>Name of Participant</th>
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</table>
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27-Apr-2005
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<tr>
<th>Designating Member</th>
<th>Name of Participant</th>
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<tr>
<td>20</td>
<td>Gevorgyan, A.A.</td>
<td>Department of Atomic Energy Ministry of Energy Government House-2 Republic Square Yerevan 375010 ARMENIA Fax: +3741562776 EMail: <a href="mailto:atomen@freenet.am">atomen@freenet.am</a></td>
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<td>21</td>
<td>Movsisyan, A.</td>
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<tr>
<td>22</td>
<td>Nalbandian, E.</td>
<td>Embassy of Armenia 9, rue Viète 75017 Paris FRANCE Fax: +33142129803 EMail: <a href="mailto:ambarmen@wanadoo.fr">ambarmen@wanadoo.fr</a></td>
</tr>
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<td>23</td>
<td>Cameron, R.F.</td>
<td>Australia Nuclear Science and Technology Organisation (ANSTO) Private Mail Bag 1 Menai NSW 2234 AUSTRALIA Fax: +61295431452 EMail: <a href="mailto:ron.cameron@ansto.gov.au">ron.cameron@ansto.gov.au</a></td>
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<tr>
<td>24</td>
<td>Kelly, J.F.</td>
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<td>25</td>
<td>Pegler, R.J.</td>
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| AUSTRIA            | Molin, A.           | Federal Ministry of Agriculture, Forestry, Environment and Water Management  
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|                    |                     | Fax: +3232967106  
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<td>Van Gheel, P.</td>
<td>Délégation de la Belgique près de l’OCDE 14, rue Octave Feuillet 75116 Paris FRANCE Fax: +33156753470 EMail: <a href="mailto:patrick.vanheyll@diplobel.be">patrick.vanheyll@diplobel.be</a></td>
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<td>33</td>
<td>Van Haute, P.</td>
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<tr>
<td>38</td>
<td>Manev, L.</td>
<td>Atomenergoproekt Ltd. 51 J. Baucher Blvd 1407 Sofia BULGARIA EMail: <a href="mailto:lubo@engineer.bg">lubo@engineer.bg</a></td>
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<td>40</td>
<td>Minev, A.</td>
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<td>41</td>
<td>Petrov, B.</td>
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<td>Commissariat à l’énergie atomique (CEA) 31-33, rue de la Fédération 75015 Paris FRANCE Fax: +331401800 EMail: <a href="mailto:jean-pierre.le-roux@cea.fr">jean-pierre.le-roux@cea.fr</a></td>
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| 153                | Perraudin, J-C.     | SG CI  
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| 154                | Perreau, D.         | Mission permanente de la  
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| 155                | Perrin, B.          | Ambassade de France en  
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| 156                | Perrin, J-L.        | MINEFI-DGEMP  
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| 170               | Schoentgen, R.      | MINFI-CABINET  
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Inspection générale pour la sûreté nucléaire  
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21, avenue de Messine 1er  
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| 251                | Tadeka, K.          | Ministry of Economy, Trade and Industry  
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| 325                | Ionescu, A.C.M.     | Ministry of Economy and Commerce - General Directorate for Energy Politics  
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<td><strong>TAJIKISTAN</strong></td>
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<td>TURKEY</td>
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