



REPORT

of the
Standing Senate Committee
on
Energy, the Environment and Natural Resources

on its

FACT-FINDING MISSION TO
PARIS AND VIENNA

September 5 – 10, 2005

**MEMBERS PARTICIPATING IN FACT-FINDING MISSION TO PARIS AND VIENNA
SEPTEMBER 5 – 10, 2005**

The Hon. Tommy Banks – Chair

The Hon. Ethel M. Cochrane – Deputy-Chair

The Hon. Willie Adams

The Hon. David Angus

The Hon. John Buchanan, P.C.

The Hon. Ione Christensen

The Hon. Colin Kenny

The Hon. Mira Spivak

Staff of the Committee:

Ms. Lynne C. Myers, Research Analyst, Science and Technology Division, Parliamentary Information and Research Service, Library of Parliament;

Mr. Gérald Lafrenière, Clerk of the Committee, Committees Directorate, The Senate.

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REPORT OF THE COMMITTEE'S FACT-FINDING MISSION TO PARIS AND VIENNA

SEPTEMBER 5 -10, 2005

INTRODUCTION

The Committee's Fact-Finding Mission to Paris and Vienna had four distinct objectives, each of which was met during the course of the meetings in Europe. This report briefly outlines those objectives and reports on the principal findings and observations of Committee members.

OBJECTIVES OF FACT-FINDING MISSION

1. Obtain an Update on the International Aspects of Nuclear Reactor Safety

- In June 2001 the Committee tabled its interim report on nuclear safety entitled *Canada's Nuclear Reactors: How Much Safety Is Enough?* This was followed in June 2002 with the tabling of a final report entitled *The International Aspects of Nuclear Reactor Safety*.
- Much of the information for this phase of the Committee's study was obtained during meetings in Paris and Vienna, in 2001, with representatives of the major international organizations involved in the industry.
- The 2005 visit allowed the Committee to follow up on its previous study by meeting again with these representatives to discuss issues of mutual interest, including:
 - International measures in place to assure the safe operation of nuclear reactors;
 - The growing need for international nuclear power safety standards; and
 - Nuclear law and liability regimes.
- Since 2001, the Committee has also dealt with legislation creating the Nuclear Waste Management Organization in this country. Consequently, the approach of various countries to managing high-level radioactive waste was also discussed during meetings in Europe.

2. Discuss Canada's Environmental Performance as Assessed by the OECD

- In 2004, the OECD carried out a detailed review of Canada's environmental performance.
- The subsequent report issued by the OECD was critical of some aspects of Canada's performance.

- Committee members met with the authors of that report and discussed the implications of its findings, in light of the Committee’s broad mandate on environmental issues.

3. Discuss Current Global Issues Related to Energy Supply and Demand

- The OECD’s International Energy Agency is one of the premier organizations in the world in the analysis of global energy issues and trends. They publish an annual report entitled *World Energy Outlook*.
- Committee members were able to hear from leading experts on a wide range of issues, including global oil supply and demand, the developing world trade in natural gas, the future of nuclear power in a carbon-constrained world, and the potential for renewable energy sources to make a greater contribution to the world’s energy mix in coming years.

4. Discuss Issues Related to the World Oil Situation

- During its 2001 visit to Europe, Committee members held highly informative talks with leading figures from the Organization of Petroleum Exporting Countries (OPEC).
- The Committee was invited to return in the future for further discussions. This visit allowed Senators to be updated on the international oil situation from the point of view of OPEC, whose member countries are responsible for about 40% of world oil production.

FINDINGS AND OBSERVATIONS

National Radioactive Waste Management Agency (Agence nationale pour la gestion des déchets radioactifs – ANDRA)

- France has 58 nuclear power plants in operation and another ten that have been shut down and/or are being decommissioned, and so have a great deal of experience dealing with radioactive waste (or “recoverable material” as they prefer to call the spent reactor fuel).
- Like Canada, France is still looking for a solution to the question of the disposal and/or storage of spent nuclear fuel (high-level radioactive waste). Representatives of ANDRA discussed how France is addressing the problem and how it is dealing with the other levels of radioactive waste.
- ANDRA, a state owned corporation, was created by an Act of Parliament in 1991 in response to public opposition over the proposed siting of an R&D facility to study radioactive waste management.
- The legislation gave ANDRA a number of mandates. Like Canada’s Nuclear Waste Management Organization (NWMO), the agency was mandated to find technical solutions to the management of high-level and long-lived, intermediate-level radioactive waste and to make recommendations to Parliament.

- Unlike Canada's NWMO, ANDRA was given a 15 year deadline for this task.
- Among the options being researched are deep geological disposal, partitioning and transmutation (using nuclear reactors, particle accelerators or other new technology to transform long-lived radioactive waste into stable or short-lived isotopes, reducing the volume of waste needing confinement over very long periods of time) and conditioning and long-term near-surface storage.
- As a result of the legislated deadline, some time in 2006, a report will be made to the French Parliament recommending a way forward, and Parliament will make the final decision on how the country will handle the high-level radioactive material (spent reactor fuel).
- In addition to this important mandate, ANDRA also manages, operates and monitors all existing low and intermediate-level radioactive waste disposal centres, and it designs and builds new centres for waste that cannot be handled by existing facilities. ANDRA offers this service on a commercial basis.
- Since 2003, ANDRA has operated a disposal facility dedicated to very low-level wastes. In most other countries this material would be sent to landfill sites, but the government wants to build public confidence in nuclear power and so deals with all of the radioactive waste, no matter how low the level of contamination.
- Another ANDRA facility, its low to intermediate-level waste disposal site, Centre de la Marche, is the first in the world to make the transition from a storage site to a closed disposal site. It is now in the monitoring phase and nuclear electricity producers pay ANDRA about 3 million Euros (Can\$4.3 million) annually to do the monitoring.
- The big question in France now is how long this monitoring will have to be carried out and how much it will cost. This will become increasingly important as the government moves towards its stated objective of, at least partially, privatizing Électricité de France (the largest publicly owned utility in the western world). The question will have to be answered if private sector investors are to be attracted to the nuclear power business.
- France has a strict policy of not importing radioactive waste. It does import high-level waste from other countries, reprocesses it and then sends the reprocessed material and all of the waste generated in the procedure back to the country of origin.

Nuclear Energy Agency (NEA)

- The Committee was briefed on the history, mandate and operation of the Nuclear Energy Agency, and engaged in discussions on issues related to nuclear safety, waste management and nuclear liability insurance.
- The NEA was founded in 1958 as a semiautonomous agency within the OECD (Organization for Economic Cooperation and Development). The Agency has a staff of 80 persons and an annual budget of 12 million Euros (approximately Can\$17 million). Its

original membership was largely European, with Canada, Japan and the United States becoming members in the 1970s.

- In the words of its Executive Director, the mission of the NEA is “to assist member countries in maintaining and further developing, through international cooperation, the scientific, technological and legal bases for the safe, environmentally friendly, and economical use of nuclear energy.” It is, in effect, a nuclear think-tank that brings international experts together to share information, to study issues of mutual concern and make non-binding recommendations.
- In recent years, the NEA has been doing more outreach work involving non-member states in Eastern Europe, to pass on best-practices, in order to enhance the safe use of nuclear power in those countries. The accident at Chernobyl demonstrated clearly that safety of nuclear facilities is an international, and not just a national, concern. The NEA is working intensively at developing a closer technical relationship with both Russia and China.
- The NEA representatives acknowledged the importance of continuing to improve their working relationship with industry (and not just with governments) since many countries are moving to privatize parts of the nuclear power industry. It is important to pass on the “safety culture” to the industrial setting.
- Unlike the IAEA (International Atomic Energy Agency), the NEA does not deal with non-proliferation issues. The NEA sees itself as, therefore, much less political than the IAEA. Because its members represent the most advanced western nations, the NEA can look at the latest developments in areas such as safety, waste management and legal frameworks, and make recommendations.
- The IAEA, with its broader membership, can then pass this information on to a much wider audience, including less developed countries that are developing, or want to develop, their nuclear power capabilities.
- NEA representatives provided two examples of how this transfer works. Following the Three Mile Island incident, the NEA was quickly able to develop a system for countries to exchange information about “operating events.” Once up and running, the system was transferred to the IAEA. Similarly, following Chernobyl, the NEA developed a scale or rating system to inform the public about the seriousness of individual “events.” Again, once the system was running, it was transferred to the IAEA, which continues to operate it.
- Given past reports by the Committee, one of the issues of greatest interest was the NEA view on Canada’s lack of progress on amending the *Nuclear Liability Act*. In its 2000 report, *Nuclear Safety: How Much Safety Is Enough?* The Committee had said that the Can\$75 million liability insurance that Canadian nuclear operators are required to carry was “woefully inadequate” and urged the federal government to take quick action to increase the coverage to at least Can\$600 million, to bring us in line with international norms.

- The Head of the NEA's Legal Affairs Division, who happens to be a Canadian, agreed wholeheartedly with the Committee's comments. She further commented that since our report was issued, the NEA had been working with Canadian officials to help with proposed amending legislation. These officials were observers at the extensive discussions that went in to the updating of the two international agreements (the Paris and Vienna Conventions) that govern liability coverage in most European countries. The negotiations resulted in significant increases in the required coverage, leaving Canada even further behind. The Committee will be reporting separately on this embarrassing situation.
- With respect to safety and regulation, the Committee discussed the key work of the NEA in sharing safety information to identify generic safety issues that may have to be addressed.
- One of the issues that has come to the fore in recent years is the growing difficulty that OECD countries are having in maintaining adequate numbers of qualified personnel and equipment suppliers, given the very low level of new construction in the nuclear power sector in the last 15 to 20 years. Both in Europe and in the United States, governments have taken a variety of actions (scholarships, etc.) to attract more graduate students into the industry. Efforts seem to have worked. As an example, the number of graduate students in nuclear engineering in the U.S. rose from just 500 in 1998 to 1500 in 2004. Similar results have been seen in Europe, and the NEA feels that as nuclear power enjoys a resurgence in popularity (as a means to fight global warming), the trend will continue.
- Other safety issues that the NEA is monitoring include the potential impacts on safety of electric utility privatization. Will the effort to be economically competitive - by cutting staff, contracting out maintenance, or extending the operating life of nuclear plants - have a negative impact on safety?
- Safety issues related to decommissioning are also a growing concern as the first generation of the world's nuclear reactors are reaching the end of their operating lives.
- It was noted that, for the first time in many years, countries are starting to talk about building new nuclear power plants, in part to address the threat of global climate change. New reactor designs and new related technologies will have to be assessed for the novel safety issues they may present. In fact, more efficient Generation III reactors are already available and Finland, France and Japan are either constructing or planning to soon construct such reactors.
- Committee members discussed the progress that is being made internationally in developing Generation IV reactors. This next generation will be designed to introduce, among other advantages, inherent safety features, and closed-cycle operation, which will produce less high-level wastes and extract much more energy from each kilogram of fuel.
- Because of the high cost of development, the international community is, for the first time, engaged in a joint research and development effort. Six designs have been chosen for further evaluation, and this will eventually be narrowed to two or three. Canada is involved in this effort, which has a deadline of 2030 to have Generation IV reactors ready

for deployment. The date was set far enough in the future so as not to compete with Generation III reactors, nor discourage their use.

- With respect to the regulation of nuclear power, the NEA is working closely with member countries to help ensure that the regulator has the trust of the public. This is essential, if nuclear power is to continue, or even expand, its role in the energy mix of OECD countries. Canada is actively involved in this effort. Representatives mentioned an important NEA conference on the topic which was held recently in Ottawa (*Building, Measuring and Improving Public Confidence in the Nuclear Regulator*).
- The management of high-level radioactive waste was a topic for discussion with the NEA. It is becoming increasingly important for countries that use nuclear power to find a “solution” to this problem if the public is to accept the continuation and even expansion of nuclear power use in the coming years.
- Despite the fact that 17 of the 28 OECD countries use nuclear energy, not one has an operational repository for high-level waste. A great deal of research and effort has been put into finding technological solutions, and deep geological disposal is viewed as the leading prospect for a viable long-term solution. Scientists have a great deal of confidence in the technologies that have been developed, but the public at large has yet to be convinced.
- A number of countries such as Canada, France, and the United States have processes in place that should see decisions made in the near future and action begun to site a repository. The NEA has carried out peer reviews on several proposed national waste management programs including the U.S.A., Switzerland and France (under way).

International Energy Agency (IEA)

- The Committee met with senior representatives of the IAE, including the Executive Director, Mr. Claude Mandil. He reviewed for the Committee the origins of the IEA as a reaction to the oil crises of the 1970s. The main goal of the IEA at that time was to establish a means of avoiding the negative economic impact of any future oil price shocks or major supply disruptions.
- To meet that goal, each member country that is a net oil importer agreed to maintain domestic oil stocks equivalent to 90 days worth of net imports. These strategic petroleum reserves were to be used in a co-coordinated way when certain criteria were met. Since its inception, this emergency response has only been triggered twice. The first time was in response to the Iran-Iraq war, and the second time was in response to the damage caused to U.S. oil facilities by hurricane Katrina, just days before the Committee’s visit.
- In recent years, both India and China, although not IEA members, have established strategic petroleum reserves and agreed to coordinate their use with the IEA.
- In addition to its emergency preparedness role, the IEA acts as a think tank to help its members develop policies that stand on three pillars: the security of energy supplies, economic growth and environmental protection.

- In the view of the IEA, climate change will have a greater impact on energy policies than any other factor (even supply), in the next decade or more. The IEA will help countries share best practices and experiences in addressing this challenge.
- The Committee heard that, in more recent years, the IEA has begun to work with non-member countries and organizations to address global energy issues. Perhaps most surprisingly is the increasing cooperation with OPEC in addressing short term oil supply issues. For example, at the beginning of the war in Iraq, the IEA faced the prospect of having to trigger its emergency response (release of oil from strategic reserves). This became unnecessary, however, when OPEC agreed to increase production to cover any anticipated supply shortfall.
- The IEA is now also working with non-member countries such as China, India and Russia to help them improve their energy policies. In the future, they would like to extend this outreach to include Latin America and Africa.
- The Committee was presented with a rather chilling assessment of the economic and geopolitical implications of continuing current energy policies unchanged. On the demand side, oil security will become more of an issue. In the past, oil was widely used for power generation and for heating. This has changed. It is now the transportation sector that is experiencing the greatest demand growth. Unlike the power generation and heating sectors, there is no possibility of rapid fuel switching in the event of supply (or price) disruptions. Such events would have devastating economic consequences.
- The Committee was told that, with respect to world oil supply, virtually all of the growth in supply between now and 2010 will come from the politically unstable Middle East (Iran, Iraq, Saudi Arabia, Kuwait and the United Arab Emirates). Supply will be determined more by national self-interest than by supply/demand fundamentals, allowing countries to manipulate the supply to increase prices.
- Under a business-as-usual (BAU) scenario for world energy use, huge environmental challenges will continue. For example, without changes, carbon dioxide emissions will increase by 60%. Much of the growth in emissions will come from the power generation sector, as India and China continue to industrialize, using their huge deposits of low quality coal.
- In discussions about the importance of including China (and other rapidly developing countries) in international efforts to reduce GHG emissions, it was pointed out that China's power plant capacity grows every year by an amount equal to the total capacity of the United Kingdom.
- One possible way to bring China (and other developing countries) into the post-Kyoto climate change efforts was suggested. The so-called "carrot and no stick" approach would allow China to set its own target for reducing GHG emissions. If they do not make the target, there is no penalty, but if they exceed the target, they can sell the extra emission credits on the international market.
- The IEA prepares annual Country Studies that provide details of member state's energy policies and make recommendations for improving those policies. In its 2004 Canada

Country Study, the agency recommended that the federal government make greater use of its powers in the environmental field to make progress towards meeting our Kyoto target. It also noted, as did the Committee in a number of its reports, that, while Canada has a good plan for reaching its target, it has to get on with implementing the necessary measures.

- There was some discussion of the advisability of the federal policy to cap the cost of carbon emission credits for large industrial emitters at \$15 per tonne. This policy would seem to remove the incentive for some industries to take action. It means, in effect, that the Canadian taxpayer, and not the industries involved, would bear the cost of not meeting the Kyoto target.
- Other aspects of the Canada Country Study discussed with the report's IEA authors included: the need to improve reliability of the international and interregional electricity power grid; the need to promote the refurbishment of existing nuclear power plants to meet near-term demand; the recommendation to look at opening areas now under moratoria to oil and gas exploration; the need to streamline oil and gas pipeline approval processes; and the importance of increasing production from the oil sands.
- Committee members discussed the importance of improved energy efficiency in a carbon-constrained world. Efficiency improvements can bring almost immediate reductions in GHG emissions, while saving money from reduced energy costs. IEA maintains an extensive, searchable, energy efficiency database (available at www.iea.org/testbase/pamsdb/search.aspx?mode=cc). The database allows member countries to learn from the experience of others and stay up to date with the latest technologies and policies.

Economics Directorate, Organization for Economic Cooperation and Development (OECD)

- Committee members met with the head of the OECD's Economics Division to discuss sustainable development – the topic of recent reports by both the Directorate and the Committee. Sustainable development has moved from being an academic issue to a policy-making tool.
- The Directorate's report looked at how each OECD country was addressing the issue of sustainable development and how well they were doing at integrating it into policy-making. They were struck by the common issues faced by all countries and concluded that, while progress is being made, much remains to be done.
- It was noted that economic instruments need to be much better utilized since they are highly efficient in helping meet environmental goals.
- Discussions focused on the Directorate's specific recommendations for Canada. Canada was urged to make greater use of more efficient economic instruments. For example, it was suggested that a wider geographic area needs to be included in cap-and-trade programs. Right now the focus of such programs is provincial. The geographic extent should not be political, but rather based on the reach of the pollutant. Climate change is global, so we need a global cap. Regional air pollution needs a regional cap.

- Canada's decision to guarantee large final emitters that they would have to pay no more than \$15 per tonne of CO₂ was questioned, especially in light of the European experience to date that has seen carbon permits costing more than was originally forecast. The Canadian taxpayer could be left paying for industry's failure to reach its targets.
- Canada is also urged to make more use of incentives and rely less on command-and-control regulatory measures, since the latter prevent business from reducing pollution in the most efficient way. Canada's tendency to rely on voluntary measures was also described as "inefficient". Industries tend to only "volunteer" to make reductions they would have made anyway, so no real progress is made.
- The role of subsidies in encouraging the development of renewable energy sources was also discussed. It was pointed out that European success with increasing the installation of wind power capacity has relied heavily on generous subsidies. The subsidies may not be the most efficient way to go, but, as with any new energy source, they may well be justified to move the technology into the marketplace.

Environment Directorate, Organization for Economic Cooperation and Development (OECD)

- This Directorate, despite its name, focuses on the economics of environmental protection, and not on the science. They attempt to help member countries deal with environmental "externalities." They would like to move countries toward including these externalities in assessments of the costs and benefits of policy options. Norway and Sweden were held up as examples of countries that are making progress in this direction, particularly through the use of green taxes.
- Representatives told the Committee that their next report on the global Environmental Outlook, due to be released in 2007, will include detailed analysis of the environmental impact of various policy options. Unlike previous Outlook reports, it will include an assessment of the costs of inaction on environmental problems, especially climate change. This analysis is intended to provide "ammunition" for Ministers of Environment when they go to Cabinet to seek funding for environmental programs.
- The representatives also outlined the main focus of their current efforts. For example, they described the MAD Program (Mutual Acceptance of Data), which is aimed at having OECD countries accept each others' assessments of the health and environmental impacts of chemicals. A new and growing area of study for the Directorate is the impact of environmental contaminants on children.
- The Committee heard that the OECD is developing new strategies to continuously monitor how well countries are doing at meeting their environmental targets. Some of this work is already being used in the Country Studies, such as the one that recently (2004) assessed Canada's environmental performance. Many of the conclusions and comments were the same as those discussed with the Economics Directorate: make better use of economic instruments; rely less on voluntary measures; identify and remove environmentally harmful subsidies; move on from policy statement to policy action (i.e. on climate change); improve compliance and enforcement of environmental laws.

- Since 1998, the Environment Directorate has been trying to get the OECD more involved in integrating sustainable development into the mainstream of the policy-making process. As the Committee heard, however, this has been a hard sell within the OECD. The Economics Directorate “is not very interested” and work continues to bring them together with the Environment, Transportation and Agriculture Directorates to work together. Sustainable development will only become a reality if all sectors become involved.
- More recently, directorates dealing with Labour and with Social Affairs have become interested, and the Sustainable Development Manager, with whom the Committee met, is hopeful that the next steps will be to more fully involve Finance and Foreign Aid officials in measuring their policies against the sustainable development yard stick.
- Canada got bad marks for the fact that it is one of only five OECD countries that does not yet have a National Sustainable Development Strategy in place. Committee members pointed out that the Committee had recommended such action in its 2005 report on sustainable development.
- On the other hand, Canada gets full marks for the fact that it is one of only three OECD countries that has a Commissioner of Environment and Sustainable Development. New Zealand and the U.K. have similar offices.

International Atomic Energy Agency (IAEA)

- Committee members received an update on developments in international nuclear safety and security that have taken place since the Committee issued its reports on these issues in 2000 and 2001.
- Many of the same messages that the Committee heard from the Nuclear Energy Agency and the International Energy Agency in Paris concerning renewed global interest in nuclear power in light of the need to address climate change, and fears about energy security and diversity were repeated at the IAEA.
- The IAEA representatives noted that the Agency has three main roles. It helps develop and spread new nuclear technology; it studies and helps both member and non-member countries address issues of nuclear safety and security; and it acts as the nuclear watchdog, through its monitoring and verification programs.
- With respect to nuclear safety, the IAEA has numerous committees to which member countries contribute experts. Canada is heavily involved, with representatives on all of the IAEA nuclear safety committees. In fact, a Canadian (Linda Keen, Head, Canadian Nuclear Safety Commission) acted as Chairman of the 3rd Review Meeting on the Convention on Nuclear Safety in April 2005.
- According to officials, since the Chernobyl accident, there has been much greater international cooperation on safety issues. Safety and security of nuclear reactors used to be seen as a strictly national issue. Chernobyl clearly demonstrated that it is, indeed, an international issue.

- As one official put it, if there is ever another Chernobyl, it would be the end of civilian nuclear power around the world. Consequently, the IAEA is working hard to ensure that lessons learned from past major incidents are not lost. They help all countries that have nuclear power stations to implement IAEA-recommended safety standards.
- As an example, many of the countries of the former Soviet Union are now involved with the IAEA and are using the Agency's expertise to establish effective regulatory regimes and implement up-to-date safety procedures. The IAEA continues to monitor the progress that each country is making, and so keeps international pressure on them to meet the expected standards for safety.
- The level of international cooperation is reflected in the fact that there are now five international nuclear safety conventions. Some of them are new, but others, such as the International Convention on the Physical Protection of Nuclear Material, have simply been strengthened. This convention, for example, used to cover only the protection of nuclear material while in temporary storage and/or transport within any one country. It now also applies to the international movement of nuclear material.
- Another new focus of the IAEA is on the safety and security of research reactors. Past safety-related efforts were directed primarily at nuclear power generation facilities. However, concern has increased in recent years over the potential for diversion of small amounts of nuclear material from research reactors, by terrorist groups, to make "dirty bombs." To prevent such incidents, the IAEA has developed safety standards for research reactors and is actively pushing countries to adopt these new standards.
- Another emerging safety issue that the IAEA is watching, and working on, is the impact of reactor aging on safety. Many of the world's first commercial nuclear reactors are reaching the end of their anticipated operational lives, but refurbishment is keeping some of them going longer than expected. Others are being decommissioned, which presents a different set of safety concerns.
- The IAEA is also monitoring and making recommendations on how to address the loss of qualified personnel from the nuclear industry, as well as the safety implications of privatization in the nuclear power generation sector.
- Since the terrorist attacks of September 11, the security of nuclear power plants has been cause for increased concern around the world. The IAEA is establishing guidelines for countries to follow in the areas of prevention, detection and response. Country studies help to identify any areas of particular vulnerability and the IAEA experts do follow-up reports, again to encourage continual improvement.
- Since 2002, the IAEA has maintained a Nuclear Security Fund to assist countries of the former Soviet Union improve their security measures with regard to all nuclear materials. The fund relies entirely on voluntary contributions from IAEA member countries. To date, the \$US32 million fund has received donations from 17 countries, including Canada (\$2 million). The money is being used for training, to help establish strong regulatory systems, to improve border security and to help support physical protection measures. Azerbaijan, Armenia and Kyrgyzstan have all had help from the fund.

- The IAEA representatives noted that Canada's contribution to the Nuclear Security Fund lapses in 2006 and asked that Committee members urge the government to make a new donation. They further asked that the next donation be a "universal" one, rather than being tied to any one program, so that the Agency would have more freedom to find the best place to invest the funds, as situations change and new challenges arise.

United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)

- UNSCEAR is the organization that collects and analyses data from a wide variety of sources on the health effects of exposure to ionizing radiation. They use the scientific data to establish exposure standards.
- The organization started out as a follow-up to the war-time exposure of people to atomic radiation – primarily the people of Nagasaki and Hiroshima. They have conducted long-term studies of the epidemiology of cancer risk to survivors of Hiroshima and Nagasaki.
- The Committee heard that there were an estimated 86,000 survivors of the war-time bombing. Of those survivors, there have so far been 7800 deaths due to cancer. Perhaps surprisingly, only 5% of those deaths (350 people) can be attributed to excess radiation from the atomic bombs. UNSCEAR's conclusion is that radiation is a very weak carcinogen at the levels experienced by the survivors.
- One finding that the UNSCEAR studies have reported that is a surprise to many is the apparent increase in the risk of heart disease in patients getting radiotherapy treatments. This is a new, and as yet, tentative finding, and the organization will be doing follow-up studies to see if the correlation proves out.
- UNSCEAR has also been following the health impacts of the Chernobyl accident. In 1988, UNSCEAR reported that there were 30 immediate deaths (28 from extreme radiation) and 115 deaths from acute radiation sickness in the weeks and months following the Chernobyl accident.
- In 2000, UNSCEAR studied 1800 cases of thyroid cancer in children exposed to radiation as a result of Chernobyl. These children were not exposed directly, but rather through the food chain (contaminated milk). By 2005, UNSCEAR had found 4000 cases of thyroid cancer in exposed children, and only 9 deaths. Thyroid cancer is a treatable disease with a relatively high treatment success rate.
- The Committee was told that, aside from these findings, there is no evidence of a major public health problem attributable to radiation 14 years after the incident. Even the incidence of leukemia, which some experts had anticipated to increase, does not appear to have occurred (even among people involved in the Chernobyl clean-up efforts).
- The UNSCEAR representative did acknowledge that, while the health impacts of Chernobyl are much less than expected, a certain amount of luck was involved. If the wind had been blowing in a different direction on the day of the accident, many of the 30,000 people living in the town of Pripyat, near Chernobyl, could have perished due to acute radiation sickness in the days and weeks immediately after the accident.

- While UNSCEAR will continue to monitor the Japanese survivors and those exposed at Chernobyl, it will also be active in other areas of study. For example, UNSCEAR will update data on natural, man-made and occupational exposure rates; examine the effects of new medical procedures involving very short time, high-dose exposure to radiation; examine the effects of radiation on the non-human environment (radiobiology); study the impact of naturally occurring radon in homes; and begin to assess the cancer risk from newly identified cellular responses to radiation. They will also continue to study the relationship between radiation exposure and non-cancer diseases (such as heart disease).

Organization of Petroleum Exporting Countries (OPEC)

- The Committee had set a precedent in 2001 by becoming the first Canadian Parliamentary delegation to visit OPEC headquarters. This return visit was welcomed by both the Committee and OPEC officials, including the Acting Secretary General, who reviewed the origins and the objectives of the organization.
- The OPEC Statute declares that the aims of the organization are: policy coordination with both OPEC members and non-member producing countries; ensuring stable oil prices in the international market; securing a steady income for OPEC producers; ensuring consuming countries of an adequate supply of oil; and, guaranteeing a fair rate of return for those investing in oil production.
- The Committee was given presentations on OPEC's view of both the short-term and the long-term world oil market outlook and had the opportunity to discuss some of the issues raised. With respect to the short-term market, the Committee was told that a key feature is the stronger than expected growth in the world economy (5.1% in 2004 and 4.1% in 2005). This was accompanied by a consequent 2.8 million barrel/day (b/d) increase in demand for oil in 2004, and a 1.6 million b/d increase to date for 2005.
- The greatest increase in demand for oil was from China, which has been experiencing 40% year-over-year increases, making it the world's second largest consumer. OPEC officials noted that future demand growth in China is proving very hard to predict and adds volatility to the world situation.
- Despite fears in OECD countries, OPEC assured the Committee that the supply is available to meet expected short-term demand. Current OPEC stocks are about 321.4 million barrels (mb), which is 34 mb more than at the same time last year and higher than the average over the last five years. This represents a 20.2 day supply.
- According to OPEC, crude oil supply is not the cause of current price spikes. The problem lies with refinery capacity, which has not grown apace with demand for refined products (especially gasoline). For example, they estimate that world gasoline stocks are at an all-time low, of 194 mb, which is 5 mb below the five year average. Damage to U.S. production and refining facilities, combined with speculation based on the fear of supply shortfalls is also causing a run-up in crude oil prices.

- Officials are obviously aware of the public perception that OPEC is pushing prices up for their own financial gain. They counter this perception with a number of publications showing who benefits from an increase in the price of a barrel of oil. These show that G7 countries get more money in taxes from each barrel of oil sold than do OPEC producers.
- According to OPEC predictions, any modest supply constraints now being felt (because of Hurricane Katrina) will ease in 2006 as production in the Gulf of Mexico returns and as OECD countries use their Strategic Petroleum Reserves to offset lost production. They predict that the price of crude oil will settle somewhere near \$50 per barrel.
- The long-term world oil outlook is, as one would expect, somewhat more uncertain. While OECD countries are concerned about “security of supply,” OPEC worries about “security of demand.” What is clear is that demand will grow (from 84 mb/d today, to 111 mb/d by 2025), fueled largely by the growth of less-developed countries including China and India.
- Most of the anticipated growth will be in the transport sector and so the issue of adequate refinery capacity to supply gasoline will be crucial, both in the short term and in the longer term. In fact, the Committee was told that OPEC expects bottlenecks in the downstream oil industry (i.e. refining) rather than oil supply to be the prime factor in price volatility.
- The scale of the potential growth in demand was explained using a few figures. Currently in the U.S., there are between 500 and 700 cars per 1000 people. The comparable figure for China at the moment is 10. Given its huge population, as China’s economy grows and the number of cars per 1000 people moves in the direction of the U.S. figure, overall world demand for gasoline will skyrocket.
- Over the long term, OPEC is optimistic that oil supply will be adequate to meet demand. Higher prices and new technologies will ensure that more of the existing resource base is extracted, and will also encourage greater production from non-conventional oil sources such as Canada’s oil sands.
- OPEC is acutely aware of the environmental concerns associated with continued reliance on fossil fuels. They believe that better technology will help to address concerns over rising emissions, especially from the transportation sector.
- With regard to emissions from stationary sources, OPEC is very interested in carbon sequestration technology, such as that being demonstrated in Weyburn, Saskatchewan. In fact, the Committee heard that OPEC considers this such an important issue, that it is contemplating joining the IEA’s (International Energy Agency) carbon capture and sequestration program.
- OPEC is making a contribution to reducing GHG emissions by encouraging (very successfully) its members to reduce gas flaring. The gas not being flared is beginning to be used to produce LNG (liquefied natural gas) for export. In the future, OPEC sees its members as becoming an important part of the emerging international market for LNG.

CONCLUSION

- During the fact-finding mission, Committee members were able to meet and exchange ideas with experts from across a broad range of organizations. Discussions ranged from the inadequacy of Canadian nuclear liability insurance requirements to the International Energy Agency's response to the impacts of Hurricane Katrina on the world price for oil.
- Committee members were brought up to date on the status of international nuclear safety and security issues, progress on radioactive waste management and the outcome of long-term studies on the health impacts of the Chernobyl accident.
- A meeting with senior officials of the Organization for Petroleum Exporting Countries (OPEC) allowed the Committee to strengthen the relationship it had begun with this important organization during a previous (2001) visit. The insight provided by the organization whose members are responsible for 40% of the world's current oil production and which hold 80% of the world's oil reserves, will be invaluable to Committee members in their future work with the Committee.
- All of the objectives that the Committee set out to achieve were met and, in most cases, exceeded.

APPENDIX A

**List of participants who addressed the Standing Senate Committee
on Energy, the Environment and Natural Resources
Paris and Vienna
September 5 – 10, 2005**

MONDAY, SEPTEMBER 5, 2005

National Agency for the Management of Radio-Active Waste
Jacques Tamborini, Director of International Affairs.

Nuclear Energy Agency

Luis Echàvarri, Director General;
Gail H. Marcus, Deputy Director General;
Thierry Dujardin, Deputy Director, Science and Development;
Takanori Tanaka, Deputy Director, Safety and Regulations;
Hans Riotte, Head of Division, Radiation Protection and Waste Management;
Javier Reig, Head of Division, Nuclear Safety;
Julia Schwartz, Head, Legal Affairs;
Karen Daifuku, External Relations and Public Affairs.

TUESDAY, SEPTEMBER 6, 2005

Permanent Delegation of Canada to the Organisation for Economic Co-operation and Development (OECD)

The Honorable Jocelyne Bourgon, Ambassador, Permanent Representative to the OECD;
Ross Glasgow, Counsellor.

Organisation for Economic Co-operation and Development (OECD)

Donald J. Johnston, Secretary General;
Sveinbjörn Blöndal, Head, Structural Policy Analysis Division, Economics Department.

International Energy Agency

Claude Mandil, Executive Director;
Noe van Hulst, Director, Office of Long-Term Cooperation and Policy Analysis;
Jun Arima, Head of Section, Country Studies;
Rick Bradley, Head of Section, Energy Efficiency and Environment;
Kenji Kobayashi, Director, Office of Oil Markets and Emergency Preparedness;
Lawrence Eagles, Head of Section, Oil Industry and Markets;
Neil Hurst, Director, Office of Energy Technology and Research and Development;
Antonio Pfluger, Head of Section, Energy Technology Collaboration.

WEDNESDAY, SEPTEMBER 7, 2005

Canadian Embassy in France

Claude Laverdure, Canadian Ambassador to France.

OECD Environment Directorate

Lorents Lorentsen, Director;
Christian Averous, Head, Environmental Performance and Information Division;
Tom Jones, Head, Global and Structural Policies Division;
Cristina Tebar Less, Acting Counsellor, Global and Structural Policies Division;
Kristen Haddock-Guichenal, National Policies Division;
Candy Stevens, Sustainable Development Expert.

THURSDAY, SEPTEMBER 8, 2005

Permanent Mission of Canadian Delegation to the International Organizations in Vienna

Ingrid Hall, Ambassador and Permanent Representative from Canada;
Scott Proudfoot, Alternate Permanent Representative of Canada;
Peter Elder, Counsellor, Nuclear Affairs.

International Atomic Energy Agency

Vilmos Cserveny, Director of External Relations and Policy Coordination;
Yoshio Taniguchi, Deputy Director General of Nuclear Safety and Security;
Ken Brockman, Director, Nuclear Installation Safety;
Eliana Correa da Silva Amaral, Director of Radiation, Transport and Waste Safety;
Ann-Margaret Eriksson Eklund, Office of Nuclear Security;
Hans Forsstroem, Director, Nuclear Fuel Cycle and Waste Technology;
Yuri Sokolov, Deputy Director General, Department of Nuclear Energy;
Paul Martin, Section Head & Manager, Environmental Sciences.

United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) Secretariat

Malcolm Crick, Scientific Secretary, United Nations Committee on the Effects of Atomic Radiation.

FRIDAY SEPTEMBER 9, 2005

Organization of the Petroleum Exporting Countries

Adnan Shihab-Eldin, Acting Secretary General;
Mohamed Hamel, Head, Energy Studies Department;
O. F. Ibrahim, Head, Public Relations and Information Department;
Mohammad Alipour-Jeddi, Head, Petroleum Market Analysis Department, and Experts,
Research Division.

Trade Commissioner Service, Embassy of Canada

Pamela Hay, Senior Trade Commissioner;

Nicole Mothes, Trade Commissioner;

Philipp Wieltsching, Trade Commissioner.