

# PATHS TO A NEW CENTURY

## PERSPECTIVES ON NUCLEAR DEVELOPMENT 20 YEARS AGO



*When the IAEA's second Director General -- Dr. Sigvard Eklund -- passed away just over a year ago, in January 2000, the international community paid tribute to a distinguished and dedicated leader for peaceful nuclear development. His work as Director General of the IAEA for twenty years -- from 1961 to 1981 -- was commended by IAEA Member States throughout the world. Upon his retirement in 1981, the Agency's Board of Governors conferred upon him the title of IAEA Director General Emeritus for his enviable record of leadership and achievements as a statesman and scientist.*

*In one of his last official statements as IAEA Director General -- to the United Nations General Assembly in New York on 10 November 1981 -- Dr. Eklund surveyed the global nuclear landscape in the context of the Agency's work. Selected excerpts from that statement are reprinted here in honour of his rich legacy and lasting contributions to the IAEA and international service.*

In 1961, the peaceful uses of nuclear energy were just beginning to show their promise with a few small nuclear power plants operating in a few countries. At the end of 1980, there were 253 nuclear power reactors in operation in 22 Member States of the IAEA, generating 8% of the world's electricity. It is possible to forecast with a high degree of probability that this figure will rise to 17% by 1985. This corresponds to what could be produced by burning the whole annual production of oil from Saudi Arabia as known at present. Thus, it is evident that nuclear energy is making a significant impact in reducing the need to burn fossil fuels. Nuclear energy is helping to take the pressure off oil supplies.

During these two decades a comparable maturity has also been achieved in the use of other nuclear techniques in the fields of agriculture, medicine and industry. Besides, several countries have mastered the technical problems of the fast breeder reactor which would make the potential supply of nuclear energy virtually unlimited. The first full-scale breeder is expected to be in operation within two years.

We are also beginning to see renewed interest in the use of nuclear reactors as sources of district and space heating which absorb almost half the energy consumption in countries in cold climates.

Nuclear power plants depend on fuel cycle services to provide them with fuel and to process spent fuel and waste. In 1961, only some nuclear-weapon States had the capability to enrich uranium. This technology was a closely guarded secret and, at that time, enriched uranium was provided to the nuclear power industry by only one of these countries. Today, some ten countries have developed or are developing various technologies for enrichment and commercial supplies are already available from several of them.

In 1961, only the four nuclear-weapon States were operating plants for reprocessing spent fuel. This was chiefly in order to obtain plutonium for nuclear weapons. Today, pilot-scale or commercial reprocessing is already being undertaken or will shortly be undertaken in more than ten countries to meet fuel cycle requirements for peaceful nuclear programmes.

Here, it is worth recalling that this process of evolution has been achieved without the loss of a single life from the operation of the nuclear components of the power plants for civil use and without a single serious emission of radiation to the public even at the worst accident that has so far been witnessed.

But, as you all know, in recent years the long-term

future of nuclear energy has become uncertain in some countries. In the United States, for example, which did so much to pioneer nuclear power, no new nuclear power plant has been ordered during the last four years, many have been cancelled and no new orders are in prospect. Several other industrial countries are facing similar situations with new orders falling off and many existing orders being deferred or cancelled. It is paradoxical that this turn should have taken place at a time when the energy scene had worsened and the need for alternatives to oil had clearly become more and more acute.

To a major degree, the nuclear decline could be ascribed to slower-than-foreseen growth in electricity demand and to high interest rates adversely affecting capital-intensive construction projects. But, at the same time one cannot deny that public resistance has played some role in the rejection of the nuclear option by some countries and in the long delays being experienced in others: the time needed to build a new nuclear plant in the United States, for example, has now stretched out to some twelve to fourteen years compared with half that period in France and Japan. In these circumstances, it is not surprising that nuclear electricity costs half as much as coal-generated power in France but that the balance is sometimes tipped the other way in the United States. To illustrate, let me refer to the Director of the French Electricity Commission who recently said that some days in the summer they run only on

nuclear and hydro -- in other words, all of France's electricity is now sometimes produced only by nuclear plants and hydro-electric stations.

Nowhere is the impact of the energy crisis felt more strongly than in the developing countries where the high cost of oil and coal has often reversed the trend of economic growth.

Nuclear power has so far done little to mitigate this problem. It contributed only 1% of electricity production in the developing world last year. Presently, only four developing Member States of the Agency are operating nuclear power plants and by 1990, this number may increase to a maximum of ten. The prospects of the introduction of nuclear power in developing countries would improve however, if smaller nuclear power plants were on the market. The Agency has been encouraging this development and a renewed interest in the nuclear industry on the design of such plants is visible.

Meanwhile, as I have mentioned on several occasions, an expansion of nuclear power in the industrial countries could help relieve the pressure on oil demand and oil prices, thus indirectly helping the oil-short developing countries. Easing of pressure on oil demand and costs would help the developing countries to build up their conventional generating systems to the size and maturity which would justify the introduction of nuclear power.

Another related matter is the safety of nuclear power plants. In this sphere, the Agency is now well advanced in a

programme to provide internationally agreed guidelines on the design, construction and operation of nuclear power plants. The IAEA is also expanding its field activities and its ability to assist Member States in the event of nuclear emergencies.

#### **Technology Transfer.**

Technical assistance or as we now refer to it, technical cooperation, is one of the main functions of the IAEA and the Agency has had notable success in helping the developing countries to introduce a wide range of nuclear techniques in the fields of agriculture, medicine, hydrology and industry. The recent growth of the Agency's technical assistance programme, of which the outlay will nearly double between 1980 (target \$10.5 million) and 1983 (target \$19.0 million) has been particularly gratifying. Recent developments in the IAEA have shown that the developing countries are now becoming increasingly conscious of the contribution that nuclear science and technology can make to their economic and social progress. Many of our Member States from the developing areas of the world have come of age in the nuclear field and now wish to have a larger voice within the Agency.

**Safeguards.** May I now turn to another main area of the Agency's work, namely, safeguards. The Agency's responsibility in this sphere results both from its Statute and the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). A few years ago, it seemed as if the number of Parties to the NPT had

reached its ceiling. However, there have been recently encouraging additions, particularly from the developing world. Notable additions include Sri Lanka, Bangladesh, Indonesia, Turkey and this Spring, Egypt. As several of these countries are in regions of tension, their willingness to accept the NPT is of considerable significance. It goes without saying that it is of utmost importance that NPT or full-scope safeguards are universally accepted by all nations of the world.

The Agency is now applying its safeguards at all nuclear installations in the non-nuclear-weapon States which are parties to the NPT as well as at all nuclear facilities of which the Agency is aware in seven non-NPT countries.

For the past five years, the Agency has been making a detailed statistical analysis and evaluation of the effectiveness of its safeguards operations and in no case has the Agency detected any discrepancy which would indicate the diversion of a significant amount of safeguarded material. It has thus concluded that all such material has remained in peaceful nuclear activities or has been otherwise adequately accounted for.

I should like to note that, of the group of countries which have not yet acceded to NPT, there are a few which are engaged in significant nuclear activities with existing or potential capability of producing nuclear explosive material. These activities are not subject to IAEA safeguards. This is a cause of serious concern.

May I now turn to another issue -- the problem of the spread of nuclear weapons. Twenty years ago in 1961, there were four nuclear-weapon States. In 1964, they were joined by a fifth. Since then, this number has remained unchanged. In 1974, one other country demonstrated that it had mastered the technology of a nuclear explosive device. To keep the matter in perspective, one must remember that the five nuclear-weapon States have carried out more than 400 tests of nuclear weapons since this solitary explosion in 1974 by another State.

We must conclude that international efforts to limit proliferation of nuclear weapons to the five nuclear-weapon States have so far, and I emphasize, so far, been remarkably successful considering that during this period, some twenty or more countries have increased their industrial nuclear potential considerably. In broad perspective, it may be said that this achievement has been chiefly due to a favourable international political climate. In 1961, East-West relations were strained and cold war tensions marked the debates in the Agency and inhibited the initial development of an international safeguards system. Fortunately, with emerging detente and growing mutual understanding, a major step forward was made possible with the conclusion of the NPT which entered into force in 1970.

Here, I believe it is timely to recall the fundamental importance of cooperation between the nuclear-weapon

States members of the Treaty not only for a viable non-proliferation regime but also for the fulfillment of the nuclear arms control commitments under Article VI of the Treaty. In a broader sense, a spirit of cooperation on all sides is indispensable for successfully overcoming any proliferation problems that may arise in future and for the efficient conduct of the IAEA's task, under the NPT, of verifying the absence of diversion or detecting any diversion that may take place. If I may add, the NPT should truly be regarded as based and nourished on mutual trust between the nuclear and non-nuclear-weapon States and the fulcrum of international cooperation aimed at sustaining and strengthening the non-proliferation regime.

**Challenges.** The greatest challenges to be met in the nuclear field in the years ahead lie in three directions:

Firstly, there is the future of nuclear energy itself. If the present trends persist, a time may come when the overwhelming relevance of nuclear energy in some countries may only be in terms of military uses. I trust this will not happen. As I stated at the Agency's General Conference last September, as a member of the scientific community, I believe that in the long term, logic and reason must prevail. Those who are truly concerned about protecting the environment and safeguarding our health and safety will come to perceive that amongst the energy options available to us today, the nuclear path is the one likely to be least damaging to the environment and the

only one that does not carry the risk of long-term climatic change. I, therefore, expect that taking a long view, the disadvantages of the alternatives as well as the imperative need for adequate energy supplies are perceived, not only by the political leaders who have repeatedly at recent summit meetings reaffirmed the importance they attach to nuclear power, but also by the general public whose fears have been played upon and who have been offered the illusion that there are "soft" paths out of prevailing energy difficulties.

This question is also crucial for the second main challenge, that of bringing nuclear technology within the reach of more developing countries and helping those that have already introduced it in their national programmes. Their problems are essentially those of finance, infrastructure and trained manpower rather than those of coping with environmentalist opposition. Our success in meeting this challenge will depend to a large extent on whether or not there is a healthy nuclear industry in the industrial countries and foresight to share new technological developments with the developing countries.

The third main challenge is the one I have already touched upon, the support and extension of a viable non-proliferation regime. Of all the services that the IAEA can render to the international community, this, in my view, is the most important. Let us not forget the dangers of proliferation. In the long term, they would be second only to the danger of a nuclear war. Whether or not proliferation is

effectively discouraged will depend chiefly on the actions and policies of the most powerful nations. The ideal would be the full and universal application of the non-proliferation regime in spirit as well as in letter, either by universal acceptance of the NPT, full-scope safeguards or full application of regional agreements like the Tlatelolco Treaty. The nuclear policies of the countries that are today operating unsafeguarded facilities capable of producing weapons material are imbedded in acute political tensions of their regions. The arms control and disarmament measures foreseen in the NPT are unrealized and, in particular, we seem to be no nearer to the crucial step of a comprehensive test ban which because of its non-discriminatory feature will attract wider adherence and thereby strengthen the non-proliferation regime.

We also have to bear in mind that the day may come when one or more non-nuclear weapon States may feel inclined, for whatever reason, to test nuclear explosives. It is to be hoped that countries that are or may soon be producing unsafeguarded nuclear explosive material understand that such a course would detract from instead of adding to their national security; in other words, one must hope that wisdom and restraint will prevail.

Looking ahead, we have to be realistic and not close our eyes to the possibility of some unwelcome eventualities in connection with the nuclear industry. For instance, even with all available precautionary means, the possibility of a

significant nuclear accident cannot be totally ruled out.

**Personal Perspectives.** May I be permitted now to include a few words from my own perspective as a nuclear scientist who has been involved in the design and development of nuclear power plants.

In the contemporary world, modern science and technology has deeply and irreversibly altered the pattern of our lives. In stimulating change and innovation, in promoting the birth of new industries and launching of vast new projects, science and technology has brought unprecedented prosperity to part of the globe and, for the first time in history, it has raised hopes in the less fortunate and more populous part of the world that it may also aspire to a tolerable standard of human life. It is my firm belief that nuclear science and technology can play some part in meeting this aspiration.

At the same time, as we all know, nuclear science and technology has also given us the means of destroying ourselves. These are tens of thousands of nuclear warheads which have been developed for destructive purposes. If nuclear proliferation and the current arms race are not checked, we might soon face the spectacle of seeing the rest of the world exposed to greater peril. Already, in the course of just 25 years, the explosive power of the nuclear arsenals has grown more than a thousand-fold and represents an explosive power corresponding to some three tons of conventional explosives for every man, woman and child

on this globe. And, military expenditure -- which annually already exceeds \$500 billion worldwide -- continues to grow at an annual rate far exceeding \$20 billion, wastefully consuming valuable material and human resources so desperately needed for the improvement of the conditions of human life in the greater part of the world.

Undoubtedly, science and technology offers us unlimited opportunities -- for good and evil -- but, in the ultimate analysis it is surely up to us, the people, to make the moral and political choices and, since the threat to humanity is the work of human beings, it is up to man to save himself from himself. Over long years, much has been said on the subject of nuclear arms control but little has been done in reality. The task is no doubt formidable but there is none before us that deserves a higher priority.

There is no nation, great or small, whose record is so unblemished that it can be trusted with a weapon capable of wiping us all out. In a world in which nations are often moved by passion rather than reason, divided by culture, race or ideology and deep mistrust of each other, the existence of great nuclear arsenals is surely not compatible with survival. Nor, as pointed out in the Final Document of the First Special Session of the General Assembly on Disarmament in 1978, can enduring international peace and security be built on the accumulation of weaponry by military alliances or sustained by a precarious balance of deterrence or doctrine of strategic superiority. The world today stands on the

brink of an abyss. Never before has mankind been in such grave peril. A nuclear war would mean the end of civilization and could lead to the extinction of the human race. It is thus evident that the highest priority of international diplomacy should be to ensure that we do not, through our own folly, go over the edge.

Here, may I recall to your minds the Russell-Einstein Manifesto of 1955. The idea that the scientific community should be actively concerned about the dangers to humanity which arose largely through the work of scientists themselves, was conceived by Bertrand Russell and was immediately endorsed by Albert Einstein. In fact, his signature to the Manifesto was one of the last acts of his life. While specifically calling upon scientists to assemble in a conference to discuss the means of averting the danger, the Manifesto urged Governments to realise that mankind had entered a new phase in which disputes must be settled by peaceful means because there would be no victors in a nuclear war. The Manifesto also contained a powerful and moving appeal to the general public in the following words: "We are speaking on this occasion, not as members of this or that nation, continent, or creed, but as human beings, members of the species of Man, whose continued existence is in doubt ... We shall try to say no single word which should appeal to one group rather than to another. All, equally, are in peril, and, if the peril is understood, there is hope that they may collectively avert it."

Our future, our civilization, our lives, are at stake. If we had a Bertrand Russell or an Albert Einstein today, they would certainly have felt compelled to issue a new Manifesto, a new appeal to the conscience of the world, in far sterner terms. I am pleased to note that there are many institutions in the world today seized with this problem and their activities should be supported. The fact is that there must be an end to the madness of the nuclear arms race, a halt on the slippery slope of annihilation. This is my deepest conviction and I should like to conclude my last address in this Assembly with an earnest appeal to you and to the Governments you represent, in their own interest to subordinate all other aims to that of bringing the nuclear arms race under control before it is too late.

Lastly, may I express my deep sense of gratitude to all Member States of the United Nations for the understanding, consideration and unfailing courtesy shown to me in all the 20 years that I have had the honour to address the General Assembly. I am sure you will extend the same consideration and courtesy to my compatriot and successor, Dr. Hans Blix.

As I now take leave of you, you have all my best wishes for success in your collective endeavours to preserve and strengthen world peace and security and to promote international amity, understanding and goodwill and equally in your efforts in the cause of urgently needed economic and social progress in the developing world. □

