

## **JULIO ASTUDILLO: Director of ENRESA's Department for the Coordination of Research and Development Projects**

*ENRESA, Empresa Nacional de Residuos Radioactivos, S.A.*, is a public company responsible for the management of all radioactive waste in Spain. Created in 1984 by Parliamentary decision, it was formed via Royal Decree 1522/1984, 4 July. Its mission is to collect, treat and store all radioactive waste produced in our country. The shareholders in the company are the *Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT)* and *la Sociedad Estatal de Participaciones Industriales (SEPI)*.

The main responsibilities of ENRESA are:

- The collection, transportation, treatment, storage and control of all radioactive waste produced in Spain.
- The dismantling of nuclear/radioactive facilities no longer in use.
- Environmental restoration of uranium mines.
- Research and development.
- Public Information.

Spain has nine nuclear reactors which produce around one third of the electrical energy which we use. In addition, there are around one thousand three hundred medical, research and industrial facilities which are authorised to use radioisotopes; some six hundred of these generate radioactive waste.

Enresa's activities are controlled by the government, which approved the General Plan for Radioactive Waste - a document which lists and defines the company's activities. The company is also monitored by the Nuclear Safety Committee (CSN), an independent watchdog organisation which reports directly to the Parliament. In addition, the activities of Enresa are subject to control by other state, regional and local bodies, as per current legislation.

In Spain all radioactive waste is controlled in inventories. This allows the origin of the waste to be recorded with precision. A further regulation obliges producers of waste to comply with a series of concrete specifications.

Enresa has highly skilled technical staff and uses the most advanced technology available for the management of radioactive waste.

Julio Astudillo Pastor is the Director of ENRESA's Department for the Coordination of Research and Development Projects and their correct execution. He is an active participant in EU projects and

Membre de:

international groups of experts in the management of radioactive waste. He is also the author of several research papers and the book "*El almacenamiento geológico profundo de los residuos radiactivos de alta actividad: principios básicos y tecnología*" (2001).

**Mr. Astudillo, what is Enresa's approach to R&D, and how does the company decide which fields are to receive R&D priority?**

For Enresa, R&D is a highly relevant activity, which must provide the knowledge, technology and methodologies required to permit safe, feasible and socially acceptable management options.

The R&D projects carried out over more than twenty years have been structured in four or five-year plans, with priority given to covering the management requirements that the industry could not supply, whilst simultaneously improving scientific and technological know-how needed for such a long-term, multidisciplinary activity as the management of radioactive waste.

A huge effort has been made in areas such as those related to the study of the behaviour of irradiated fuel; insulation and confinement materials (metallic materials, concrete, natural materials); the migration of radionuclides; the study of the hydraulic, mechanical and geochemical functioning of natural systems; and environmental restoration and numeric modelling used to quantify processes and establish reliable, long-term functional estimations. We have also prioritised support for currently operating management installations (Cabril, Vandellós 1, etc.).

Most of the results of these studies can be seen in ENRESA's website.

**What role do you believe Technological Centres and Universities should play?**

For Enresa, which was created as a management company, Technological Centres and Universities provide fundamental support in their dual role as the originators of knowledge and technology and their long-term maintenance.

Waste management often requires highly specific developments and technology, as a result of the legislation in force in different countries and the management options which have been adopted. This means that they are, in many cases, not attractive to the industry. Waste management agencies have to provide specific solutions which require long, costly research, and development and demonstration programmes; it is here that the Technological Centres, with the support of Universities, are fundamental.

In addition, the time periods involved in the design, construction, licensing, operation and closure of storage facilities are sufficiently long so as to require continuous support, not just in

the resolution of daily problems, but also allowing the incorporation of scientific and technological improvements which have a positive impact on the safety of the installations. The Technological Centres must ensure that this technology is maintained and transmitted to us.

### **What results do you expect?**

In the specific case of ENRESA we are receiving results on a number of different levels as a result of our collaboration with the Technological Centres and Universities.

Firstly, they are providing basic knowledge related to the processes used for safety analysis. They are uncovering highly relevant data in relation to the behaviour of irradiated fuel, the interaction between radionuclides and concrete, clay and steel, as well as durability processes for engineered barriers. They are also providing precise data about basic nuclear properties, and fundamental physical-chemical and thermodynamic constants which allow the long-term modelling of the behaviour of storage systems.

On the other hand, they are updating highly specific technology and methodologies for the characterisation of waste (radiochemical techniques), along with the development of pre-industrial prototypes for treatment, conditioning, waste volume reduction systems, decontamination systems, and the improvement of environmental mobile laboratories. That is, equipment and prototypes of immediate industrial use are being created, which has a considerable impact on management.

It should be emphasised that much of the development taking place in the Technological Centres can be applied to areas other than those of waste management, which makes it even more relevant.

### **What opinion do you have concerning nuclear waste research carried out in Spain in comparison to that carried out in the rest of Europe?**

One point that we shouldn't forget is that the Nuclear Power Stations in Spain generate approximately 6800 tonnes of irradiated fuel and some 200,000 m<sup>3</sup> of low and medium radioactive waste. This waste has to be managed in a safe manner, and that is why it is essential that we have a scientific and technological infrastructure that ensures that we have the most advanced knowledge available in this field at all times. Management requires even better knowledge and technology which help, amongst other things, to increase society's confidence regarding these questions.



Innovation in radioactive waste management involves the application of results which help improve the safety of the installations; this is not the case in other fields, where the results of R&D are applied to generate profits or competitive advantages. The use of resources to produce knowledge and technology which improve safety and the acceptance of management options.

From this perspective it is essential that research groups are maintained in this field, just as they exist in other European countries. It is also essential that cooperation between Spanish and European groups continues to exist at current levels, as has been the case up until now. International collaboration in the field of R&D has been a basic criterion from the beginning of our operations. A very high level of participation of Spanish scientists and technology in the field of management of European programmes has been achieved, and more importantly, with rightly received recognition and prestige.

Membre de:

