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National Commission on Atomic Energy

Dr. HUGO ERRAMUSPE

Participation of Nuclear Power in the Field of Energy

Every day the newspapers include information about the energy crisis. Fortunately, Argentina is in a position to say that it can supply most of its consumption through fossil fuel (the country produces 90% of what it consumes), or through any other means of energy production. Thus, the situation is that Argentina is supplying most of its demand.

However, in connection with the fields of energy, which has become a strategic area at present, the country has decided to elaborate a plan that would allow it to make the necessary provisions to face the uncertainties of the future and avoid any critical situation. The electric sector has for the first time in the country, elaborated a long-term plan up to the year 1995, extending to the year 2000, where several sources have been included, mainly hydroelectric and nuclear energy.

In most countries nowadays, the greatest participation, even in the electric sector, is rendered by fossil fuel. But the country is following a policy of substitution, resorting to the participation from the different sources of energy, as soon as possible, so as to reduce the fossil fuel to its minimum.

The first part of this plan stresses the importance of hydraulic energy. Those people who belong to the nuclear sector agree with the process that is being developed in the country. All the participants from the different sectors of the energy field find no antagonism or antimony in the participation of the hydraulic energy and the nuclear energy because both are considered in Argentina as complementary participations. This complementary participation is the result of two circumstances. First, we all know that in the daily consumption of energy, there are certain hours where there is maximum demand and that such situation taking place every day of the year results in a determined curve which indicates the need for a permanent power base feeding the system. There is another portion of the system of semi-peak or peak, where there are machines used only in those hours where there is a maximum demand, and in general these machines produce the kw/h at a very high cost. The situation regarding the hydroelectric plants is similar, when we try to cover the maximum demand by saving water and applying it in the most expensive moments. (peak hours)

Nuclear plants on the contrary, are mainly base stations and they are convenient not only because they operate without interruption, but because during the operation, fluctuations that might be produced by the changes of power can be avoided.

The second circumstance by which they are considered to be complementary is because in the case of hydraulic power plants, as it is well known, the resources of the rivers are not an inexhaustible source. Argentine is presently working on this. Projections are really important as far as the amount of mw estimated to be installed, but naturally, that project has a final total cost.

The time will come when most hydraulic developments will have been used, and the question will arise: What will happen in Argentina by the end of the century? If the country does not want to use these fossil fuels which will probably disappear in the next 70 years, it will have to turn to another source of energy. In this case, nuclear energy would arise as a fundamental participation to meet such needs. This will be a gradual participation, but by the end of the century it will have become a mass participation. Thus, the complementation of both resources is that the hydraulic resource bears at present the most important participation. But when such resource begins to diminish, nuclear sources will appear. Therefore, the strategy of the nuclear field is to acquire the necessary training and knowledge in order to be prepared when such transition takes place.

Argentine Nuclear Plan And its Future Projection

Argentina is firmly committed to the develop-

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ment of the specifically peaceful use of nuclear energy, convinced that the atom must help the general welfare. With the approval of Decree 302/79, the National Executive Power took a fundamental step in the direction of a long-term nuclear policy in the country. This regulation, implements the policies and goals approved the year before, using unenriched uranium and heavy water moderate, as well as the complementary plants for their supply such as heavy water plants and fuel cycle factories.

It is true that numerous antecedents show that the intention of the country is not a single expression of desire, but a fact. It is with this document that a program of nucleoelectric output is definitely elaborated, changing the already existing trend of building atomic stations, one by one.

This decision sets an adequate ground where the national industry may properly elaborate its investments and entrepreneur decisions with the purpose of carrying out this plan. Its aim is a national self-sufficiency — a vital situation from the geopolitical viewpoint.

This regulation describes in detail the plan of activity in the nuclear field, practically until the end of the century. It is worth analyzing the goals of this program, which in their most general terms aim at "increasing the scientific, technical and industrial efforts in the field of energy so as to use it peacefully and to enjoy, to a full extent, human and natural resources while strengthening national development."

This concept can also be derived from the following particular goals:

1. To develop a continuous program of nuclear investigation and fulfillment for peaceful purposes.

2. To improve the stage of development already achieved in this field.

3. To increase the scientific and technical specialized personnel in the field, to ensure their training and to promote their permanent residency in the country.

4. To contribute to the development of national science and technology by means of the participation in the accomplishments that have taken place in the nuclear field.

5. To increase the nucleoelectric energy, contributing to the local development and save hydrocarbons.

In order to carry out these goals, several policies have been taken into consideration:

1. To consider as national interest of highest priority, the development, production, use and control of nuclear energy.

2. To promote the growing use of nuclear technology.

3. To elaborately sort medium and long-term plans for the investigation and development of the nuclear files, making sure that their execution will be continuous and without interruptions. Such plans will also foster the introduction of nuclear reactors into the country, and that would be the most appropriate.

4. To promote the design and construction of nuclear plants, with accelerated increase of the national technical and industrial participation, to satisfy the future electric energy demand.

5. To develope a scientific-technical structure, with its own faculty activity which might generate the necessary knowledge to reach a level of national participation in the nuclear field.

6. To promote the growing participation of the national industry and engineering in the nuclear procurement.

7. To diffuse medium and long-term programs of nuclear investigation and activities, ensuring that these plans will not be interrupted, and that the necessary requirements of the scientific and technical personnel will be satisfied.

8. To promote the development of national skills for the design, projecting, management, construction and operation of the facilities necessary for the nuclear program.

9. To include in the National Energy Plan the

participation of nucleoelectric energy.

10. To adopt the technology of unenriched uranium for the nuclear plants, estimating the possible participation of other nuclear combustibles in accord to the national interests.

Taking all these points into consideration, the National Commission on Atomic Energy is developing a plan of activities that is permanently revised and modified, and which includes six programs:

1. Installation of Nuclear Plants
2. Supply to Nuclear Stations
3. Radioisotope and Radiation
4. Radiologic Protection and Security
5. Investment, Development and Administration
6. Training and Support

Installation of Nuclear Plants

This program considers the purpose of installing and operating nuclear stations with a growing participation of the national science engineering, technology, and industry. The plan was basically estimated to operate the nuclear station ATUCHA I, which has shown a high efficiency since it started operating, turning out to be one of the most effective nuclear stations in the world, this measured in terms of energy percentage generated, in comparison to the maximum amount of energy that can be generated. A second auxiliary building which contains tanks is under construction in order to increase capacity of storage of burnt fuel elements, and to keep on with the substitution of imported input of the station by national products.

The program includes the execution of the works of EMBALSE nuclear station in the Province of Cordoba. These works were originally granted to a constorium formed by Canadian and Italian companies, in a "turn-key" contract. The CNEA (NCAE), however, had growing responsibilities for the supply of vapor in the nuclear sector, this since 1977, and, finally becoming in 1980, the principal subcontractor assembling in the nuclear sector with excellent results in the development of the works.

CNEA (NCAE) is currently training personnel which will be in charge of operating the station. It has also estimated and implemented the active participation of national enterprises in the provision of component and engineering services and assembling of the different systems of that plant, trying particularly to obtain as much knowledge and experiance as possible so it might facilitate the management of projects in future plants.

The first of four stations foreseen by the National Nuclear Power up to 1997 has been called for bid and granted, estimating that such station will be operating by 1987. It will have a net power superior to the 680 mw and it will be built near the ATUCHA nuclear station. Its characteristics of design are similar, allowing a greater efficiency in its operation.

In order to carry out the works of ATUCHA II and of the other stations included in the plan, the National Executive Power has authorized the creation of ENACE (Empresa Nuclear Argentina de Centrales Electricas — Argentine Nuclear Enterprise of Electric Stations) a mixed enterprise with a State majority through which Argentina acquired progressively the management capability, engineering and construction of the nuclear stations that will allow the maximum external independence by 1997.

In the ATUCHA II project as well as in the other projects, the CNEA will stimulate the participation of the Argentine enterprises belonging to the private sector in the supply of components and services.

Supply to Nuclear Stations

This program has the purpose of providing nuclear supply to nuclear stations with a maximum participation of national science, engineering, technology and industry, as well as achieving a complete self-supply in the nuclear field. It is probably the most extensive program due to the numerous areas that it includes.

The plan considers all the activities related to the exploration and search of nuclear ore, especially area prospecting works of interest in Sierras de Cordoba, investigation of the potential

uranium in the valley of Conlara (San Luis), surveys in the nuclear bed of Sierra Pintada (San Rafael, Mendoza), and prospecting in the area of Los Chihuidos (Neuquen).

As far as the production of uranium concentrate, the activities aim at optimizing production in the factory-mining complexes of Tonco (Salta), Pichinan (Chubut), and Malargue (Mendoza). A contract signed at the beginning of 1980 between CNEA and a consortium of French-Argentine enterprises will carry out the development of the deposit of Sierra Pintada which current reserves may, alone, ensure the national self-supply of uranium. These will increase once the estimated explorations are finished. At this location, a uranium plant will be opened. It will have a capacity of 700 tons of U308 per year. During 1980, national production of concentrate reached an amount of 200 tons, and it has been estimated that in the future there will be a surplus as to allow exportation after the adequate reserves have been stored, and for this purpose a legal regulation has been established.

While Argentine technology tries to prepare itself for the production of uranium dioxide of nuclear purity, in the factory complex of Cordoba, a new line of production has been established, and this will meet the needs of production demands by the fuel cycle. On the other hand, the manufacturing of nuclear combustible elements, ATUCHA type, include in this program several tasks at the level of pilot plant to achieve the technology for its manufacturing in the country which will allow an industrial factory to operate. Such factory is at an advanced stage of construction at the Atomic Center Ezeiza.

A special alloy plant is also being built nearby, and together with the technology that is being developed by CNEA as a pilot plant, it will produce the zircaloy rod used to contain the uranium pellets inside the combustible elements. This program also refers to the operation of the zirconium sponge pilot plant, operating in the Atomic Center Bariloche, which enlargement is under study in order to obtain a production of 10 tons per year.

All the requirements of the nuclear industry demand the existence of highly efficient infrastructure for the stuffy behavior of the combustible elements before and after being incorporated to the plants. In this case the program of activities include the construction of an experimental laboratory for combustibles and radiated material, thermohydraulic circuit of high pressure for examination and test of combustibles, and another one for the test and verification of those elements before being introduced in the vector.

The program also refers to the production of heavy water, which has been done through the construction of the pilot plant being built near the nuclear station, and the operation of a laboratory prepared to deal with sulphidric acid works. Meanwhile, to comply with the demand of the program of nuclear stations on a medium term, a Swiss enterprise has been granted the settlement of an industrial plant of heavy waters, with capacity of annual production of 250 tons.

Radioisotopes and Radiation

The purpose of this program is the production of radioisotopes and sources of radiation in demand by the market, and to promote their applicability. In general it implies the manufacturing of radioisotopes and radioactive components in order to cover more than 90% of the national demand (a small amount is imported due to technical economic situations) and to increase exportation; to continue operating the radiation plant (semi-industrial) of the Atomic Center Ezeiza, expanding its utilization in the services of radium sterilization in demand by the national market; to foster the creation of plants of this type in the private sector; to operate cells and other installations for the handling and fractioning of radioisotopes and radioactive material; to produce high activity sealed sources; to carry out services of reference in dosimetry and metrology of ionzing radiation for the area of Latin America; and in general, to develop our use of the radioisotopes and sources of radiation, in medicine, industry, science, agriculture, food industry, etc.

Radiologic Protection and Nuclear Security

This program tries to give the country the necessary protection to its population and to the environment from the harmful effects of nuclear exposure. This means that there will be some regulations that will demand control, vigilance, inspection, and survey of all the activities which in-

volve the use of radioactive material of nuclear origin and of the ionizing radiations, with the exception of X-rays, to carry out surveys and preoperational evaluations for the nuclear center in Embalse. The nuclear reactor will be located in the Atomic Center of Investigation of Peru; the nuclear station ATUCHA II, and it will also operate stations for the treating of radioactive waste.

Investigation and Development

Its purpose is to strengthen a scientific-technical structure with its own execution capability which may generate the necessary knowledge to obtain self-supply in the nuclear fields. For this purpose there are various activities in basic and applied research and technologial development in the fields of biology, physics, chemistry, engineering, etc., thoroughly selected to support the previous programs and the future demands in the country.

One of the most ambitious projects of this program ready to be confirmed, is the construction, installation and operation of an electrostatic accelerator of 20 mve, which operates in the Atomic Center Constituyentes and which is already being built. Some other activities for the manufacturing of combustible low-enriched elements for radiation and research reactors are taking place; and to manufacture combustible elements for power reactors, CANOI type. Some other activities refer to the installation of laboratory surveys in nuclear fusion to place and operate prototype of solar pool for industrial purposes; to investigate the output of eiectric energy of mass consumption from solar energy; and to build a reactor of intermediate power, designed to meet the goals and future evolution of the Commission.

Administration, Training and Support

This program refers to the activity carried out by CNEA to train the personnel and provide the necessary infrastructure. As far as organization and programs, this sector is working on the implementation of an accounting information system based on the principle customarily applied by the industrial and commercial enterprises; on defining an outline of the nuclear plans that will replace the present ones; and on selecting the most appropriate legal aspects for the future activities of the institution of the nuclear industry in the country.

The activity of training — one of the most important in the CNEA — includes the implementation of a program to achieve the necessary human resources for the fulfillment of the nuclear plan, and to continue with the numerous training courses it now has. (Institute Balseiro, Atucha Training Center, plus other agencies of the Commission and the Institution, nationally and abroad.)

A definite step towards this goal, has been the implementation of the nuclear engineering studies, which can be taken at the Instituto Balseiro, where these studies and those of Masters Degrees in Physics have been existing since 1955. Engineers and Masters can complete their corresponding PhD.

In connection with auxiliary infrastructure, it has considered to improve the operation of the computer center and its remote job terminals to improve the communication system between the agencies depending on CNEA, and to increase the infrastructure of the Atomic Center. This program is also responsible for the implementation of agreement of international cooperation, not only of binational characteristics, but multilateral characteristics, with international organizations such as OIEA (International Commission of Atomic Energy) ICAE (InterAmerican Commission of Nuclear Energy) and CIEN (Commission InterAmericana de Energia Nuclear.)

Argentina has had an important participation in the international program of evaluation of the fuel cycle (INFCEO), and it is a member of the Group of Non-Aligned Coordinating Countries in the field of peaceful uses of nuclear energy, which met for the first time in Buenos Aires June 30 to July 4, 1980.

In the field of horizontal cooperation, it is important to underline that Argentina is the first developing country which has elaborated a program of transference to other developing countries. An agreement with Peru made possible the installation of an experimental power reactor for the training and teaching in the Peruvian Institute of Nuclear Energy, carried out by CNEA in 1979. In 1980, the works for the construction of the

Atomic Center HUARANGAL will keep CNEA busy since this center will be operating in 1987 and its additional facilities in 1991, 1994, 1995, and 1997.

Based on the solid foundation of the silent but continuous activities of the members of the CNEA during three decades, many of these collaborators unfortunately are not amoung us, but have left a priceless legacy. It is possible to foretell that those goals, established according to the possibilities of the country, will be fulfilled according to the desire of the entire community.

In 1980, basic steps were taken so that many programs may effectively be put in motion. Argentina is confident that nothing will interrupt the irreplaceable collaboration that nuclear energy will give to supply the demands, and to participate in the welfare of all the countries in the world.