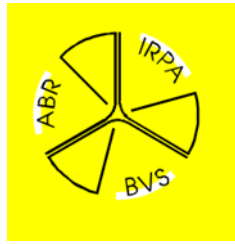


---

**BELGISCHE VERENIGING VOOR  
STRALINGSBESCHERMING**

Sociale hoofdzetel c/o SCK-CEN  
Herrmann Debrouxlaan 40,  
B-1160 Brussel

Secretariaat: Véronique Mertens  
c/o FANC/AFCN  
Ravensteinstraat 36, 1000 Brussel



02 289 21 27  
[office@bvsabr.be](mailto:office@bvsabr.be)  
<http://www.bvsabr.be>

**ASSOCIATION BELGE DE  
RADIOPROTECTION**

Siège social c/o SCK-CEN  
Avenue Herrmann Debrouxlaan 40  
B-1160 Bruxelles

Secrétariat Véronique Mertens  
c/o FANC/AFCN  
rue Ravensteinstraat 36, 1000 Bruxelles

---

**Scientific meeting of the Belgian Society for Radiation Protection BVS/ABR**

**Why should we be concerned about NORM?**

**Friday October 28, 2016**

**Federal Agency of Nuclear Control FANC/AFCN, Room 503  
Ravensteinstraat 36, 1000 Brussel**

Dear colleagues,

We have the pleasure to invite you at our scientific meeting '*Why should we be concerned about NORM?*' on Friday October 28 in Brussels.

NORM stays for Naturally Occurring Radioactive Materials (including enhanced radioactivity materials).

Why should we be concerned about NORM? NORM in general are probably a minor problem for the general population, although they can contain more than ten times the radioactivity concentration that is permitted for e.g. food stuffs. This situation can change if these materials are processed in the industry. The relatively low radioactivity concentrations can be enhanced, and will be refound in either the final product, or in the useful residues or in the waste products. As such NORM materials can present a problem in the first place for the health of the workers, but eventually also for the population in general. In the new Euratom Basic Safety Standards (BSS) Directive, NORM industries are regarded as radiation practices.

In the first part of this meeting we will remind the new features of the European BSS on NORM, and discuss the practical implementation in Belgium, France and the Netherlands. In the second part we will present some practical consequences and applications of NORM.

The programme and the abstracts can be found in annex.

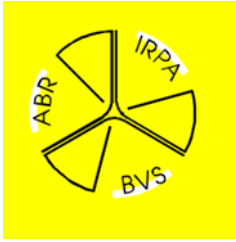
*The participation to this Scientific Meeting is free, but registration is required by Wednesday October 26 at the latest via our website [www.bvsabr.be](http://www.bvsabr.be) in the activities/scientific meetings section or directly via <http://www.bvsabr.be/events.asp?lang=NL&ID=19>.*

Patrick Smeesters  
President of BVS/ABR

Herwig Janssens – Augustin Janssens  
Coordinators for BVS/ABR

**Annexes**

- Programme
- Abstracts and CV's of the speakers



Scientific meeting of the Belgian Society for Radiation Protection

## Why should we be concerned about NORM?

Friday October 28, 2016

Federal Agency of Nuclear Control FANC/AFCN, Room 503  
Ravensteinstraat 36, 1000 Brussel

### Programme

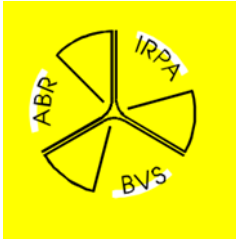
- 13.00-13.30: Reception of the speakers and the participants
- 13.30-13.45: *Setting the scene: why should we be concerned about NORM, what are the implications of the new the Euratom Basic Safety Standards?*  
Augustin Janssens  
Society for Radiation Protection BVS/ABR, Belgium
- 13.45-14.15 *How will Belgium implement the European directive with regard to NORM?*  
Stéphane Pépin  
Federal Agency of Nuclear Control FANC/AFCN, Belgium
- 14.15-14.45: *How NORM activities are regulated in France and what are the opportunities for evolution?*  
Pierrick Jaunet  
Nuclear Safety Authority ASN, France
- 14.45-15.15: *How will the Netherlands (try to) implement the new BSS in the NORM and building industry?*  
Rob Wiegers  
IBR Consult BV, Netherlands
- 15.15-15.30: Coffee break
- 15.30-16.00 *How can NORM4BUILDING support the management of NORM residues?*  
Wouter Schroeyers  
Nuclear Technological Center NuTeC, Hasselt University, Belgium
- 16.00-16.30: *What is the radiological/ecological impact of NORM residues and effluents on the environment?*  
Hildegard Vandenhove  
Nuclear Research Centre SCK•CEN, Belgium
- 16.30-17.00: Final discussion, questions and remarks

### Publication

The presentations of this meeting will be published in the Annals of the Belgian Society for Radiation Protection BVS/ABR.

### Registration

*The participation to this Scientific Meeting is free, but registration is required by Wednesday October 26 at the latest via our website [www.bvsabr.be](http://www.bvsabr.be) in the activities/scientific meetings section or directly via <http://www.bvsabr.be/events.asp?lang=NL&ID=19>.*



## Why should we be concerned about NORM?

Friday October 28, 2016

Federal Agency of Nuclear Control FANC/AFCN, Room 503  
Ravensteinstraat 36, 1000 Brussel

### Abstract and CV

#### Setting the scene: why should we be concerned about NORM, what are the implications of the new the Euratom Basic Safety Standards?

Augustin Janssens

One may wonder why we should now be concerned about NORM materials and processes. Would they be regulated if we did not have the precedent of regulating nuclear industry and other practices involving exposure to ionizing radiation? Probably yes, but maybe in a different way. Our system of radiation protection is the fruit of a long history of the management of induced radioactivity.

In the new Basic Safety Standards Directive NORM industries are regarded as practices and managed exactly in the same way as any other practice. Still the criteria for exemption and clearance are at 1 mSv/y instead of 10  $\mu$ Sv/y, allowing for the prevailing background radiation and levels of concentration of naturally occurring radionuclides in the earth's crust. The Directive now also addresses residues from past NORM activities, that had so far not been regulated, as existing exposure situations, and NORM in building materials is also addressed, both in natural stones and for the recycling of residues from industry.

Occupational exposures in NORM industries should now follow the same protection scheme as for other radiation sources, but there is one important feature that is fundamentally different: low specific activities will not give rise to high accidental exposures. Public exposures from NORM industries are in general of less concern than occupational exposures. Liquid effluent may cause the contamination of ground or surface waters used as drinking water supplies, and the requirements on the quality of drinking water are very strict. On the other hand, NORM radionuclides are extremely long-lived. The proper management of NORM residues, in particular their recycling in building materials is crucial, but may be the cause of new exposure pathways.

Augustin Janssens has retired in 2013 from the European Commission, where he held the position of Head of Unit, Radiation Protection, in DG ENER. He was deeply involved in drafting the international Basic Safety Standards and in the negotiation of the consolidated Euratom Basic Safety Standards Directive. He has a PhD in nuclear physics (1977, University Ghent), and in the seventies and early eighties conducted research at the Nuclear Physics Laboratory in Ghent. He joined the European Commission in 1985.

#### How will Belgium implement the European directive with regard to NORM?

Stéphane Pépin

NORM industries are regulated in Belgium since 2001, following the implementation of 1996/29/Euratom. Current regulations define a 'positive list' of work activities involving natural radiation sources, which has been regularly updated through the publication of successive FANC/AFCN decrees and takes into account most of the sectors listed in annex VI of 2013/59/Euratom. Companies which belong to the listed activities must notify FANC/AFCN and provide the relevant data for assessing the dose to the workers and the population. A peculiar attention has been given to the issue of management of NORM residues:

exemption/clearance criteria based on the EC publication 'Radiation Protection 122 Part II' have been published in Belgian regulations. Disposal and processing of NORM residues with an activity concentration above these levels are submitted to declaration within the regulatory framework of NORM work activities. Decommissioning of NORM facilities also involves various challenging aspects: lessons have been drawn from recent decommissioning projects and will be integrated in the process of implementation of 2013/59/Euratom.

NORM legacies have also been addressed by FANC/AFCN and various initiatives have been taken regarding the identification, the environmental monitoring and, in some cases, the remediation of NORM contaminated sites. A law proposal has been drafted which should implement the requirements of art. 73 of 2013/59/Euratom regarding contaminated areas.

The issue of NORM in building material was not specifically addressed in current Belgian regulations. FANC/AFCN has started consultations with various stakeholders in order to develop a regulation commensurate with the risks involved. FANC/AFCN intends to carry out regular surveys of the natural radioactivity in building materials in order to better focus on building materials of concern, without unnecessary burden for the producers or importers of building materials.

Stéphane Pepin is physicist and got his Ph.D. in theoretical nuclear physics from the University of Liege, Belgium in 1995.

Since 2003, he is an employee at the Federal Agency for Nuclear Control FANC/AFCN, the Belgian regulatory body for radiation protection and nuclear safety, where he works essentially on NORM issues and on the follow up of aircrew exposure to cosmic radiation. He participated in the development of the Belgian regulations regarding management of NORM residues and management of NORM legacies.

## **How NORM activities are regulated in France and what are the opportunities for evolution?**

Pierrick Jaunet

Professional activities which use materials which naturally contain radionuclides not used for their radioactive properties but which are liable to create exposure likely to harm the health of workers and the public ('enhanced' natural exposure) are currently subject to the provisions of the Labour Code and the Public Health Code. The regulation requires for specific activities which can lead to significant exposure of the general public or of workers, dose assessment for public and occupational exposures.

The transposition of the new Euratom Directive 2013/59/Euratom will deeply modify the regulatory framework for these activities and will implement new regulation for building materials. NORM activities will be subjected to the legal system for nuclear activities as defined in Article L. 1333-1 of the Public Health Code. In particular NORM activities will have to measure the radioactivity of materials, products and waste materials by accredited laboratories, and will be potentially submitted to specific authorization or notification. Concerning building materials, France wants to regulate the whole cycle: NORM raw materials activities, professionals of construction products containing NORM materials and building construction professionals such as architects, designers or builders.

A draft decree for the transposition was released by the French government in last August and is currently submitted for public consultation.

Pierrick JAUNET is deputy director of the Ionizing Radiation and Health department at ASN, the French nuclear safety authority and head of the worker and public exposure unit which oversee for ASN the transposition of the BSS directive. He was previously specialized in environmental issues at ASN and as ICPE (Installation Classified on Environmental Protection grounds) plants inspector at the Ministry of the Environment.

## **How will the Netherlands (try to) implement the new European BSS in the NORM and building industry?**

Rob Wiegiers

As in all member states also the Netherlands have to implement the Euratom BSS into national legislation. NORM is in this process a special theme for reasons that some major changes occur compared with the previous Euratom BSS/1996. The main aspects are that NORM (industry) is seen as an existing situation, therefore imposing a different approach as is used in the current legislation (Besluit Stralingsbescherming). A second (and even more important one) is that buildings and building materials are included in the legislation: buildings as far as the indoor radon concentration is concerned, building materials will be screened on their radionuclide content. Therefore, this presentation will consist of following themes: explaining the current NORM situation in the Netherlands, the impact the BSS implementation may have on the traditional NORM industry and the impact it may have on the building industry, all based on the most recent proposals for implementation as discussed in the Netherlands.

Rob Wiegiers has a background as building material engineer (TU Eindhoven). After 4 years of both scientific and applied research work at the institute for applied physics TPD/TNO he changed to the industry as a member of the management team of a holding consisting of several building product factories. After that he established, together with a colleague, IBRConsult in which R&D on building materials, reuse and also process development are the main activities as well as all aspects concerning NORM. Rob Wiegiers is, amongst others, chairman of several national committees and branches and active in both the Dutch and the European NORM and radiation protection community.

## **How can NORM4BUILDING support the management of NORM residues?**

Wouter Schroeyers

The COST Action 'NORM4Building' Tu1301 studies the reuse of by-products that can contain enhanced concentration of Naturally Occurring Radionuclides in existing and new types of construction materials. In particular, the NORM4Building network focusses on the application of by-products such as coal fly and bottom ash, slags from iron and steel production, copper slag, red mud and phosphogypsum in Portland and alkaline activated cements & concretes and in ceramics. The COST Action was launched in September 2014 and will run till September 2017.

In this presentation problems and potential solutions regarding the management of NORM (Naturally Occurring Radioactive Materials) containing by-products that were considered by the COST Action NORM4building will be discussed. Options for the management of NORM residues are evaluated in the light of the implementation of the new Euratom Basic Safety Standards (EU-BSS) at the member state level considering the impact on the related industrial sectors. The authors would like to acknowledge networking support by the COST Action TU1301 ([www.norm4building.org](http://www.norm4building.org)).

Wouter Schroeyers is professor at Hasselt University and head of the educational management team of Nuclear Technology in the Faculty of Engineering Technology. He is linked to the research group NuTeC, the 'Nuclear Technological Center', part of the larger research institute 'Center of Environmental Sciences'. The lecturer has several years of experience as a trainer for practical radiation protection in the non-nuclear industry, in particular for naturally-occurring radioactive material (NORM) processing companies. He was involved in several research projects to study the presence and reuse of NORM in several Belgian industrial sectors. He is the chair of the European COST network 'NORM4building' (TU1301) and a member of the scientific committee of the European Alara Network for NORM.

## **What is the radiological/ecological impact of NORM residues and effluents on the environment?**

Hildegard Vandenhove

Some industrial activities such as oil and gas extraction, phosphate fertilizer production, ceramic production, coal combustion in power plants or mining and ore processing for the production of metals (tin, aluminum, ...), geothermal energy production, ... involve the use of materials, usually regarded as non-radioactive but which contain naturally occurring radionuclides (NORM). NORM industries may be of radiological concern for the general public and the environment as a result of their discharges and wastes.

We will present a short overview of the waste production processes and the radiological content of the raw materials, residues and discharges for the NORM industries that may require regulatory control. The main sources and pathways by which technologically enhanced radioactive materials can impact on man and environment and methodologies to assess radiation doses for the dominant pathways for external and internal exposure and fauna and flora exposure will be described. For a few example cases, a more in depth analysis of the radiological impact to man and environment will be performed.

Hildegard Vandenhove is director of the Institute Environment, Health and Safety of the Belgian Nuclear Research Centre, performing research and providing services in the domains of radiation protection, long-term waste management, dismantling of facilities, safeguards and social sciences. For +15 years she has been head of the unit Biosphere Impact Studies and has +20y experience in the domain of transfer assessment and human and environmental impact assessments. She has coordinated several projects dealing with contaminated land management and human impact assessment including projects dealing with NORM and U-mining and milling. She (co)-authored more than 70 peer review international journal articles.