

# BELARUS EXPERIENCE OF APPLYING THE DOSE CONSTRAINT FOR OCCUPATIONALLY EXPOSED WORKERS IN NATIONAL REGULATIONS

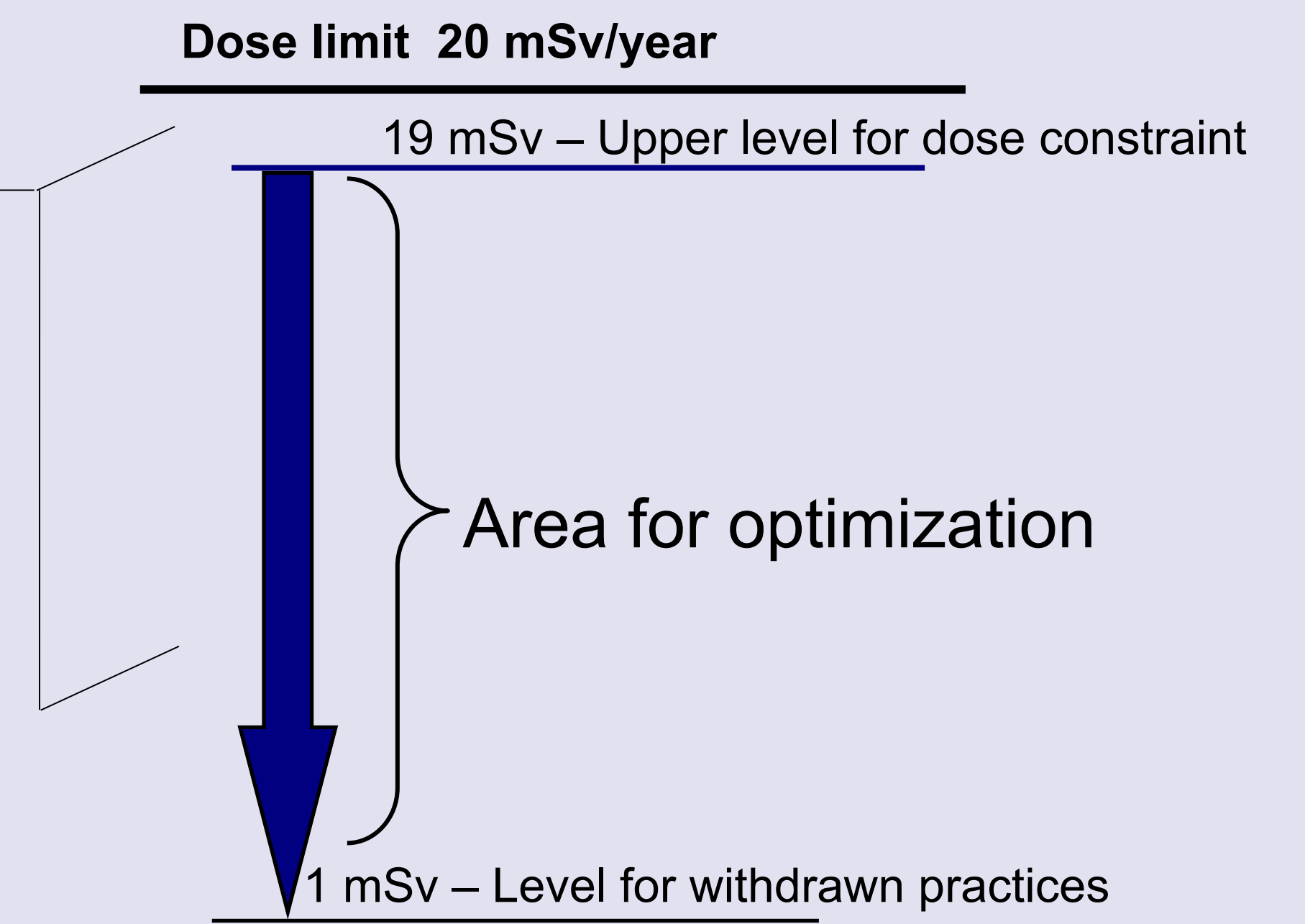
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## Introduction

The International Commission on Radiological Protection (ICRP) publications and the IAEA safety standards recommend the application of source-related dose constraints (hereinafter referred to as DC) under a planned exposure situation as a tool for the optimization of measures to ensure protection of the radiation workers and members of the public. For occupational exposures, the dose constraint is a value of individual dose used to limit the range of options considered in the process of optimization.

By now the DC concept for occupational exposure has been widely used in various exposure situations, however, the comprehensive review of its practical implementation allows speaking that in many cases the used DC does not resemble DC as defined by the ICRP.

The report is intended to contribute to the experience of introducing the concept of DC for occupationally exposed workers to the national regulatory framework for radiation protection and safety.



## Legislative framework

In the Republic of Belarus, the commitment of the source operator (employer for use) and the Sanitary Supervision Service (hereinafter referred to as Gossannadzor) to establish DC for occupational exposure within frame of optimization of protection and safety is prescribed in the radiation hygienic regulations [1], effective from January 2012.

Further a new Law of the Republic of Belarus "On radiation safety" put in force on June 18, 2020 [2] updated the requirement on legislative level and authorized the Ministry of Health (hereinafter referred to as MoH) to set up the procedure for establishing and application of DC in the radiation protection system.

In pursuance of the Law, the MoH developed and approved "Regulation on the procedure for establishing and application of the dose constraints and reference levels" (of 31.08.2020) and "Guide for assessing the radiation risk to health and determining the DC for occupationally exposed workers of Belarus NPP during normal operation" (of 28.01 2022), both based on ICRP and IAEA requirements.

In planned exposure situations related to a given radiation source DC shall be established:

- for exposure of workers at nuclear facilities
- for workers at radiation facilities, who are working with open sources corresponding to 1-2 class of work or with sealed radiation sources of I and II safety category;

The constraints are set as one or more of the following values:

- annual individual effective dose of a standard worker (for occupational exposure);
- annual equivalent dose to an organ or tissue;
- risk constraint for exposure to a single (specified) source.

## PROCEDURE FOR DETERMINING AND REVIEWING THE DOSE CONSTRAINT

### At the design stage:

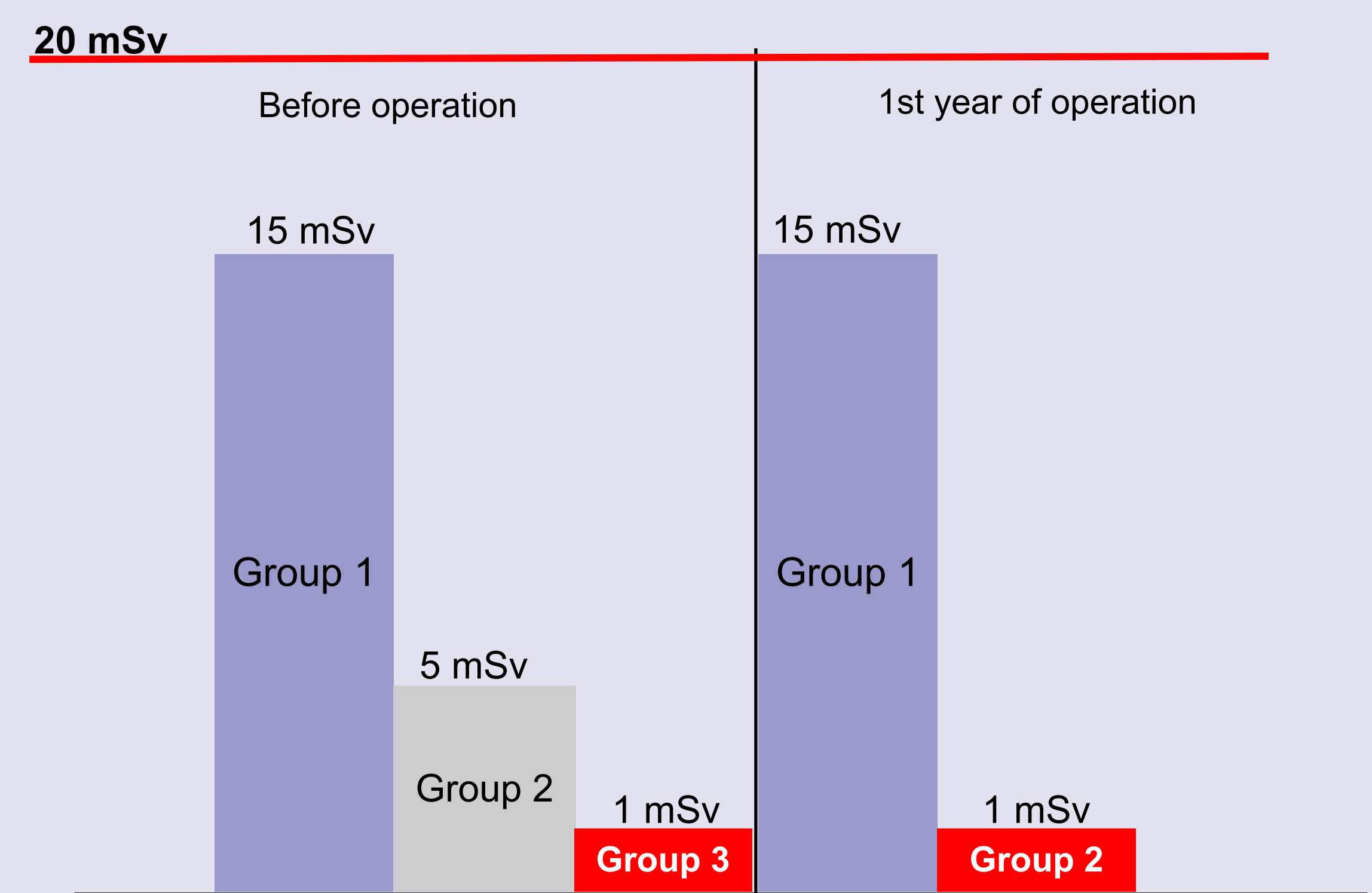
- analysis of exposure doses for workers at analogue NPPs for the period of at least the last 5 years of work in conditions typical for the NPP being designed;
- indication of "best practice" of NPP-analogues;
- a comparative analysis of exposure doses and parameters characterizing the radiation situation at the workplaces of the workers at the designed NPP and at analogue plants;
- determining the DC for a given group of workers based on the exposure doses of the standard worker, received maximum dose while performing analogue work at the analogue NPP with "best practice".

### At the stage of operation:

- retrospective analysis of individual exposure doses of workers over a period of 5 years of work;
- selection of the most exposed groups of personnel, taking into account the results of the analysis of individual annual exposure doses and the accumulated exposure dose for the analysed period;
- determining personnel groups for differentiation of the DC - based on the analysis of radiation doses and radiation parameters at the workplace;
- selection of the "best practice" (of one reactor- analogue) based on the data on the levels of annual occupation exposure at the reactor-analogue;
- comparative analysis of radiation doses and levels of parameters characterizing the radiation situation at the workplaces of the personnel of the NPP and NPP with the reactor-analogue;
- calculation of exposure doses for a standard worker based on radiation parameters at the workplaces of identified worker groups;
- calculation of exposure doses for a standard worker of the selected group after optimizing protective measures to the level of the "best practice" (the NPP-analogue), or the introduction of advanced protection methods (predicted dose);
- calculation and justification of the normative value of the DC for the personnel of each of the selected groups;
- assessment and establishment of the DC.

Establishing of Dose constraint for workers in Belarus		
<b>In the design phase of building a new facility</b>	<b>Employer for use:</b> defines DC values for workers, involved in specific tasks and practices based on the experience of the similar facilities and practices with comparable working conditions; submits the DC standard form to Gossannadzor for DC endorsement; demonstrates to Gossannadzor that the facility will be designed in such a way that no occupationally exposed worker will be expected to receive a dose exceeding the DC; approves the DC value (after endorsement of Gossannadzor)	<b>Gossannadzor:</b> advises and gives formal agreement on the DC value based on the results of the sanitary-hygiene expertise; lays down DC values in the sanitary passport (permission) issued by Gossannadzor within the process of the sanitary authorisation of activities with the source of ionizing radiation
<b>At operating facility</b>	<b>Source operator (facility):</b> specifies DC values based upon data on actual doses received by the workers of the facility and data from other existing radiation protection practices with comparable working conditions; submits the DC standard form to Gossannadzor for DC endorsement; approves DC values (in consensual agreement with Gossannadzor)	

### Responsibilities for establishing DCs



### Dose constraints for workers at Belarusian NPP

## IMPLEMENTATION

Manager (RSI user or organization operating nuclear facilities)

\_\_\_\_\_  
 (signature) \_\_\_\_\_ (initials, surname)  
 Date: \_\_\_\_\_

**Dose constraints for workers**  
 Full and abbreviated name of the IRS user or the organization operating the nuclear facility, departmental subordination (if applies), address, phone number, fax number, e-mail address

\_\_\_\_\_  
 The official responsible for radiation safety  
 (position, number and date of the order on assignment of duties, phone)

Category of exposed persons	Annual effective dose, µSv	Equivalent dose*, µGy		
		The lens of the eye	Skin	Hands and feet
Personnel (certain categories of personnel*)				

\* filled in if it is necessary to establish a dose constraints for certain categories of personnel, in certain organs and tissues. On the basis of a positive conclusion of the state sanitary and hygienic examination from «\_\_\_» \_\_\_\_\_ year №\_\_\_\_\_, issued by \_\_\_\_\_ (name of the territorial institution of state sanitary supervision)

Additional information (name of documents on the basis of which the DCs are established, their date, number, number of pages): \_\_\_\_\_

Approval date «\_\_\_» \_\_\_\_\_ year  
 Valid for \_\_\_\_\_ years  
 Executant (official of the state sanitary supervision institution)  
 \_\_\_\_\_ (signature) \_\_\_\_\_ (initials, surname)  
 Made in \_\_\_\_\_ copies.

**Form for submitting the draft of value of DC for occupational exposure**

Dose constrains for personnel of Belarus NPP			
Group	Normalized value (Controlled indicators)	Applies to	Value, mSv
1	Effective dose	All staff	15,00
	Dose equivalent	All staff	
	Lens of the eye		15,00
	Skin	All staff	350,00
	Hands and feet	All staff	350,00
2	Equivalent dose on the surface of the lower abdomen	Women under the age of 45	0,75
	Effective dose	All staff	1,00

Regulation on the procedure for establishing and application of the dose constraints and reference levels of 31.08.2020

- GENERAL PROVISIONS
- PROCEDURE FOR ESTABLISHMENT AND APPLICATION OF THE DC FOR THE POPULATION
- PROCEDURE FOR THE ESTABLISHMENT AND APPLICATION OF THE DC FOR WORKERS
- PROCEDURE FOR THE ESTABLISHMENT AND APPLICATION OF DRLs IN CASE OF PATIENT EXPOSURE
- PROCEDURE FOR ESTABLISHING AND APPLICATION OF RLs IN EMERGENCY AND EXISTING EXPOSURE SITUATIONS

### Guide for assessing the radiation risk to health and determining the DC for occupationally exposed workers of Belarus NPP during normal operation of 28.01.2021

- USE CASES AND SCOPE
- GENERAL PROVISIONS
- ALGORITHM FOR DETERMINING DC FOR PERSONNEL
- DETERMINATION OF STAFF CATEGORIES FOR ESTABLISHING DC
- DC CALCULATION AND DETERMINATION
- METHOD FOR ASSESSING THE RADIOLOGICAL HEALTH RISK TO PERSONNEL DURING BELNPP OPERATION

- Appendix 1. List of NPPs with VVER reactors (analogues)
- Appendix 2. The procedure for retrospective assessment of personnel exposure doses
- Appendix 3. Estimation of values of accumulated personnel doses
- Appendix 4. Calculation of individual occupational exposure dose for a standard worker
- Appendix 5. Example of health risk assessment or a specific age group of personnel
- Appendix 6. Coefficients for health risk calculation

### References

- Radiation Safety Requirements (NRB- 2012)
- Law of the Republic of Belarus of June 18, 2019 No. 198-3 "On Radiation Safety"

International Conference on Occupational Radiation Protection (CN-300)  
 Geneva, Switzerland; 05-09 September 2022