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WELCOMING ADDRESS

Johny LAHURE
State Secretary for Economic Affairs of the
Grand Duchy of Luxembourg

Mr Commissioner, Mr Chairman, Ladies and Gentlemen,

It gives me great pleasure to welcome you, on behalf of the Luxembourg Government and myself, to the Second Conference on Radioactive Waste Management and Disposal. The Conference will concentrate on five main themes and, given the importance and interdependent nature of the subjects to be covered, will last five days.

In giving the welcoming address I have the advantage of not needing to go into technical detail. I must, however, exercise a certain minimum amount of caution.

Otherwise, I might find all too quickly that I am out of my depth addressing a very technical conference attended by a good number of eminent experts actively involved in the field.

I hope nevertheless that you will allow me, as the government spokesman of the host country, to make a few brief comments before the conference proper gets underway.

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From the Community viewpoint, the conference will, by considering the various questions and their ramifications, establish meaningful links between subjects which, although seemingly dry and technical, in reality have a direct bearing on various strands of Community policy, namely energy policy and its technological and economic aspects, and environmental policy, which necessarily includes ecology.

I should like to draw your attention to four points that are fundamental to a rational and effective Community approach.

On 17 January, the European Parliament adopted a Commission proposal for a new, shared-cost (over the medium term) multiannual research programme in the field of radioactive waste.

Thus this conference would appear to have come at the right time.

Secondly, it must be stressed that the subjects covered form part of an interrelated complex involving energy, technology, the vast research programme and environmental protection as a whole.

Your work - to demonstrate the interrelationships and the basic need for action work and to emphasize the community nature of the right approach - is of fundamental importance to the Community.

International cooperation is of the essence, since analysis of scientific problems of such magnitude requires the finest brains.

Lastly, I should point out that this is a logical continuation of a process the Community started years ago.

The number of Commission documents in the field is enormous but I will only mention the document of 9 February 1982, outlining a Community energy strategy in the nuclear field which provides an excellent description of various problems, including those relating to radioactive wastes produced throughout the nuclear cycle, and covers the subject in depth.

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Mr Chairman, ladies and gentlemen,

having briefly outlined the European and international aspect, I should like to underline the importance of ecology in this field.

My government intends - and I am pleased to note that this is also one of the questions with which you are concerned - to implement a programme of priority environmental measures.

Obviously, it would be inappropriate to go into details at this stage but I can nevertheless say that particular stress will be placed on waste management, prevention policy and environmental protection.

I should now like to look briefly at the question from a philosophical point of view.

The existence of the ecosystem, as a living and organized unit, is now a well accepted basic principle.

Several thinkers, particularly Edgar Morin, a sociologist and philosopher, teach that various elements are striving to establish a delicate balance : i.e. objective scientific knowledge and ultimate goals on the one hand, and the position of man and the requirements of nature on the other.

It is my belief that your work will throw more light on the numerous interrelationships involved which are essential to our overall understanding of the world in which we live.

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Ladies and gentlemen,

To conclude my address, I would like to say three things :

- I thank you sincerely for having chosen to hold your Second Conference in the capital of the Grand Duchy, with its long history of Community involvement.

- I wish you every success in your work, which I consider fundamental, and hope that it will produce the desired response.

- Lastly, I will be happy if at the end of the Conference, all concerned can look back with general feelings of satisfaction on the five days of technical and economic discussions.

Thank you

OPENING ADDRESS

N. MOSAR
Member of the Commission of the European Communities

One of the basic aspects of our industrial society is the ability to convert available natural resources into useful energy. Since the invention of the steam engine, we have developed and exploited new and more economical sources of energy. We thus have a wide range of different primary energy sources today, mainly coal, oil, natural gas and nuclear energy, which meet most of Europe's needs.

The utilization of these primary energy sources and the extent to which they cover overall requirements depend primarily on price, on local or regional availability and on the technical feasibility of exploiting them - but the level of useful reserves, socio-economic conditions and environmental considerations play an increasingly important part. When planning for our medium and long-term energy supplies, we must therefore use our energy resources economically and rationally, and we cannot abandon any source of energy. This also holds true for nuclear energy which, together with coal, provides our electricity needs.

The trade and industry which provide a living for the vast majority of the people of Europe have always produced harmful waste. Some dangerous substances produced by the chemical industry, the textile industry, the iron and steel industry and conventional power stations are still today released into the environment, especially by old installations, in the form of waste gases or water. Nuclear energy also produces dangerous waste.

What is the difference between nuclear waste and other dangerous substances?

1. Unlike toxic metals such as cadmium, lead and mercury, certain radioactive components of nuclear waste do not occur in nature, although sources of similar natural radiation, although with very low radioactivity levels, are present everywhere in the environment, and even in the human body.
2. All radioactive substances ultimately become non-radioactive, so that in one generation most of the radiation from nuclear waste will have disappeared.

Nuclear waste also differs from the waste produced by other industries in that the quantities, their properties and the effects on the environment are perfectly well known, and since nuclear energy was first used techniques have been developed to remove nuclear waste from the environment and from society.

As early as 1957, the Treaty establishing the European Atomic Energy Community laid down basic standards for ionizing radiation and for limiting the release of radioactive substances into the environment, even though the Community's first nuclear power station did not begin operating until four years later.

Why, then, is non-nuclear waste treated differently?

Dangerous nuclear waste can be stored because:

- Firstly, nuclear power stations use very little fuel to produce large amounts of energy. Understandably, therefore, they produce only very small amounts of waste, the safe isolation of which has proved perfectly feasible.
  Conventional power stations, on the other hand, produce such large amounts of gas and ash that it is virtually impossible to remove all dangerous substances.

- The second reason why radioactive waste is treated differently is that the effects of radioactivity on man and his environment were known even before nuclear energy was used. It was therefore possible to develop effective safety measures and incorporate them in the design of the first reactors. Since then there has been further substantial progress in the field of reactor safety.

If our health and environment are so well protected, why do we continue pouring money into waste management and research in that field?

Over a long period, waste gradually accumulates in nuclear installations and in temporary stores. Although most of the radioactivity disappears quite quickly, it takes thousands of years before waste with the longest half-life can be considered safe.

We therefore have to find a way of isolating it from the environment with no need for human intervention. Such conditions, providing safe storage for thousands of years without the need for human control, can be achieved only by disposal underground. Geological formations which are very unlikely to be disturbed over the next thousand years by earthquakes or other natural causes, or by human activity are found only at great depths below the surface of the earth.

Nevertheless, not content with trusting geological strata, we shall also encase nuclear waste in very tough containers.

The design of such a system of barriers and the careful examination of all matters relating to safety are the primary objectives of our research programme. In order to work as efficiently and as realistically as possible, the Commission will develop and exploit, together with certain Member States, large experimental installations in deep geological formations. For the first time experiments will be carried out on a small scale on the storage of highly radioactive "vitrified" waste. The prerequisite is that it must be possible, after the experiments, to remove the waste from the installations in completely sealed containers. The experience and know-how thus gained, as well as the other results of these research programmes, will be available to all Member States.

The effectiveness of the Community's activities in this field is known outside Europe and was emphasized by the Council when the third programme of research was adopted at the beginning of the year.

Over the next few days you will gain an overall impression of the results obtained, and will be able to discuss them. I would ask you to examine carefully the results and conclusions reached before any further steps are taken towards the permanent removal of radioactive waste.

We wish to continue in this direction, basing our actions fully on the knowledge acquired and on the reliability of the new techniques developed. The available scientific know-how, our technical resources and the time devoted to this subject can totally exclude the possibility that waste management becomes a game of chance with dire consequences for future generations.

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Ladies and gentlemen, the technological and scientific problems which remain will require a great deal more work. It is all the more heartening, therefore, that we do not have to work in an uncoordinated way. The programme for this conference clearly shows that the researchers and research institutes of the Member States and of the Joint Research Centre are cooperating closely. In adopting the third programme of research, the Council recently confirmed that this cooperation is fruitful.

Let us not forget that national frontiers, customs duties and passport checks, which have still not yet been completely abolished after 28 years of the Community's existence, do not represent a barrier to the transport of dangerous substances by air and sea.

It therefore makes sense to establish a common front of science and technology to protect man and his environment in Europe. The spirit of cooperation which inspires research should also be present when final storage installations are designed and used in the future.

We regard such integration as one of the Commission's most pressing tasks, but we are aware that this will require patience, hard work and intuition on the part of our partners.

I would therefore like to thank very sincerely all those who have contributed towards the success of the Community programmes.

THE DEVELOPMENT OF NUCLEAR POWER AND THE RESEARCH EFFORT IN THE COMMUNITY

D.H. DAVIES, Commission of the European Communities, Brussels

Summary

The development of nuclear power in the Community is analysed at the light of the oil crisis which hit the world in 1973. Before 1973, nuclear energy was rapidly penetrating the market all over the world : nuclear power plants were being ordered in large numbers and the development of advanced nuclear reactors and of their fuel cycle was vigorously pursued in almost all industrialized countries.
In all logic the 1973 oil crisis should have quickned the pace of nuclear energy development; in reality the expected rapid expansion of nuclear energy in the most industrialized countries did not materialize. Despite the setbacks to the global pace of nuclear development, the nuclear energy's share of electricity production in the Community increased from 5.4% in 1973 to 22.4% in 1983.
To-day the installed nuclear electricity generating capacity is about 55 GWe and the nuclear energy's share exceeds 25%. In 1990 these figures should be about 100 GWe and 35% respectively.
The improvement of management of energy resources and the reduction of energy imports are some of the major goals to which Community research is directed. In this context, the further development of nuclear fission energy is considered as one of the main ways of reducing dependence on energy imports. The Community research strategy therefore provides for the consolidation and intensification of the research activities in the nuclear energy field. Among these research activities, the research effort deployed in the Community in the field of radioactive waste management is reviewed in more detail. Some achievements of the twelve year Plan of Action and of the multiannual R&D programmes are presented.

1. General Nuclear Power Situation

Dependence upon energy imports of the European Community has grown subtantially since 1950 in spite of the exploitation of North Sea Oil and gas : virtually all the increased dependence concerns oil.

Presently the European Community annually uses an amount of energy equivalent to approximately nine hundred millions tons of oil; of this 45 % is imported. The rest, that is approximately 55 %, is produced indigeneously. Of the energy which is imported, over 75 % is in the form of oil.

These data refer to the energy balance of the European Community as a whole. The situation is certainly not ideal. Individual Community Countries display significant variations with respect to the average, which makes the situation of some of them extremely dependent upon oil.

The predominant position gained by oil in the last few decades in the energy balance of the most industrialized Countries is a consequence of its flexibility of utilization, ease of transport and of storage. Furthermore oil was, until twelve years ago, a very cheap source of energy thanks to large and intensively exploited reservoirs. The 20th century has truly seen the triumph of oil.

The most developed Countries, shaped by the "oil civilization" which

gave them unprecedented prosperity, have been caught in a dependence upon a source of energy which is no longer under their control and yet continues to be the vital bloodstream of their economies.

Over the past twelve years remarkable developments perturbed the world energy scene and nuclear energy has experienced its fair share of upheavals. Twelve years ago the oil crisis hit the world. While it came as a great shock, it should hardly have been a surprise.

It is useful to recall that the early motivations for the development of nuclear energy included conservation of fossil fuel resources, particularly oil, and reduction of energy dependence.

The early motivations for the development of nuclear energy are as valid to-day as they were then. The search for other alternative sources of energy (solar, geothermal, wave, etc...) which has been undertaken in the meantime has the same motivations and is complementary to but not substitute for nuclear energy. The experience of the last decade has indeed confirmed the importance of diversifying the energy sources. This is particularly true for the European Community.

In this context, the development of policies in the nuclear energy field, over the last decade, appears paradoxical.

Before the 1973 oil crisis, nuclear plants for electricity production were being ordered in large numbers, all over the world, on economically competitive terms. Nearly all of the nuclear plants now in service (i.e. approx. 65 GW in the US, 55 GW in the European Community and 18 GW in Japan) were ordered before 1973 (*).

Not only was nuclear energy rapidly penetrating the market, but also the development of advanced nuclear reactors and of their fuel cycle was vigorously pursued in almost all industrialized countries. This was in recognition of the fact that uranium resources were limited, and hence had to be rationally utilized, and that sooner or later nuclear energy would have to be used for non-electrical applications (e.g. process heat, metallurgical processes, production of synthetic fuels) in order to conserve oil and gas currently used for these applications. The successful development of fast breeder reactors and of high temperature gas cooled reactors could, thus, contribute to solving the problems of uranium supply and of hydrocarbon conservation. In parallel, reprocessing and radioactive waste disposal technologies were also being developed and gradually applied.

The 1973 oil crisis brought home the tangible message that oil supplies could not be guaranteed and that too strong a dependence upon oil and, more generally, energy imports was a most undesirable situation for any country.

In all logic the 1973 oil crisis was a factor that should have quickened the pace of nuclear energy development. The strategic case for nuclear energy was in fact reinforced and the economic competitivity of nuclear energy with respect to fossil energy seemed bound to improve.

In reality, not all the expectations placed upon nuclear energy could be fullfilled and the then expected rapid expansion of nuclear energy in the most industrialized countries did not materialize.

It is not intended to suggest reasons for this. For the present purpose, it is sufficient to review, briefly, the current situation :

- Nuclear power plant construction rate has not kept up to expectations of the seventies in any of the Countries of the western world except

(*) With the notable exception of France, nuclear power stations now take longer than 10 years from decision to build to completion.

France. In the United States, for instance, so many orders have been cancelled in last ten years that the total gigawatts ordered to date are less than ten years ago. Cancellations amount to about 110 GW for a cost which is estimated at some 10 billion dollars.

- In the European Community the rate of ordering was more modest and the massive cancellations experienced by the United States have not occurred. The total capacity which has been reached at the end of the last year is approximately 55 GW (before 1973 the target was about 100 GW).
- The advanced reactor development programmes have been adversely affected in the last twelve years. High Temperature Gas Cooled Reactor projects have suffered serious setbacks : the 8 GW ordered in the United States between 1971 and 1973 were all cancelled between 1974 and 1976. The joint European effort for the development of this system (the Dragon Project) terminated in 1976. Only a few scattered efforts to continue the development of this most interesting reactor system are still pursued in Germany, the United States and the Japan.

The Fast Breeder Reactor system, on the other hand, has continued to be vigorously and purposefully developed within the European Community. Even so, it would be difficult to deny that its prospects of commercial introduction have receded considerably; (ten years ago, 1990 was considered a realistic date for its commercial introduction; to-day 2005 is mentioned more and more frequently). Signs of hesitation are not rare even among the supporters of the developments.

Despite the setbacks to the global pace of nuclear development, the nuclear contribution in the Community has grown steadily. From 1973 to 1983 the nuclear contribution towards meeting the Community's total demand for energy increased from less than 2 % to about 10 %. The nuclear energy's share of electricity production in the Community increased from 5.4% to 22.4% in this period. To-day the nuclear share in electricity production in the Community exceeds 25 %. Furthermore, the Community's nuclear power capacity accounts for about one third of the world capacity. These figures show that nuclear power has become an essential part of the Community energy strategy.

The European Community has strong incentives to continue the peaceful development of nuclear power and has been able to maintain steady policies to this effect in the difficult last ten years : the development of fast reactors, the reprocessing of irradiated fuels and radioactive waste disposal are still being actively pursued.

The Community strategy, approved by the Council of Ministers in February 1980, aims at "closing" the fuel cycle, by reprocessing the spent fuel with the following objectives :

a) to extract plutonium as an energy source and thus pave the way for its recycling, particularly in fast breeder reactors, the advantages of which in terms of availability of supply are well known (of course, the enriched uranium still contained in irradiated fuels is also recoverable).

b) to separate out the highly radioactive fission products and to condition them with a view to final dispoal compatible with safety and environmental requirements.

The strong incentives to continue the development of nuclear power and the investment programmes in the Member Countries should lead, by 1990, to an installed nuclear electricity generating capacity of about 100 GWe. At that time, this capacity will account for about 35 % of electricity production in the Community and meet about 14 % of the Community overall demand for energy.

Concerning the outlook for the nineties, the Commission has recently proposed the adoption of the following objectives for development of nuclear power :

(i) to produce about 40 % of Community electricity in 1995, and
(ii) subsequently, to increase its share in electricity production considerably after the turn of the century.

The 1995 target would require commissioning of some 25 GWe of new capacity between 1991 and 1995. This figure takes into account a loss of 3 to 4 GWe resulting from the decommissioning of old nuclear power plants which is likely to take place in the first half of the nineties. Therefore, in 1995, the total installed nuclear electricity generating capacity should be of 120 GWe.

As far as the development of fast breeder reactors is concerned, the Commission recognizes that these reactors are not yet economically competitive with thermal reactors. Nevertheless, it thinks that the advantages of having fast breeder reactors available after the year 2000 will be such that it would be injudicious to wait until difficulties with uranium supplies arise before preparing for their commercial introduction.

The Commission therefore welcomes the cooperative agreement for fast reactor development signed by five Community Member States (Belgium, France, Italy, Germany and United Kingdom) on 10 January 1984 and suggests, as for a target, that these reactors should aim to reach comparable generation costs to thermal nuclear plants by 2005.

It is clear that the above objectives will only be achieved through a substantial effort of research, development and demonstration which will clearly benefit from international cooperation.

2. Research Effort in the Community

In 1983, the Council of Ministers adopted a proposal by the Commission for a European Scientific and Technical Strategy, expressed in the first framework programme 1984-1987 in which are set out the major goals to which Community research should be directed .

Among these goals, the improvement of management of energy resources and the reduction of energy dependence are considered as essential if the Community is to face up to the energy challenge. In order to attain these major goals, the Commission recommended an approach centred on specific objectives with a view to :

- facilitating the implementation of the research specifically desired by the Member States;
- facilitating the subsequent adoption of action programmes for implementation by identifying and putting into order the priority needs of the Community and thus the relative weighting to be given to the corresponding scientific and technical objectives.

As far as improving the management of energy resources and reducing energy dependence is concerned, the Commission proposed to concentrate its effort during the period 1984-1987 on the following four scientific and technological objectives : the rational use of energy, the development of renewable energy sources, controlled thermonuclear fusion and the development of nuclear fission energy.

Concerning the nuclear fission energy, the Commission considered again its development as one of the main ways of reducing, through the diversification of energy resources, the Community's dependence on oil. The continuation of a resolute nuclear programme is therefore an essential aspect of European energy policy. The Community strategy provides