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DIRECTORATE-GENERAL ENERGY
Directorate D – Nuclear Energy
D.4 – Radiation Protection

Main Findings of the Commission's Article 35 verification in Spain

HUELVA sites: Phosphogypsum piles and CRI-9

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Verification team: Mr C. Gitzinger (team leader)
Mr E. Henrich
Mr P. Vallet
Mr. J-L. Frichet (national expert on secondment – France)

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INTRODUCTION

Article 35 of the EURATOM Treaty requires that each Member State shall establish facilities necessary to carry out continuous monitoring of the levels of radioactivity in air, water and soil and to ensure compliance with the basic safety standards ⁽¹⁾.

Article 35 also gives the European Commission (EC) the right of access to such facilities in order that it may verify their operation and efficiency.

For the EC, the Directorate-General for Energy (DG ENER; formerly Directorate-General for Energy and Transport - DG TREN) and in particular its Radiation Protection Unit (at the time of the visit: TREN.H.4) is responsible for undertaking these verifications.

Further to parliamentary questions and petitions, a team of four inspectors from DG TREN.H.4 visited the Huelva sites on 14 September after having been fully informed of the current situation by the site operator, by the regulatory authorities and by other actors. The goal of this verification was to obtain complete information and to verify a number of monitoring installations involved in the environmental radioactivity monitoring of the Huelva sites. The laboratories performing the measurements were also included into this verification.

The visit to the Huelva sites included also meetings with the Spanish competent authorities, *Consejo de Seguridad Nuclear (CSN)* ⁽²⁾, *CIEMAT* and Directorate General for Energy Policy and Mines (*DGPEM*) of the Ministry of Industry, Tourism and Trade, as well as with *Junta de Andalucía*, Directorate General of Sustainability of the Coasts and the Sea of the Ministry of the Environment and Rural and Marine Affairs and with *FERTIBERIA*, *EGMASA*, *ENRESA* and *GEOCISA* and with representatives of the analytical laboratories of the universities of Huelva and Seville.

The present report summarises the results of the discussions with the site operator, other actors and the Spanish competent authority *CSN*, as well as results of the verification team's review of some aspects of the environmental surveillance at and around the Huelva sites in relation with the NORM issue and an accidental contamination with the artificial radionuclide Cs-137.

Specifically, reference is made to the accidental presence of the contamination with caesium-137 at the Inert Materials Recovery Centre (*Centro de Recuperación de Inertes, CRI*) in *Las Marismas de Mendaña* and to the alleged existence of radiological levels due to emissions of uranium, radon-222 and other radioactive components from the phosphogypsum ponds. The first issue refers to the existence of radioactive material of an artificial origin (caesium-137), and the second one to the existence of naturally-occurring radioactive material (NORM).

The purpose of the review was to acquire full information both from the operator and from the regulator concerning both issues relevant to the Huelva sites and to get state of the art information on the monitoring and remedial measures put in place till now.

¹ Directive 96/29/Euratom, Council Directive of 13 May 1996 laying down basic safety standards for the health protection of the general public and workers against the dangers of ionising radiation (OJ L 159, 29.6.1996, p. 1).

² *Consejo de Seguridad Nuclear* /Nuclear Safety Council, Justo Dorado 11, 28040 Madrid.

MAIN FINDINGS

The proposed verification programme could be completed within the time allocated. In this regard the verification team appreciates the advance information supplied, as well as the additional documentation received during and after the verification.

1 INTRODUCTION

The Commission's decision to conduct an urgent mission under the scope of Article 35 EURATOM was discussed with the Spanish authorities in August 2009. Beginning of September 2009 the Spanish competent authority invited the Commission services to come to Spain from 14 to 17 September in order to verify the Huelva NORM and Cs-137 issues and the relevant environmental radioactivity monitoring programmes.

2 COMPETENT AUTHORITIES AND LEGAL BACKGROUND

2.1. INTRODUCTION

In Spain, generally, facilities liable to generate radioactive effluents and/or waste must have proper control storage, treatment and removal systems. Radiological monitoring programmes must be based on site and discharge characteristics. Site-specific control programmes are implemented by the *Consejo de Seguridad Nuclear (CSN)*. Nation wide monitoring networks for environmental radioactivity are set up and managed by *CSN*.

For NORM industries decisions with regard to any environmental radioactivity monitoring programme have to be made, case by case, by the relevant competent authority, based on advice by *CSN*. With regard to the phosphate industry at Huelva it is made up by the companies *Fertiberia* and *FMC Foret S.A.* The phosphogypsum piles administrative concession is the responsibility of *Fertiberia*. The *Junta de Andalucía* acts as competent authority.

2.2. CONSEJO DE SEGURIDAD NUCLEAR (NUCLEAR SAFETY COUNCIL)

The *Consejo de Seguridad Nuclear (CSN)*, established in 1980, is the Spanish organisation responsible for nuclear safety and radiological protection. It is independent from the Government and reports to the Spanish Parliament. *CSN* issues reports with binding content prior to the awarding of authorisations to regulated facilities (either “nuclear” and/or “radioactive”) by the Ministry of Industry, Tourism and Trade and proposes regulations on nuclear safety and radiation protection nation wide.

2.3. MINISTRY OF THE ENVIRONMENT AND RURAL AND MARINE AFFAIRS; DIRECTORATE GENERAL OF SUSTAINABILITY OF THE COAST AND THE SEA

Among the competences of the Directorate General of Sustainability of the Coast and the Sea of the Ministry of the Environment and Rural and Marine Affairs, are the management, protection and preservation of the land-maritime public domain, where the Huelva phosphogypsum area is located.

2.4. MINISTRY OF INDUSTRY, TOURISM AND TRADE; DIRECTORATE GENERAL FOR ENERGY POLICY AND MINES

The Nuclear Energy Act defines radioactive waste as any residual material for which no use is foreseen that contains radioactivity above certain levels that need to be defined by the Ministry of Industry (*MITYC*) with a previous binding report of *CSN*.

2.5. “JUNTA DE ANDALUCÍA”, DEPARTMENT OF THE ENVIRONMENT

With regard to effects of discharges from NORM activities, the Regional government is the competent authority on regional level. For the case of Huelva, this is the Department of the Environment of the *Junta de Andalucía*. The competence is related to the implementation of Directive 96/61 (IPPC).

2.6. MINISTRY OF HEALTH AND CONSUMER AFFAIRS (RADIOLOGICAL SURVEILLANCE OF FOOD STUFFS)

The body responsible for the radiological monitoring of foodstuffs is the Ministry of Health and Consumer Affairs.

In compliance with Articles 35 and 36 of the EURATOM treaty, *CSN* has established and manages the national Environmental Radiological Monitoring Network, which includes the sampling of foodstuffs (milk and mixed diet). The design and development of this network follows EC recommendations.

2.7. RADIOACTIVE DISCHARGE AUTHORISATIONS FOR NORM FACILITIES

The current regulation “*Reglamento de protección sanitaria contra radiaciones ionizantes*”, which was published in July 2001, establishes 1 mSv per year as the effective dose limit for the protection of the public.

The competent authorities have to require studies with regard to the operation of NORM industries to assess its radiological impact. *CSN* is playing an advisory role.

3 HUELVA PHOSPHOGYPSUM-PILES, PONDS AND CRI-9

3.1. INTRODUCTION

The marshlands (*las marismas*) used by the local phosphate fertilizer industry for stocking phosphogypsum are located to the south of the city of Huelva, in the estuary of the river *Tinto*, before its junction with the river *Odiel*. This is a great span of land that faces the sea and has marshland vegetation subject to tidal movements of the estuary.

Since the nineteen-sixties phosphate industry has been operating close to Huelva city.

The *FERTIBERIA* industrial plant in Huelva produces fertilisers using phosphate rock as a raw material for the production of phosphoric acid, various phosphates and fertilisers. This phosphate rock is a sedimentary rock that contains natural concentrations of uranium and thorium. In relation to unperturbed typical soils, these concentrations are relatively high for U-238 (1500 Bq/kg), which is usually found in radioactive equilibrium with its decay products, including Ra-226.

In the process of manufacturing phosphoric acid, the rock is ground to the proper grain size and then treated with sulphuric acid. Phosphoric acid and gypsum (phosphogypsum) are produced in the reaction; the greatest part of the radium contained in the phosphate rock

usually co-precipitates with gypsum. Most of the uranium and thorium remains with the phosphorus in the phosphoric acid.

The redistribution of these natural radionuclides - present in the original rock - to the various products, by-products, solid wastes, and effluents obtained in the industrial process may lead to an exposure of workers and members of the public.

At present, *FERTIBERIA*'s activities in Huelva's industrial area generate around 2,5 million tonnes of phosphogypsum per year and 0,5 million tonnes more are produced by *FMC Foret S.A.*

Until 1997, the phosphogypsum generated by *FMC Foret S.A.* (approximately 20% of the total amount) was dumped directly into the *Odiel* River estuary and the phosphogypsum overflowed from the ponds, into the *Tinto* River by *Fertiberia*.

The verification team was informed that today the phosphogypsum piles and ponds in *Las Marismas* cover an area of approximately 850 hectares and it is estimated that the total amount accumulated during the nearly 40 years of operation of this fertiliser factory is 70 million tonnes.

The team was also informed that it is planned to close the *FERTIBERIA* production plant by 2012.

3.2 FIRST EVALUATIONS OF THE RADIOLOGICAL SITUATION OF THE HUELVA SITES; FIRST REMEDIAL MEASURES

In 1989, *CSN* commissioned the Energy, Environment and Technology Research Centre *CIEMAT* to do first studies on the radiological situation resulting from the operation of the phosphate industry. In 1998 further studies have been performed by *CIEMAT* at the request of the Environmental Agency of the *Junta de Andalucía*.

As a result of the 1989 study, *CSN* sent a series of suggestions to the *Junta de Andalucía* on the waste management and restoration of the phosphogypsum ponds, among which was the attenuation of the emissions of radon gas (decay product of Ra-226) using an appropriate cover for the phosphogypsum deposits, including restoring of vegetation.

Between 1991 and 1993 the restoration of some 400 ha of ponds (Zone 1 of the site) was carried out by the Environmental Agency.

In 1997, the direct dumping of phosphogypsum into the *Odiel* River estuary ceased. In the same year a new process of recirculation of waters was implemented (this process is still in use). Until 1997, the phosphogypsum generated by *FMC Foret S.A.* (approximately 20% of the total amount) was dumped directly into the *Odiel* River estuary and the phosphogypsum from *Fertiberia* overflowed from the ponds, into the *Tinto* River.

In September of 1997, *Empresa de Gestión Medioambiental S.A. (EGMASA* – a public sector company attached to the Environmental Agency of the Andalusian government), *FERTIBERIA* and the Huelva Town Council signed a cooperation agreement for the environmental recovery of the phosphogypsum ponds numbers 6, 7, 8, and 9 in Zone 4 (*Las Marismas de Mendaña*). *FERTIBERIA* at that time held an administrative concession on that land granted by the Directorate General of Coasts of the Ministry of the Environment. This cooperation agreement built the basis for The Inert Materials Recovery Centre (*Centro de Recuperación de Inertes, CRI*), the project which dealt with the recovery of *FERTIBERIA*'s phosphogypsum ponds in that area.

The second study in 1998 showed that the restoration of some 400 ha of ponds (Zone 1 of the site) carried out by the Environmental Agency between 1991 and 1993 and the restoration of

phosphogypsum dumps that had begun in 1997 (which included stopping dumping into the estuary) had generated a clear improvement in the radiological situation in the area. The activity concentrations of natural radionuclides measured in the restored areas were found to be lower than the background levels in the unaffected marshlands.

At the time of these first studies (1989 and 1998), according to the regulations then in force, this industrial activity was exempt from specific regulation on radiation.

3.3 RELEVANT NORM RELATED LEGISLATION AND RESULTING INITIATIVES

Before 2001, NORM activities were not specifically regulated in Spanish radiological legislation.

Since 2001, the Spanish regulation covering NORM issues (which includes phosphogypsum piles and ponds) is the Health regulation on ionising radiation (*Reglamento de protección sanitaria contra radiaciones ionizantes – RPSRI*), approved by Royal Decree 783/2001 (BOE 26-7-01). This regulation transposes Council Directive 96/29/Euratom (the Basic Safety Standards Directive).

In line with the mission of CSN to advise the competent authority for the relevant industrial sector, in 2004 CSN financed a research project with the University of Seville and the University of Huelva to assess the impact of radiation caused by the activities of several non-nuclear industries in southern Spain, including the industrial area of Huelva.

In summary, based on this four-year-long project the authorities concluded that the potential radiological impact caused by the piles and ponds at the Huelva site on workers and the public is very small with regards to the limits imposed by law. Thus, no additional remedial action would be necessary in the areas that are already covered with protective material. For the ponds and piles still operating restoration is envisaged.

3.4 VERIFICATION ACTIVITIES AT NORM SITES

The verification team was given a general overview of the phosphogypsum storage sites (Zones 1 to 4) which cover surface areas of 400 ha (Zone 1) and 720 ha (Zones 2 to 4; plus Zone 5 which has never been used for phosphogypsum storage and is relatively small - it expands to the North of Zones 3 and 4).

The team could see that Zone 1 was remediated (1991 to 1993) and is covered by vegetation. It was informed that both, ambient gamma dose rate and radon levels in that area, currently are comparable to such in non-affected "background" areas. Thus, it was confirmed that Zone 1 in its current state does not pose any radiological risk to the population.

The verification team was informed that the IPPC permit (AAI/HU/039) issued by the *Junta de Andalucía* on 29 April 2008 governs the actual industrial utilisation of the phosphogypsum stacking piles (Zones 2 and 3) of the Huelva site. Currently the phosphogypsum is pumped from the fertiliser plant to Zone 2, containing the "Stacking Pile". Zone 3, which contains the "Safety raft" or "Security reservoir", is a reserve area to be used to collect water in case of emergency, produced by high rainfalls, avoiding the overflow of phosphogypsum, to the *Tinto* River.

During the visit a few ambient gamma dose rate measurements were taken using an *EG&G Berthold UMO* device equipped with a probe type *Berthold LB 1236*. No measurement showed values that would have to be considered as posing an unacceptable radiation risk for the workers.

The verification team was shown the outlets of the pipes for discharging the phosphogypsum sludge near the south border of the south-pond (Zone 2). The team observed ongoing consolidation work at the east rim of the pile using a dredger. It also observed the process of seeping from the pile to the leaching channel, from where the water (which contains large amounts of phosphoric acid) is pumped back to the fertiliser factory.

At Zone 3 the team could observe trucks loading phosphogypsum to be transported off-site. The team was told that to some extent the material is used for improving certain soils following national regulations in place.

With regard to the development of the site the verification team was informed that production has been reduced to some 50%. A complete stopping of fertiliser production is discussed, however, social arguments regarding the labour situation in the Huelva area have been raised. The Directorate General for Marine and Coastal Sustainability of the environment Ministry has initiated a “Study for the Recovery of the Phosphogypsum Ponds in the Marshes of Huelva; Diagnosis Phase and Regeneration Proposal”. In June 2009, the *Junta de Andalucía* has established a committee of five experts for the evaluation of the restoration plan for the entire site.

Taking into account the very long half lives of some of the natural radioactive contaminants in Zones 1 to 4, the verification team recommends developing also administrative solutions for the very long term that avoid any future uses of the affected areas that could lead to an unacceptable population exposure. In the extremely long term the possible destruction of the surface layer could become an issue. Thus, measures such as prohibition of soil removing construction, of re-forestation with deep rooting trees, or of agricultural methods using deep ploughing should be considered.

The team was informed that the University of Huelva - within a project of the Ministry of Science and Innovation- continues monitoring of NORM issues.

The verification team endorses the continuation of the environmental radioactivity monitoring currently performed by the University of Huelva.

3.5 ACCIDENTAL CONTAMINATION BY CS-137 IN ZONE 4 (CRI-9)

Further to the cooperation agreement between *EGMASA*, *FERTIBERIA* and the Huelva City Council from 1997 remedial work was ongoing in Zone 4, in particular dumping of inert material to cover the phosphogypsum ponds. Part of this material came from *ACERINOX*, a stainless steel works at Algeciras, Cádiz.

On 30 May 1998, in the *ACERINOX* factory a radioactive caesium-137 source that was inadvertently mixed in with scrap metal the company uses as raw material was accidentally melted in one of its electric arc ovens used to produce stainless steel.

Subsequently, caesium-137-contaminated exhaust dust was transported to the inertisation plant near Huelva.

The resulting neutralised material of this process was used in the customary manner as filler for the phosphogypsum pond restoration plan at the Inert Materials Recovery Centre. Obviously at that time nobody realized the Cs-137 contamination; thus, the material was dumped in pond number 9 (*CRI-9*).

3.6 CONTAMINATION AT CRI-9: EVALUATION OF THE RADIOLOGICAL SITUATION AND FIRST MEASURES

Further to the dumping of the contaminated material in *CRI-9* and having realised the contamination issue with Cs-137 of the *CRI-9* site, the Directorate General for Energy Policy and Mines (*DGPEM*) issued its Decision of 22 June 1998, on the adoption of protective measures in relation to the radioactive contamination incident. This decision required that *EGMASA*, the company in charge of the remediation work conducted at *CRI-9*, present an action plan for the normalisation of that site to *CSN*. To get approval of the implementation of this action plan *EGMASA* would have to obtain a favourable evaluation by *CSN*.

During July-August 1998, the authorities ordered *EGMASA* to interrupt the operation (NORM related remediation activities) at *CRI-9* and to implement the above mentioned action plan with clear radiological objectives (the resulting dose to individuals must be smaller than 1 mSv/year).

As a first step of the implementation of the action plan for the normalisation and remediation of the *CRI-9* site and under the control of the *CSN*, *Empresa Nacional de Residuos Radiactivos (ENRESA)*, the company contracted by *EGMASA*, performed two actions to remove 341 tonnes of the most contaminated material from "fronts" 3 and 4 in *CRI-9* and to transport such materials to the *ENRESA*'s medium and low-level radioactive waste centre at El Cabril, Cordoba, for final disposal. The rest (less-contaminated material; 4857 t) is currently still in *CRI-9*.

Due to the fact that the events at *CRI-9* had potentially led to a lasting exposure situation any legal instruments transposing Title IX (intervention) of the European Basic Safety Standards had to be applied.

After *ENRESA* had carried out the two actions to remove the most contaminated material at the inert material dump sites (see above), on 14 September 1998, *EGMASA* requested an authorisation from *CSN* for the normalisation of the *CRI-9* site.

On 15 January 2001, the Directorate General for Energy Policy and Mines (*DGPEM*), taking into account *CSN*'s report of 3 November 2000, issued a Decision to inform *EGMASA* that the normalisation of *CRI-9* was to be carried out, which entailed laying a cover of clay on top of the contaminated dump sites.

In 2002, *EGMASA* submitted a radiological surveillance programme to the authorities ("*Plan de Normalización del CRI-9*" - "Normalisation Plan for *CRI-9*") including a radiometric control of the area.

CSN has been controlling the developments at *CRI-9* through the evaluation of the information provided by *EGMASA* and by conducting periodic inspections.

The evaluation of the results obtained during the first twelve months of this programme, delivered to *CSN* in quarterly reports, concluded, among other aspects, that the analytical results for surface waters did not show that the remedial actions carried out were effective in confining the Cs-137.

The results of the monitoring plan were evaluated by the Spanish authorities in relation to the degree of compliance of the work conducted with the requirements stated in the "*Plan de Normalización del CRI-9*" ("Normalisation Plan of *CRI-9*"). This evaluation took into account all the information provided by *EGMASA* and the inspections carried out (October 2007). The results seem to indicate that the clay layer has not proven to be an effective barrier for isolating the contaminated materials, as it is not preventing the migration of caesium through the ground. However, the measurements suggest that the area affected by this

migration remains confined to the proximities of the clay covered site, without reaching the areas outside of *CRI-9*.

Thus, according to the values seen, the Spanish authorities assumed that the radiological impact on workers, the population and the environment continued to be not significant.

In July 2007, the Technical Directorate Radiation Protection at *CSN (DPR)* sent a letter to the Huelva Town Council, *FERTIBERIA* and *EGMASA* informing *FERTIBERIA* that, as holder of the administrative concession of the ponds (including site *CRI-9*), among other actions, it must restrict access to the sites for all persons not involved in the Environmental Radiological Monitoring Plan underway.

On 30 January 2008 *DGPEM* issued a new decision requiring *EGMASA* to carry out a series of additional reinforcing actions at *CRI-9* to ensure an adequate level of long-term radiological protection of the population, workers and the environment.

In September 2009, *EGMASA* submitted the results of a complementary radiological characterisation performed with the technical advice of *ENRESA* to support the design of the corresponding confinement reinforcement works.

After having received full information at the opening meeting the verification team visited the *CRI-9* site and verified a selection of the installed environmental radioactivity monitoring facilities.

The team was informed that – after taking into account the different issues affecting the implementation of these actions by *EGMASA*, once *CSN* has studied the reports delivered in September 2009 by *EGMASA* on the radiological situation of the contaminated area – *CSN* will propose definitive actions and the measures to be implemented in the contaminated area.

Having received all information included in this report and after verification of the *CRI-9* site, the verification team considers that the environmental radiological monitoring as currently performed on behalf of the regulator is adequate.

The verification team endorses a thorough verification (after finishing the remediation work according to plan) of the effectiveness of the clay cover to prevent migration of the contamination. It also endorses a continuing monitoring of environmental radioactivity in the area. The team suggests reconsidering the total fencing of CRI-9 in order to completely prevent access by unauthorised persons.

4 VERIFICATION OF LABORATORIES

The following chapters describe the verification activities performed in the laboratories involved in environmental radioactivity monitoring (studies and routine programmes) at the Huelva NORM sites including *CRI-9*.

4.1 UNIVERSITY OF HUELVA

The verification team visited the analytical laboratory of the University of Huelva, belonging to the "*Grupo de investigación: Física de Radiaciones y Medio Ambiente*" of the Applied Physics Department. Analysis undertaken includes, tritium, using a liquid scintillation counter, gamma spectrometry, using HPGe detectors and alpha spectrometry employing a complex setup of *Ortec* chambers

4.2 UNIVERSITY OF SEVILLE

4.2.1 CITIUS

CITIUS (*Centro de Investigación, Tecnología e Innovación – Universidad de Sevilla*) is part of the University of Seville. Together with the University of Huelva it performed a study with regard to the environmental impact and possible exposures by the Huelva phosphogypsum sites. The verification team was informed that within the study the *servicio de radioisótopos* of *CITIUS* dealt mainly with the aspects of surface water, sediments and phosphogypsum. Collaboration exists with CSN regarding NORM industries in general and with regard to the national environmental radioactivity monitoring network.

The service started preparations for receiving ISO 17025 accreditation for its measuring tasks. *CITIUS* as a whole is ISO 9001 certified.

It includes the following laboratories:

- radiochemistry
- gamma spectrometry
- alpha, beta spectrometry

The verification team encourages all efforts with regard to receiving ISO 17025 accreditation for the measuring tasks performed by the servicio de radioisótopos of CITIUS.

4.2.2 NUCLEAR PHYSICS DEPARTMENT

The *Departamento física atomica molecular y nuclear* of the Physics faculty of the University of Seville, through the research group “Applied Nuclear Physics group”, participates in the national environmental radioactivity monitoring programme set up by CSN.

On the roof of the Physics faculty building several devices are installed, belonging to the national radioactivity monitoring programme

It includes the following laboratories:

- radiochemistry
- alpha, gamma spectrometry

The verification team was shown the quality manual for the Nuclear Physics department and for *CITIUS* (defining among others the responsibilities) with regard to the tasks for the national monitoring systems: *Manual de la calidad de laboratorio de radiactividad ambiental (Programa REVIRA REM y PVRAIN) - Departamento de Física Aplicada*. The team was also shown various written procedures for sample preparation.

Several UPS's with holding times of approximately ½ hour are in operation. Electric power generation by a diesel generator is available at the faculty, but not available for the gamma spectrometry lab.

The verification team recommends securing electric power, in particular for gamma spectrometry, by connecting to an electric power system that is secured by the diesel generator of the faculty (in addition to operating the available UPS's for short power failures). With regard to sample preparation it recommends signing the data checks on the sample preparation sheets.

4.3 CIEMAT

CIEMAT (Centro de Investigaciones Energeticas MedioAmbiantales y Tecnologicas), the Research Centre for Energy, Environment and Technology, in Madrid, is a public organisation for research and technological development. It works under the Ministry of Education and Science. Its main objectives are to develop alternative energy sources, to find solutions to improve the use of resources and energy generation systems and to solve the problems of the Spanish companies regarding energy and its effects on the environment.

Some of the laboratory measurement procedures (tritium in liquid, alpha/beta total and Sr-90) are accredited to comply with the ISO 17025 quality standard.

In 1989 *CIEMAT* was asked by *CSN* to develop a study to assess the radiological situation in the vicinity of Huelva city as a consequence of the phosphate industry. A second study was performed by *CIEMAT* in 1998 after *Junta de Andalucía* request to verify the radiological impact of the phosphate industry following the implementation of a recovery plan.

4.4 GEOCISA - LABORATORIO DE VIGILANCIA AMBIENTAL Y ESTUDIOS RADIOMETRICOS

The team verified the radiological laboratory at *GEOCISA* in Madrid that has been charged with performing the monitoring of the *CRI-9* site at Huelva.

GEOCISA has quality certification in compliance with the ISO 9002:94 standard. It uses the quality management systems ISO 9001, ISO 17020, ISO 17025 and the environment management system ISO 14001. In particular, the "Chemistry laboratory" is accredited to ISO 17025 by the Spanish accreditation authority *ENAC*.

The verification team visited the *Laboratorio de Vigilancia Ambiental y Estudios Radiometricos* that is responsible for the radiological monitoring tasks associated with the *CRI-9* site at Huelva.

For gamma spectrometry electric power is assured for one hour by a UPS. After power failures a security officer has to call a staff member that subsequently turns off all critical equipment.

The verification team recommends securing electric power, in particular for gamma spectrometry, by connecting to an electric power system that is secured by a diesel generator (in addition to operating the available UPS's for short power failures).

5. CONCLUSIONS

All verifications that had been planned by the verification team were completed successfully. In this regard, the information supplied in advance of the visit, as well as the additional documentation received before the start and during the verification, was useful.

The information provided and the outcome of the verification activities led to the following observations:

- (1) The information provided and the verification activities that were performed demonstrated that the radiological studies and surveillance programmes established for the concerned area are appropriate and efficient.
- (2) With regard to the impact from the phosphate fertiliser production (NORM industry) the work conducted showed that the potential radiological impact caused by the phosphogypsum piles and ponds on workers and the public is very small with regards to the limits imposed by law. No additional remedial action seems to be necessary in the areas that are already covered with protective material. For the ponds and piles still operating restoration is envisaged.

With regard to monitoring, the verification team endorses the continuation of the environmental radioactivity monitoring currently performed by the University of Huelva.

The team points to the very long half lives of the substances involved and thus the necessity of an extremely long persistence of any measures that are taken.

- (3) Concerning the contamination with Cs-137 at *CRI-9*, the verification team endorses a thorough verification (after finishing the remedial work according to plan) of the effectiveness of the clay cover to prevent migration of the contamination. It also endorses continuing monitoring of environmental radioactivity in the area. The team suggests reconsidering the total fencing of *CRI-9* in order to completely prevent access by unauthorised persons.
- (4) A few topical suggestions are formulated. These aim at improving some aspects of the environmental radiological surveillance of the sites. They do not discredit the fact that environmental radioactivity monitoring of the phosphogypsum sites in the Huelva area is in conformity with the provisions laid down under Article 35 of the Euratom Treaty.
- (5) The Commission Services ask the Spanish competent authority to inform them of any implementation achievements with regard to the situation at the time of the verification.
- (6) The verification team acknowledges the excellent co-operation it received from all persons involved in the activities it performed

[signed]

C. GITZINGER

Team Leader