



BSS and ICRP Recommendations

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Introduction 1



- In the EU radiation safety is regulated by some mechanisms of the European Community e. g.
 - EURATOM Treaty (1957),
 - directives,
 - regulations.
- The basic directive is the *Council Directive 96/29/Euratom laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation* - **BSS**.
- Date of text: 13 May 1996.
- Implementation required: 13 May 2000.



Introduction 2



- Council Directive 96/29/Euratom is based on the “1990 Recommendations of the International Commission on Radiological Protection” prepared by the ICRP – ICRP 60



INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

<http://www.icrp.org/>

- From the history:
 - The ICRP was established in 1928.
 - The ICRP was “established to advance for the public benefit the science of radiological protection, in particular by providing recommendations and guidance on all aspects of protection against ionising radiation.”

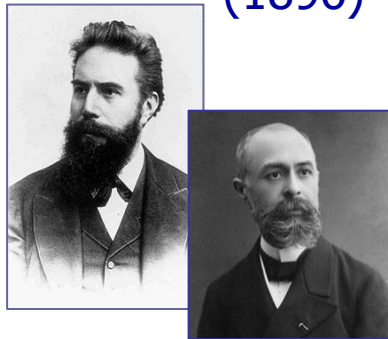


Introduction 3



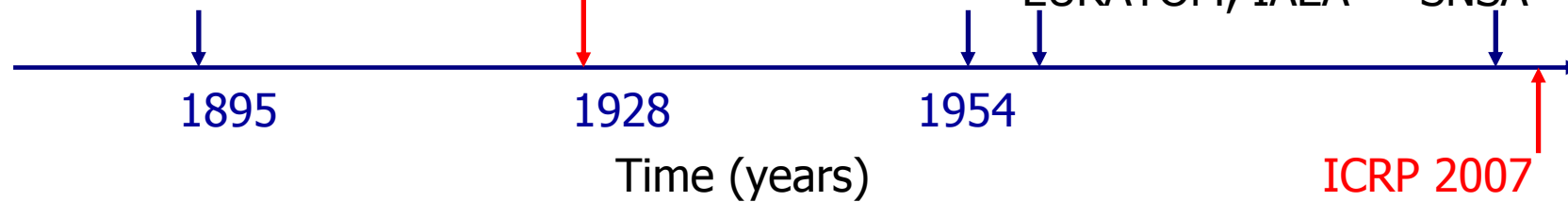
W.C. Roentgen
(1895)

H. Becquerel
(1896)



ICRP

Obninsk (first NPP)



- 3 mSv/week (1951) → 20 mSv/year or 100 mSv/5 years (EC 2000)

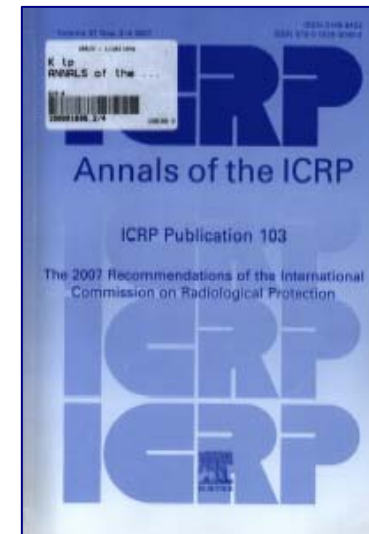
Introduction 5



- After long consultations with experts and other stakeholders all over the world the ICRP prepared new recommendations in 2007.

ICRP 103

Consultations including web



- The ICRP prepared the evolution of the recommendations already existing based on scientific data (e.g. UNSCEAR) as well as on the feedback from the implementation of the radiation protection system.



Introduction 6



- Main ICRP 103 commission



J. Lee, Y. Sasaki, H. Menzel (observer), C. Streffer, N. Shandala, J. Preston, A. Sugier, A. González, J. Pentreath, J. Valentin L.-E. Holm, C. Cousins, R. Cox. Absent Z. Pan, J. Boice.



Introduction 7



- The ICRP recommendations are reflected in documents of the EU.
- Other organisations also follow the ICRP recommendations, e.g. IAEA in the *Fundamental Safety Principles* (2006) and *IAEA BSS*.

ICRP recommendations

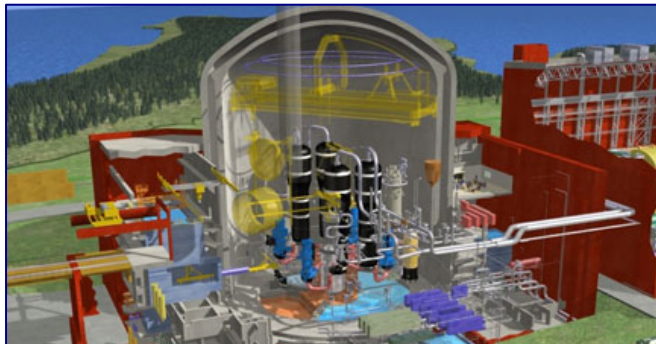
BSS



Introduction 8



- The requirements of the recommendations are part of the *Convention on Nuclear Safety*.
- The producers of the NPPs take into account the ICRP recommendations.



- E.g. AREVA enhanced radiological protection in the EPR

“The EPR enhances radiological protection for operating and maintenance staff. The aim is to keep the collective dose in the region of 0.40 man-sievert per reactor per year. This is considerably lower than the average value of 1 man-sievert currently observed in nuclear power plants in the OECD countries.”

<http://www.areva-np.com/scripts/info/publigen/content/templates/show.asp?P=865&L=US&SYNC=Y>





Three main principles are kept

1. The Principle of Justification
2. The Principle of Optimisation of Protection
3. The Principle of Application of Dose Limits





Main changes

- I. changed in some radiation quantities (e.g. w_R , w_T)
- II. implementation of radiation safety system
- III. safety and security issue
- IV. protection of the environment

*To look also in:

http://resource.npl.co.uk/docs/science_technology/ionising%20radiation/clubs_groups/irmf/34th_meeting/tanner.pdf

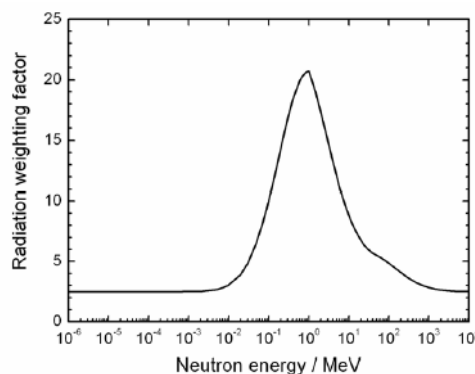




I. Changes in some radiation quantities - 1

- radiation weighting factor

Particle	1990	2007
Protons	5	2
Neutrons	Step function	Continuous function



* charged pions $w_R = 2$.



I. Changes in some radiation quantities - 2

- tissue weighting factor

Tissue	1990	2007
Breasts	0.05	0.12
Gonads	0.20	0.08



I. Changes in some radiation quantities - 3

- risk coefficients (unit %/Sv)

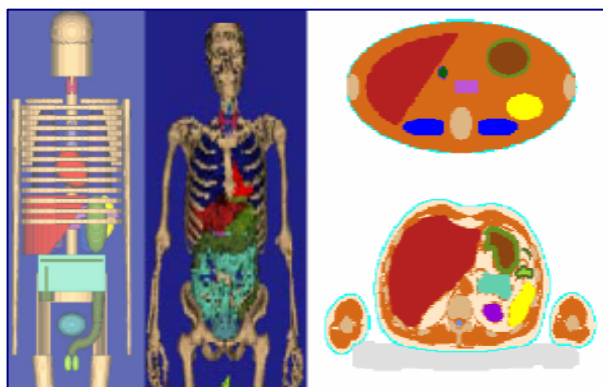
Population	Cancer		Hereditary Effects		Total	
	1990	2007	1990	2007	1990	2007
Children	6.0	5.5	1.3	0.2	7.3	5.7
Adults	4.8	4.1	0.8	0.1	5.6	4.2

* in general 5%/Sv fatal risk



I. Changes in some radiation quantities - 4

- use of reference computational phantoms, namely *voxel phantoms*, in order to update the organ dose conversion coefficients.



*http://resource.npl.co.uk/docs/science_technology/ionising%20radiation/clubs_groups/irmf/34th_meeting/tanner.pdf



II. Implementation of radiation safety system

- Exposure situations are defined:
 - planned exposure situation controlled by dose constraints,
 - existing exposure situation controlled by reference levels,
 - emergency exposure situation controlled by reference levels.
- The bands used for dose constraints and reference levels are recommended.



II. Implementation of radiation safety system

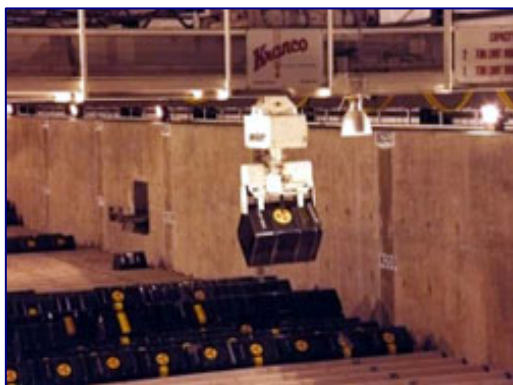
- In general, three groups of persons are controlled:
 - workers,
 - patients,
 - member of a public.

3×3 matrix



II. Implementation of radiation safety system

- Dose constraint is a tool used by an operator.
- The operator focuses on a specific task.
- In general a dose constraint is well below the dose limit.



*Right North Anna Power Station Reactor Head Replacement", L. Rollings, Surry NPP, USA (<http://www.isoe-network.net>)



II. Implementation of radiation safety system

- The regulator focuses on the total dose of a person related to all sources and on the dose limit.



Person



III. Safety and security issue

- Terrorist actions should be taken into account.
- Security should be taken into account when assessing radiation protection issues.



<http://www.guardian.co.uk/gall/0,,550207,00.html>





IV. Protection of the environment

- Investment into research related to impact of radiation on other species is recommended.
- A basic question: Is the environment protected enough if only the protection of a man is required?
- A draft "Environmental Protection: the Concept and Use of Reference Animals and Plants" (2008).





Overview of the ICRP 103

- The ICRP 103 has eight sections and two annexes.
- The ICRP 103 has a slightly different organisation than the ICRP 60 reflecting the fact that some conceptual changes are given e.g.:
 - A separate section related to so called “interventions” is not given.
 - Recommendations related to “medical exposure” are given in detail in Sec. 7, containing the recommendations also related to persons who are not patients.
 - Protection of the environment is described in a separate section, namely Sec. 8.
- The “Executive summary” is given just in the beginning of the text in order to facilitate the reading.

The Role of the ICRP 103 1



ICRP 103 and BSS of the EU

- The “RECAST procedure” is taking place to revise the current BSS Directive and to consolidate the existing legislation taking into account among others also the recommendations of the ICRP 103.
- One **BSS directive** will be prepared.
- Radiation protection legislation or recommendations to be considered in the “RECAST procedure”
 1. Basic Safety Standards, Directive 96/29/Euratom
 2. Medical Exposures, Directive 97/43/Euratom
 3. Outside Workers, Directive 90/641/Euratom
 4. Control of high activity sealed radioactive sources and orphan sources Directive 2003/122/Euratom
 5. Public Information, Directive 89/618/Euratom
 6. Radon, Commission Recommendation 90/143/Euratom



The Role of the ICRP 103 2



ICRP 103 and BSS of the EU

- The intensive drafting procedure is taking place in last two years.
- The approval of the draft of the new BSS is expected to be given by *the EC Group of Experts established by the Art. 31 of the EURATOM Treaty* in 2009 - 2010.
- The details of the procedure are given on the Internet.

<http://www.hse.gov.uk/radiation/rpnews/rpnews220908.htm#a2>

http://ec.europa.eu/energy/nuclear/radiation_protection/doc/art31/2008_06_11_report.pdf

[http://192.171.153.213/protect/StefanMundigIECRevisionBSSPROTECTworkshopMay.pps#288,16,What can/shall be regulated? When? How? \(2\)](http://192.171.153.213/protect/StefanMundigIECRevisionBSSPROTECTworkshopMay.pps#288,16,What%20can/shall%20be%20regulated?%20When?%20How?%20(2))



The Role of the ICRP 103 3



ICRP 103 and BSS of the IAEA

- The IAEA has just prepared the draft of the IAEA BSS
Draft 2.0 (DS379), May 2009.
- The draft was prepared with a strong collaboration of the OECD/NEA and others.
- The details of the IAEA procedure are given on the Internet.

<http://www-ns.iaea.org/committees/files/RASSC/189/RASSCAgenda.pdf>

<http://www-ns.iaea.org/committees/files/draftcomments/804/DS379-revisedBSS draft2.0-7May2009.pdf>





Future of the BSS

- It is foreseen that the **new BSS** of the EU will be published in next years with the requirement to be implemented around 2015.
- Due to the fact that the ICRP 103 does not change drastically the overall system of the radiation protection radiation safety in the EU will not change fundamentally.
- The required changes could be prepared in advance in accordance with the national legislation system.
- The foreseen activities related to nuclear technology in the EU countries will increase the need for the radiation protection experts and regulatory control.*
- The IAEA BSS are also to be published in a near future.

* EC Strategic Energy Technology Plan (SET, March 2008)
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0723:FIN:EN:PDF>

Conclusions 1



Future of the ICRP

- New ICRP recommendations are expected to be published around 2020.
- Some issues are still challenging*
 - renaissance of use of nuclear energy,
 - improvements of the dose models,
 - understanding of the behaviour of radionuclides in a body,
 - use of reference animals and plants,
 - implementation of radiation protection of the environment,
 - “medico-legal” issue,
 - implementation of radiation safety regarding a few generations of operators,
 - new phenomena e.g. individual susceptibility, cataract, women risk factors, influence on the progeny ...

* <http://www.hleg.de/>

http://ec.europa.eu/energy/nuclear/radiation_protection/doc/publication/145.pdf

