ENVIRONMENTAL MONITORING IN THE VICINITY OF THE MOL-DESSEL SITE (BELGIUM): A HISTORIC OVERVIEW

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ABSTRACT

The nuclear site of Mol-Dessel (Belgium) dates from the fifties, and a large diversity of activities have taken place from then on till today. The site comprises a nuclear research centre SCK•CEN, operating research reactors (one of them in dismantling), hot laboratories, laboratories for plutonium research, experimental fields etc. But there are also industrial facilities related to waste handling and treatment (Belgoprocess) or nuclear fuel fabrication (FBFC Int'l and Belgonucleaire). In the past, there has also been a reprocessing plant operated by the OECD (shut-down in 1974), and laboratories for isotope production, that moved to the novel site of IRE at Fleurus between 1970 and 1974.
Recently, a survey has been performed of the environmental monitoring results from the beginning on till end of 2000 in the framework of the selection of a candidate site for a repository for low level waste.
The paper presents the lessons learnt from this study. These lessons relate to several aspects. At first: the responsibilities for monitoring and data management (in a site with various operators). Second, historical changes have had an impact on the monitoring programme. Furthermore, technological evolutions introduce some difficulties in establishing a coherent data set. Furthermore, the influence of non-site related events, such as fall-out from nuclear weapons testing or the Chernobyl accident, but also the presence of a coal fired station, is apparent.

INTRODUCTION

The Mol-Dessel nuclear site is situated in the North-Eastern part of Belgium. It has been created in the 1950's as the first nuclear site in Belgium. In the course of these 50 years, many activities have taken place and are to a considerable extent still ongoing today.

- Nuclear research, mainly in the Belgian Nuclear Research Centre (SCK•CEN); this centre operates two research reactors, a critical facility, plutonium laboratories, an underground research lab for studying the behaviour of clay in the context of a high level waste repository etc. Besides this, there is also a European research institute belonging to the European Joint Research Centre called IRMM. Although IRMM is increasing the non-nuclear parts of its reference materials and measurements activities, it still runs accelerators and possesses 'hot laboratories'.
- Nuclear waste handling and treatment is the main activity of Belgoprocess. This company has two sites comprising the vast majority of Belgian radioactive waste, including high level waste originating from the former OECD reprocessing plant 'Eurochimic' that operated on the site several decades ago, but also vitrified wastes returning from the La Hague reprocessing plant or important amounts of radium originating from a former radium factory nearby.
- Nuclear fuel fabrication at the plants of FBFC Int'l and Belgonucléaire.

In the past, there was a reprocessing plant called Eurochimic, as already mentioned, and the first PWR reactor of Western Europe was operational there as well (BR3 reactor of SCK•CEN). Both these facilities have largely been dismantled nowadays.

Furthermore, the preparation of radioactive sources for medical and industrial purposes, due to the creation of the National Institute for Radio-Elements (IRE), moved in the seventies to the site of Fleurus in the Southern part of Belgium.

Nearby to the nuclear zone, one finds also a coal fired power station, which has lead to dumping grounds for fly ash in the neighbourhood as well.

At present, the Belgian government has decided that a low level waste repository can only be envisaged in existing nuclear sites, and as such, the Mol-Dessel region is a candidate site for hosting a low level waste repository. Interesting stakeholder processes have been started in this context (in Mol, in Dessel but in Fleurus as well), but this is beyond the scope of this paper.
As the Mol-Dessel region is a historic one, the stakeholder panels in Mol and Dessel, together with the waste handling authorities ONDRAF/NIRAS, decided to ask for a historic overview of the monitoring results in the region, as a kind of reference frame to refer to should the decision be made to really create the waste repository here.

All the facilities mentioned above have always been monitored, and envirionmental monitoring has been started very early. Monitoring programs started even before the first relevant legislation in this context was created. At present, this surveillance is still ongoing. This paper will give an overview of lessons learnt that may be useful considering elsewhere as well in the framework of the monitoring of a complex nuclear site and transparency to the population.

Organisational issues

The Belgian legislation allows the authorities imposing control measurements to be performed by the operators. These may include stack monitoring, but also sample collection in the environment or food chain (such as grass or milk), followed by laboratory analysis. The operators then have to prove compliance with the permits for releases etc. as formulated in their licence. In the case of Mol-Dessel, there is a multitude of operators, and several 'historical actors' in the mean time have disappeared. As such, there is no unique database of all historic measurements for the entire site. Furthermore, many results were only available on paper, not allowing a quick overview of evolutions etc.

A second part of monitoring actions at present is coordinated by the authorities. The Federal Agency for Nuclear Control has agreements with the main laboratories to monitor for radioactivity in the main pathways of exposure, depending on the activity levels to be expected. These results are centralised with the authorities. But as the technical activities started earlier than these contracts, also here a complete overview is missing.

In order to communicate with the population or to get a complete picture, one complete database with sufficient lifetime would certainly be a real progress.

Historic changes

In the course of time, there have been a lot of changes:

1. Technical changes: the main changes involving environmental monitoring are due to the evolutions in sample collection (e.g. use of filter material) or detection apparatus (e.g. the switch from NaI(Tl) detectors to Germanium

detectors in gamma-spectrometry). These changes, usually a real progress, were very useful in them, but render a comparison of results difficult if not impossible. The frequent lowering of detection limits also is inherent to the improvements in methods or equipment used. This is certainly positive, but may lead to more difficulties in discussions with the population.

2. Changes in authorisations: the limits of authorised releases, or the so-called action levels or intervention levels, or any other kind of reference level used througout this period, have often be redefined; the rationale of this may have been changes in legislation or in international recommendations; technical evolutions; changes in release pattern of the site; or maybe just the inclusion of an extra 'safety' factor. These changes have not always been documented very well over the last decades, or the documents are no longer easily accessible as the original authors have gone or the archives are so huge. For the historic study, several people who had gone on retirement already about 15 years ago had to be contacted in order to get aware of past activities or get an idea of interesting reports from the past.
3. Openness and transparency: the degree of openness in the nuclear still depends from site to site, but nowadays our institute makes all monitoring data publicly available. This is in a sharp contrast to the situation in the very beginning, when anything related to the nuclear sector was bathing in a pool of secrecy. There were even official statements not allowing publication of monitoring data, presumably also inspired by the fact that air, rain or soil monitoring studies showed elevated values due to the fall-out from weapons testing.
4. The shut-down or construction of several facilities, the reduction of influence of the fall-out and the releases by the coal fired station, the reduction in financial means available etc. also have lead to suspending a number of analyses or sampling points.
5. Changes of units (pCi/cm3 changed into Bq/L etc.) leading to conversions to be introduced into the tables.

Given this situation, the rapporteur presenting an overview today is confronted with the situation that many of the graphs he intends to present to an audience of non-specialists only show results for a limited period of time, or fluctuations that have nothing to do with the facilities, but that are caused by external factors. The most difficult situation as regards communication is when at a certain moment in time an increase in activity levels in the environment has been identified with values still remaining below the action levels as defined in the past. This means that a peak is clearly visible, but that at present one doesn't find any valuable information about the cause of this increase as it was not considered of sufficient importance several decades ago.

The main lesson here is to organise maintaining the competence by making a good overview of data, but also by guaranteeing that background information about sampling procedure, apparatus, hypotheses of impact studies etc. are adequately documented as well.

External impact

The fall-out from weapons testing, but also the impact of Chernobyl on the measurement values in Belgium are well-known. But also other factors play a role. As an example: water levels in some small ponds or rivers nearby. But one also finds an influence of seasons or weather, making the interpretation for laymen not always easy. As an example: the concentration of radioactivity in rain water in Bq/L may be

strongly increased if the quantity of rain is limited after a long period of dry weather. As such, it is important not only to maintain numbers and graphs, but also expertise to interpret the data.

Adequate monitoring may lead to improvements

As explained above, there is also quite a lot of ^{226}Ra present in the Mol-Dessel site. Its origin is the former radium factory of Olen in Belgium, and a number of experiments in the sixties in our institute. It is clear that this radium emits radon gas, leading to enhanced concentrations in the environment. An increase of awareness and the implementation of a program of installing track edge detectors around that site have stimulated changes in the storage conditions, leading to a drastic reduction of the local radon concentration in the vicinity of the storage.

Aerial or car borne gamma surveys

A very convincing methodology to localize, identify and/or quantify radioactive contamination is the airborne gamma survey, possibly enhanced by car borne measurements for a better detail or a more precise localisation of the source(s) of radiation. Such an effort has been performed in collaboration with the Scottish Universities Research and Reactor Centre (SURRC, at present called SUERC) of East Kilbride in Scotland. The technology allows detecting in a large range of activities, and is very useful in explaining the impact - or lack of impact - of a facility on a region. These results have been presented by Prof. Sanderson in the insinume 2002 conference, and will not be discussed in detail here. It is, in terms of communication to the public, very relevant that detection limits are so low that one easily finds back the dumping ground of fly ash or a railway track in the region. This reassures the people easily about the limited radiological impact of our site upon the quality of the soil, agricultural products etc.

Conclusions

The inquiry of the historical monitoring results in the Mol-Dessel site in Belgium has demonstrated that the historic impact of the site upon the present radioactivity levels outside the buildings and known storage facilities is very low. But the study has also lead to some management advice. The openness and public availability of the monitoring data has been strongly appreciated. It was also very relevant to show that not only our facilities deal with radioactivity, but that a lot of external factors contributed as well: natural radioactivity in fly ash, fall-out etc.

However, the data collection was tedious, and several difficulties were met that preferably would be avoided in future: there is no single database of all measurements available for the site (distribution of responsibilities); historic changes lead to several graphs that are not easy to interpret by the population, or that seem 'incomplete'; small fluctuations beyond 'scientific' concern may not be well investigated and yet lead to concern by the population. The main lesson learnt from this study is the need to maintain knowledge, and not only to keep track of measurement results, but also about methodologies, hypotheses in interpretation etc.