Challenges in implementing the change in regulations in the NORM industry

THE NEW BSS

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2016 Rio norm VIII CHALLENGES AND SOLUTIONS

MOTIVATION

It seems evident that the revised BSS would provide greater clarity on the control of exposure to natural sources although their application will be far to be trivial, still remaining some complexities.

The description and evaluation of some important challenges, in relation with the implementation of the new BSS in the NORM industries will be form the core of this presentation.

INTRODUCTION: Some history….

It was about twenty years ago when some countries, mostly European, started to introduce measures to regulate exposures arising from natural sources, in particular from minerals other than those associated with the extraction of uranium.

Two important milestones in this regard were the establishment of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (IAEA, 1996) and the European Council Directive 96/29 of Euratom published the 13 of May 1996.

Both contained provisions for protective measures against significantly increased exposures of workers and members of the public to natural sources.

The beginnings….

The beginnings were quite far to be easy. Only one year after the publication of the European Directive, the first NORM Conference was held in Amsterdam due to the concern generated in the European chemical industry about its implementation.

The novelty of these regulations,
The lack of experience of all the actors involved,
The confusing treatment of some key points of the international standards,

→ **a certain chaos during the first few years.**

It was the time where misunderstandings in the interpretation of several requirements of the BSS were no unusual, and where a tendency for overregulation was evident due to the no application of the principle of graded approach.

Along the time ……

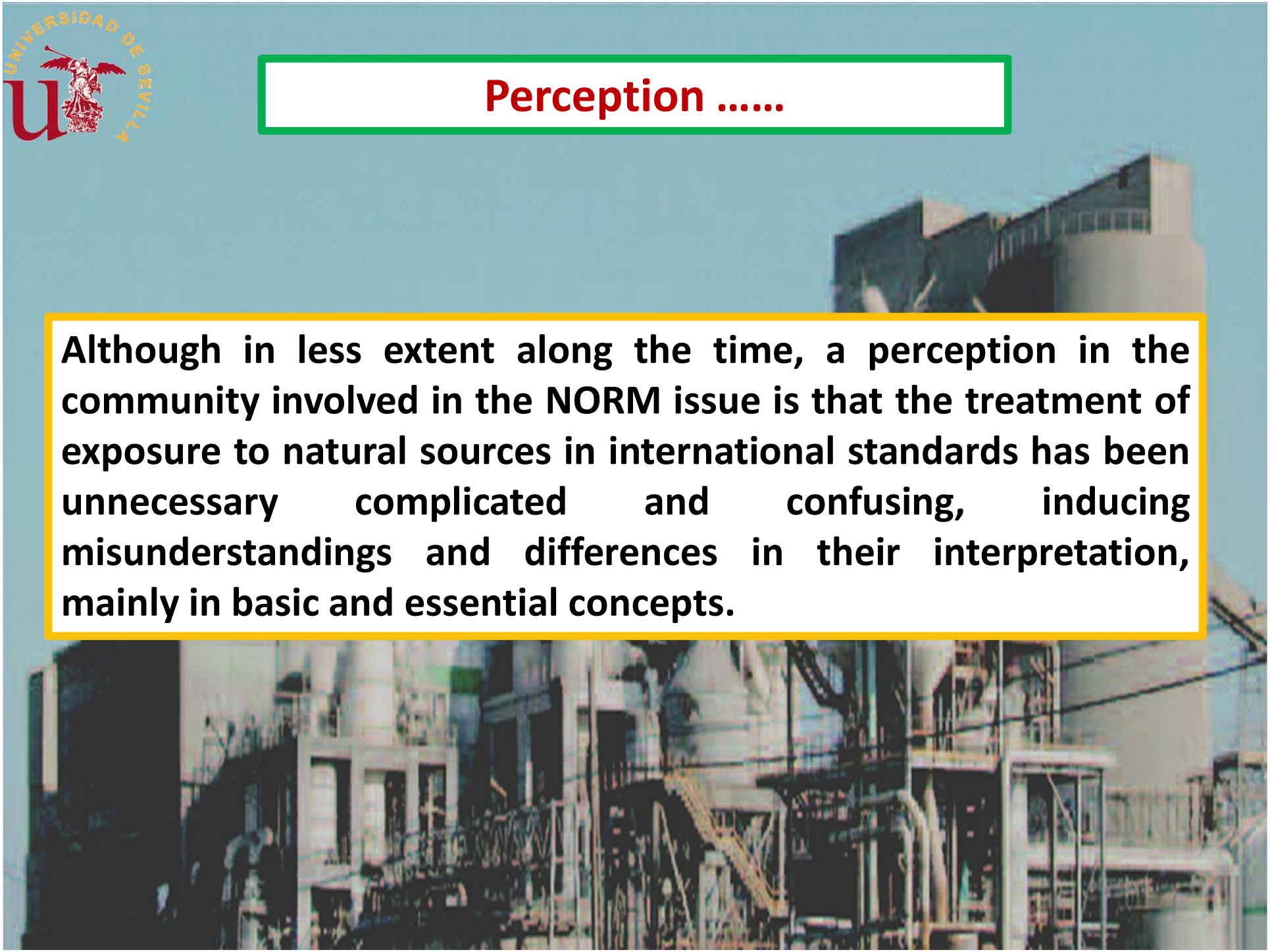
From 1996 until now, the advances in the Radioprotection in NORM have been evident, acquiring the issue a worldwide dimension not existing twenty years ago.

New regulations for the control of exposures to NORM become established and the knowledge about levels of exposure has clearly improved.

Nevertheless, all the controversial aspects have not disappeared

NORM V Conference Seville, Spain 2007 → there was a chaos or consensus in relation to managing NORM? → There was still a little of both

Perception ……



Although in less extent along the time, a perception in the community involved in the NORM issue is that the treatment of exposure to natural sources in international standards has been unnecessary complicated and confusing, inducing misunderstandings and differences in their interpretation, mainly in basic and essential concepts.

THE NEW BSS

Only a couple of years ago were definitively published the new version of the International Basic Safety Standards (BSS) which replaced the published ones in 1996.

The requirement in the new BSS are in line with the 2007 Recommendations of the ICRP.

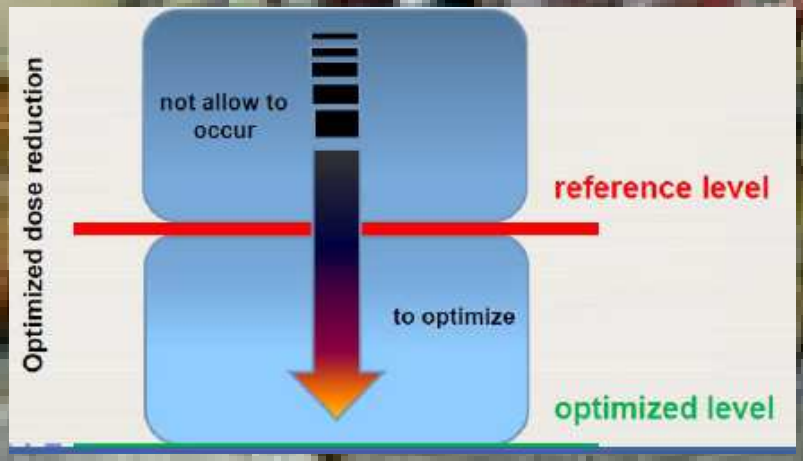
Three types of exposure situations (planned exposure situations, existing exposure situations and emergency exposure situations) are reflected in the structure of the new BSS.

Exposure to natural sources continues to be generally subject to the requirements for existing exposure situations, but exposure control, is based on the use of the so called reference levels.

Reference levels replace the concept of "action levels" included in the old BSS

Reference levels

Reference levels are levels above which it is inappropiate to plan to allow exposures to occur, and below which optimization of protection should be implemented.



Reference levels are not the same as action levels

Action levels are levels at or below which remedial action (and thus the need for optimization) is no normally necessary.

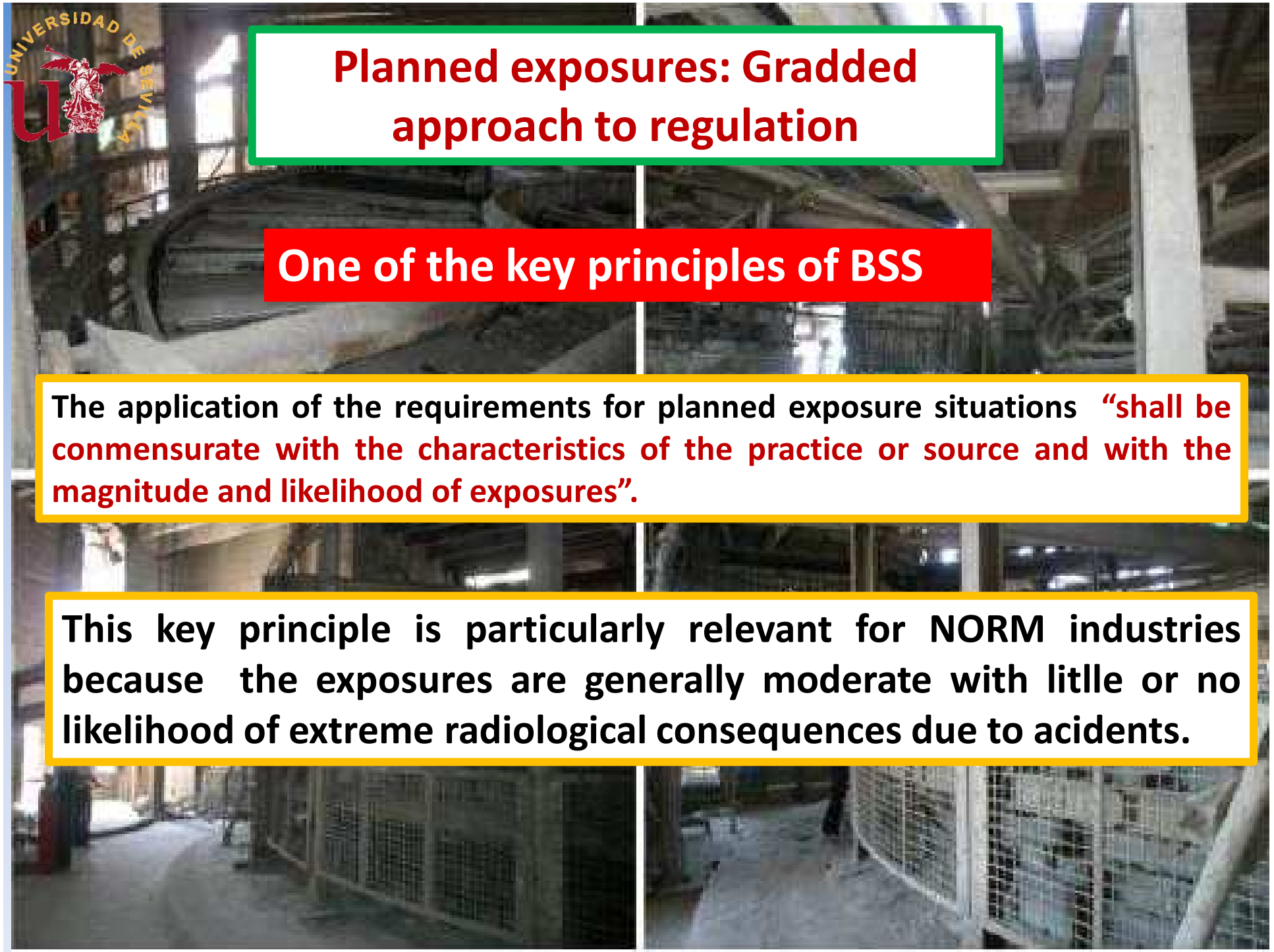
THE NEW BSS (cont.)

Only few exposures to natural sources, by exception, are subject to the requirements for planned exposure situations.

One of these particular cases is the exposure to material (other than commodities such as food, driking water, fertilizers and construction material) with a radionulide concentration exceeding 1 Bq/g for the U and Th decay series, or 10 Bq/g in the case of of ^{40}K (exposure to NORM).

In the new BSS, for the first time, numerical criteria for exemption and clearance of NORM have been included.

The exemption is determined on the basis of dose commensurate with the natural background (about 1 mSv /year) and the clearance criteria for NORM 1Bq/g for U and Th series radionuclides and 10 Bq/g for ^{40}K.



Planned exposures: Gradded approach to regulation

One of the key principles of BSS

The application of the requirements for planned exposure situations **"shall be conmensurate with the characteristics of the practice or source and with the magnitude and likelihood of exposures".**

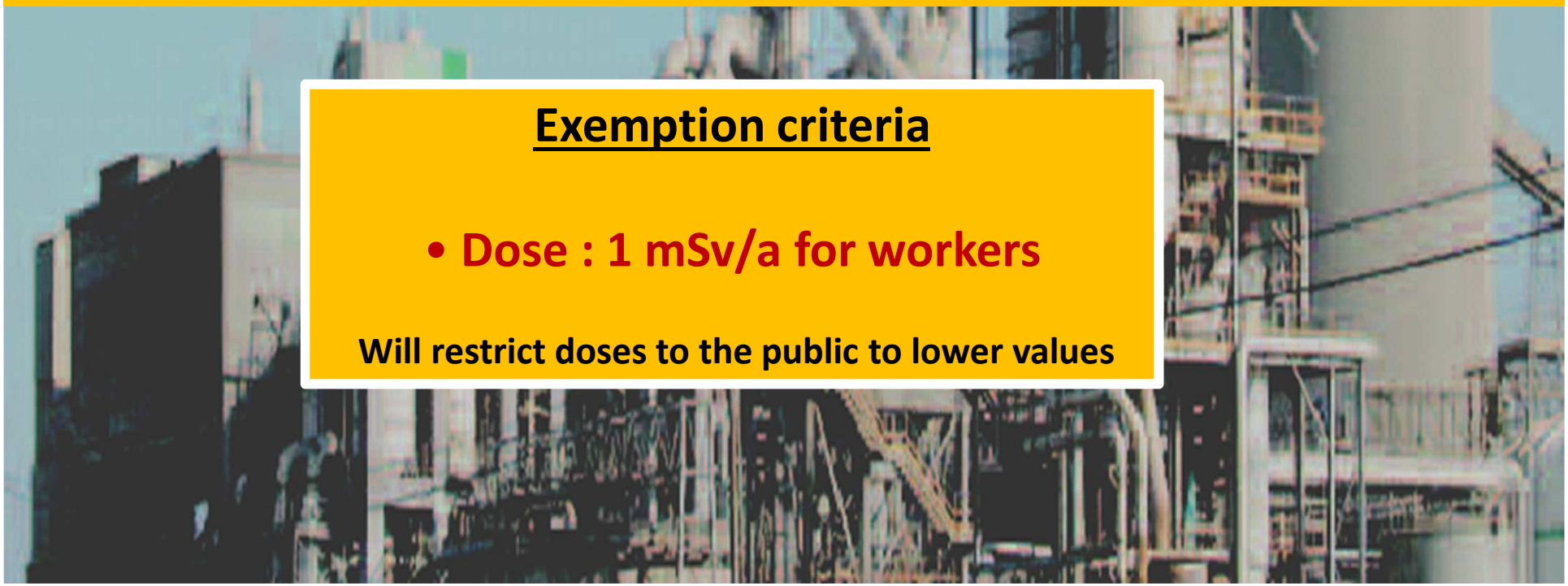
This key principle is particularly relevant for NORM industries because the exposures are generally moderate with litlle or no likelihood of extreme radiological consequences due to acidents.

Regulatory control of NORM in planned exposure situation

Exemption

Responsible authority should establish exemption criteria based on dose

- Taking into account economical, social and political factors
- Balancing the consequences of regulatory control, in terms of impact on the NORM activity, against the benefit in terms of approved radiation protection



Exemption criteria

- Dose : 1 mSv/a for workers

Will restrict doses to the public to lower values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Challenges

Challenges (I)

Some efforts should be needed for the proper implementation and full understanding by the affected community of the newly introduced "reference level" concept.

The tendency observed in the first months of implementation of the new BSS to simply interexchange the concepts of action levels and reference levels should be properly corrected.

The "reference levels" sometimes have been used as limits defeating the purpose of optimization.

These efforts should be accompanied for the continuous didactic dissemination of the basic concepts of exclusion, exemption and clearance that historically have been applied confusingly/wrongly by a no negligible fraction of the actors involved in the radioprotection of NORM material.

Reference Levels vs. Action levels (I)

The change from “action levels” to “reference levels” is far from being anecdotic.

In addition to an evident change in the philosophy of regulation, the selection of numerical values for the “reference values” quite identical to the previously established in the old BSS for the “action levels” resulted in a very significative increase in the stringency of protection measures in existing exposures situations.

This increase is principally through the removal of what was effectively a lower bound on the application of the optimization process.

Planned vs. Existing exposures

The concepts of planned and existing exposure situations not fully understood in terms of practical information.

When some doubts appear about which type of requirements (planned or existing exposure situations) should be implemented, by default these cases should be treated as existing exposure.

It is then followed the philosophy of the BSS that treat the great majority of exposures to natural sources as existing exposure situations.

The selection performed in these unclear cases is only based in taking practicability as the most important consideration, because the exposure should be controlled regardeless of the type of situation.

Individual Industrial Approaches

BSS developed for the NORM industry in general. but…

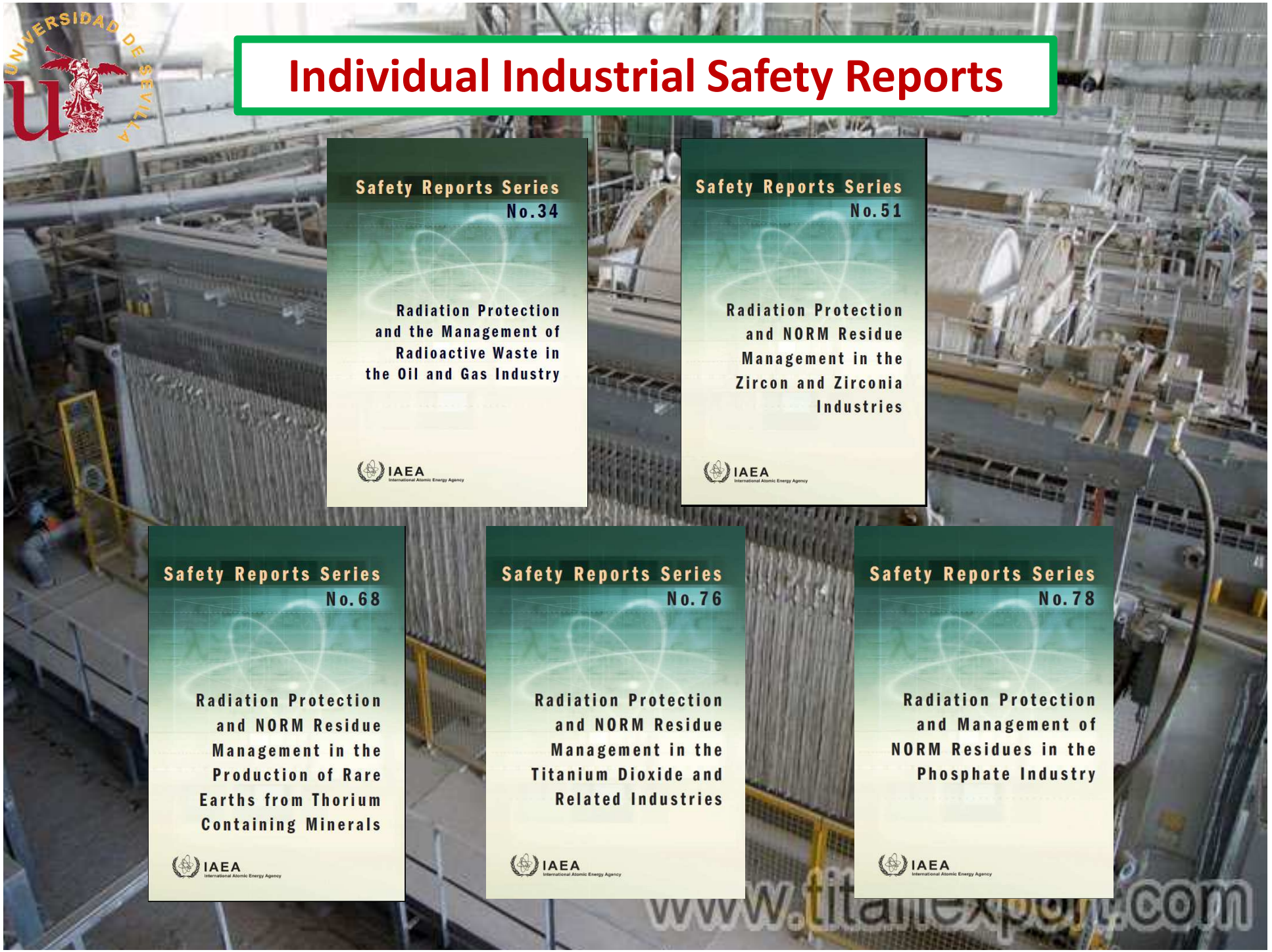
Individual NORM industries are very different as are the practical radiation protection challenges they face.

No single approach is appropriate for all industrial NORM processes

In NORM industries, most of the actions taken to comply with regulation are situation specific and very hard to generalise. The idea of a common protocol to control the exposures in all the NORM industries should be forgotten

The " positive list" of industrial sectors

Individual Industrial Safety Reports

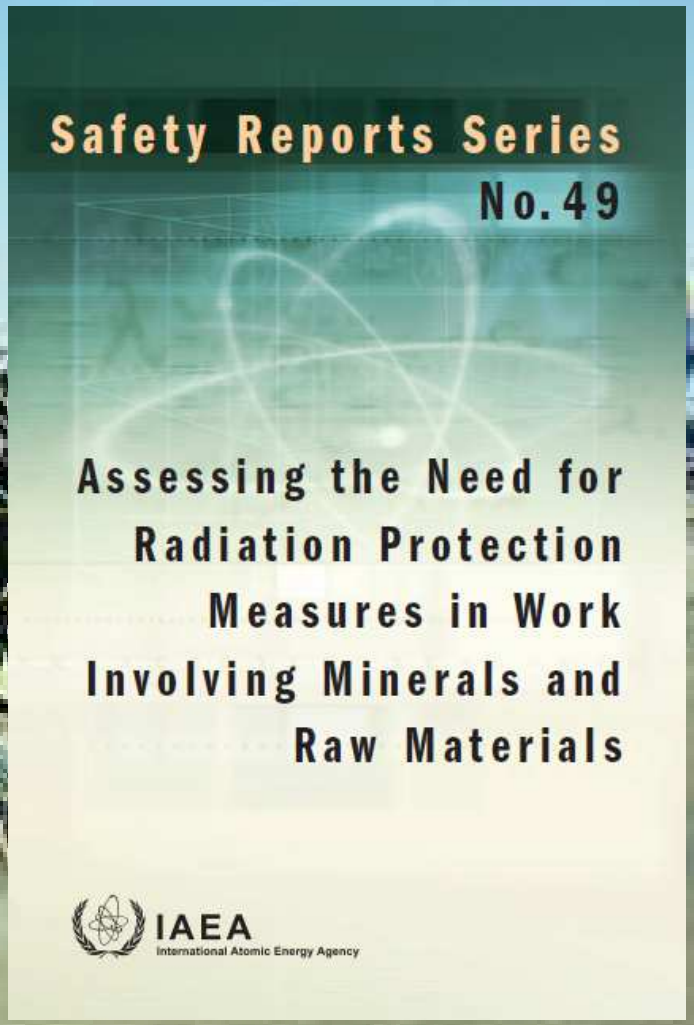


Assessing the need…..

Excellent Safety Report from where the dimension and magnitude of the radiation Protection in the NORM industry is clearly deduced.

The most important key points concerning RP in the NORM industry are didactically introduced and explained.

Is "imperative" the survival of this safety report in all it dimension. For that reason , some parts need to be adapted to the new BSS.



Approaches to decrease occupational doses….

Through the individual studies performed in NORM industries, it is clear that in most of the workplaces of NORM industries the worker doses are lower than 1 mSv/year.

They are few exceptions related with U/Th mining and processing, rare earths extraction etc, where there is a potential for higher exposures if adequate control measures are not implemented.

The majority of published studies have been concentrated in determining individual doses in order to establish the need or not of regulatory control, but only in extremely limited number of the needed cases information is given on how such doses might then be optimized in practice.

Additional studies in NORM workplaces where dose optimization are needed should be performed, with special emphasis in the evaluation of alternative approaches to decrease occupational doses in practice.

Assessment of worker doses….

The methodologies for realistic assessment of worker doses suffer from non-standardised approaches, being necessary to plan how this standardisation can be approached.

The emphasis should be put on actual monitoring data (individual and workplace) to ensure that the dose estimates are realistic, rejecting the approaches based in conservative models.

In particular, it is important the standardisation in the determination of occupational inhalation doses which suffers until now of a tendency for the application of simplified non-validated approaches.

Lack of Measurement Infraestructure….

A lack in the development of standardisation is found also in the NORM industries associated to the measurements methods and protocols to determine the radionuclide concentrations in their raw materials, products and residues.

There is a clear industrial lack of sufficient infrastructure to analyse and interpret radionuclide concentrations.

There is an associated lack of qualified experts for radiation protection in the NORM industries.

There is a lack in the development and standardization of field methods for activity analysis in industrial samples.

These lacks are partially covered by some radiation protection service companies…. But only partially.

Management of NORM residues

The need for minimising radioactive waste is one of the basic principles embodied in the IAEA safety standards

Increasing acceptance on the concept of use of NORM residues rather than disposal.

- **Many instances of residue recycling and use**
- **Instances of dilution**

Management approach needs to be tailored to the particular industrial activity and its location

A risk-based and situation specific approach is essential

Management of NORM residues (II)

For some NORM industries, especially those producing low or medium volume residues with higher activity concentrations, a suitable waste disposal repository is the only solution, being in the last years increasingly accepted that these NORM residues may disposed in a manner similar to that for other hazardous wastes.

For residues of moderate content of radionuclides there is an increasing acceptance on the concept of use rather than the disposal, being the recycling an emerging option. In case of waste disposal, exposure control of the workers involved in its management and maintenance should be assured.

Valorization….. with scientific evidences

Cement & Concrete Composites 37 (2013) 76–81

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Evaluation of the use of TiO_2 industry red gypsum waste in cement production

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Journal of Hazardous Materials 191 (2011) 269–276

Contents lists available at ScienceDirect

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Physico-chemical and radioactive characterization of TiO_2 undissolved mud for its valorization

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The cumulative effect of three decades of phosphogypsum amendments in reclaimed marsh soils from SW Spain: ^{226}Ra, ^{238}U and Cd contents in soils and tomato fruit

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Thanks
Gracias