ANNUAL REPORT

Activities of the President of the National Atomic Energy Agency and assessment of nuclear safety and radiological protection in Poland in 2020

2020

PAA
NATIONAL
ATOMIC ENERGY
AGENCY

ANNUAL REPORT

Activities of the President of the National Atomic Energy Agency and assessment of nuclear safety and radiological protection in Poland in 2020

WARSAW 2021

PAA
NATIONAL
ATOMIC ENERGY
AGENCY

Purpose and legal basis for the publication of the Report of the President of the PAA

The report on the activities of the President of the National Atomic Energy Agency and assessment of nuclear safety and radiological protection in Poland has been prepared on the basis of Article 110(13) of the Atomic Law Act of 29 November 2000 (Journal of Laws of 2021, items 623 and 784). In accordance with the statutory obligation, this report has been presented to the Prime Minister.

Vision

The National Atomic Energy Agency is a modern and competent nuclear safety authority, which is respected and trusted by the general public and which conducts activities significant for ensuring nuclear safety and radiological protection.

Mission

Through regulatory and supervisory measures, the National Atomic Energy Agency aims to ensure that activities involving exposure to ionizing radiation are conducted safely for workers, the general public, and the environment.

Contents

Dear Reader,

I am pleased to present the Report on Activities of the President of the National Atomic Energy Agency (PAA) as well as the information concerning the evaluation of nuclear safety and radiological protection in Poland in 2020.

In the past year, activities related to the use of ionizing radiation sources did not pose a radiation hazard to the Polish population or to the natural environment. Based on the data presented in this report, it should be assessed that the state of nuclear safety and radiation protection in Poland remained at a high level in 2020. No radiation emergency was recorded in the country, while radiation levels in the environment and in basic foodstuffs and food products remained within the applicable limits.

As in previous years, in 2020 the PAA's activities were focused on performing statutory regulatory functions, as well as supporting and promoting a safety culture by improving the national legal, organizational and regulatory control framework in the area of nuclear safety and radiological protection.

Despite the special conditions connected with the epidemiological situation in the country, in 2020 the PAA carried out its tasks efficiently and without any disruptions. The National Contact Point of the Radiation Emergency Centre operated smoothly, 24 hours a day, 7 days a week, receiving a total of 8347 notifications and providing 553 detailed consultations, most of which concerned the detection of elevated radiation levels.

The President of the PAA issued 754 decisions regarding licenses to conduct exposure-related activities involving ionizing radiation, which increased the number of supervised activities up to 6,947, as of the end of December 2020 (an increase of 4.9% over the previous year). The President of the PAA granted a total of 349 radiation protection officer licenses and authorisations to take up positions of significant importance for ensuring nuclear safety and radiological protection in entities that conduct exposure-related activities.

Nuclear regulatory inspectors carried out 465 inspections at organizational units that used sources of ionizing radiation, as well as 35 nuclear material safeguards inspections. Due to the epidemic situation, many of those were remote inspections. Moreover, in the past year, 7 inspections were carried out at nuclear facilities operated by the National Centre for Nuclear Research and the Radioactive Waste Management Plant.

The inspections carried out in 2020 confirmed the absence of threats to nuclear safety and radiological protection of the nuclear facilities operated in the country. Both in the case of nuclear facilities and other activities related to exposure to ionizing radiation, the identified irregularities were effectively addressed by the organizational units, which ensured an adequate state of nuclear safety and radiological protection in the audited entities. In 2020, the National Atomic Energy Agency activated

13 early warning stations for radiation contamination along the Polish eastern border. The PAA set up 25 new stations between 2016 and 2020. Further expansion of the station network and its higher density will enable the PAA to detect radiation emergencies earlier and forecast their development more accurately. This will enable the PAA to respond faster in crisis situations and to better inform the public about the need for possible intervention. The radiation situation is monitored on a continuous basis, and the residents of Poland can view the current results of the measurements on the Agency's website.

Last year, legislative work was conducted on 19 draft implementing acts to the Atomic Law Act. In 2020, work on 6 projects was completed, which allowed for full implementation of the provisions of Council Directive 2013/59/Euratom into Polish law.

Nuclear safety and radiological protection issues become particularly important in the context of dynamic activities related to the Polish Nuclear Power Programme. In October 2020, the Council of Ministers updated the Programme, thus significantly empowering the PAA in terms of staff, competences, equipment, infrastructure and allowing it to benefit from technical and expert support. In the licensing of nuclear power plants, the PAA will be guided by the principle of the primacy of nuclear safety and radiation protection over other aspects of the activity, which is a fundamental principle for the use of nuclear technologies and ionizing radiation sources.

I encourage you to study the Report!

Dr. Łukasz Młynarkiewicz
President of the National Atomic Energy Agency

1 National Atomic Energy Agency

Fot. PAA

Role of the President of the National Atomic Energy Agency

The President of the National Atomic Energy Agency (PAA) is the central government administration authority competent in matters related to nuclear safety and radiological protection. Activity of the PAA is regulated by the Atomic Law Act of 29 November 2000 and the relevant implementing acts. The President of the PAA is supervised by the minister responsible for climate matters. The President of the PAA performs his tasks with the assistance of the National Atomic Energy Agency.

The scope of activities of the President of the PAA includes tasks which involve ensuring nuclear safety and radiological protection of Poland, in particular:

1) Preparation of draft documents related to national policies involving nuclear safety and radiological protection, entailing the nuclear power engineering development programme, as well as internal and external threats;

2) Exercising regulatory control and supervision over activities which cause or may cause exposure of people and the environment to ionizing radiation, including inspections conducted in this scope and the issuance of decisions on licenses and authorisations connected with the said activity;

3) Promulgation of technical and organizational recommendations concerning nuclear safety and radiological protection;

4) Performing tasks related to assessment of the national radiation situation in normal conditions and in radiation emergency situations as well as providing the relevant information to appropriate authorities and to the general public;

5) Performing tasks resulting from the Republic of Poland's commitments in the area of nuclear material accountancy and control, physical protection of nuclear materials and facilities, special control of foreign trade in nuclear goods and technologies, and other obligations arising from international agreements on nuclear safety and radiological protection;

6) Conducting activities related to public communication and technical and legal advice on nuclear safety and radiation protection, including the provision of information on ionizing radiation and its impact on human health and the environment, as well as on possible measures in case of radiation incidents to the public – excluding the promotion of the use of ionizing radiation, in particular, in nuclear power, due to the principle of independence of nuclear regulatory activities;

7) Cooperation with central and local administration authorities in matters involving nuclear safety, radiological protection and in research on nuclear safety and radiological protection;

8) Performing tasks involving national and civil defence as well as the protection of classified information, as stipulated in separate regulations;

9) Preparing opinions on nuclear safety and radiological protection with reference to planned technical activities involving the peaceful use of nuclear energy for the needs of central and local administration authorities;

10) Cooperation with competent foreign entities and international organisations within the scope of the Atomic Law Act;

11) Preparing drafts of legal acts within the scope of the Atomic Law Act and consulting them in accordance with the procedure specified in the Rules of Procedure of the Council of Ministers;

12) Issuing opinions on draft legal acts prepared by authorised bodies;

13) Presenting an annual report on the President of the PAA's activities for the preceding year and an assessment of the state of nuclear safety and radiation protection in the country for approval to the Prime Minister by 30 June of each year.

The Prime Minister may define the detailed scope of activities of the President of the National Atomic Energy Agency by way of a regulation – so far he has not exercised this right.

Organizational structure

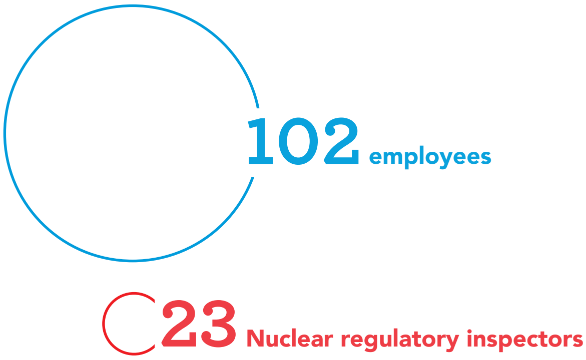
FIGURE 1.

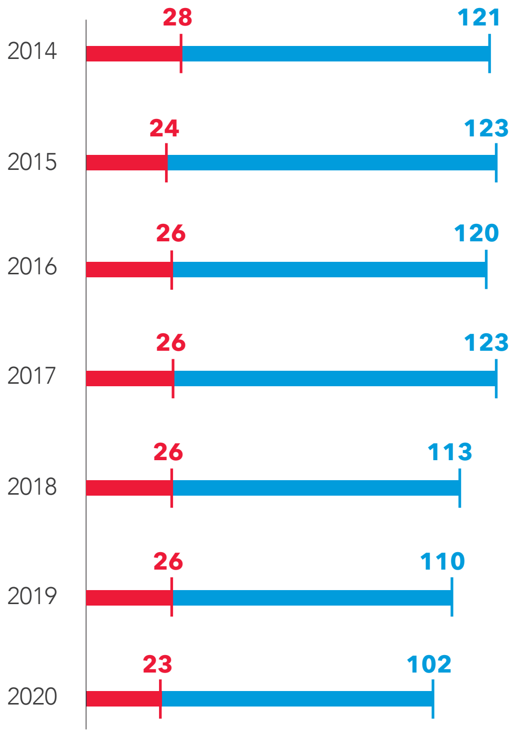
Organizational structure of the PAA (as of 31 December 2020)

Employment

The average annual headcount of the PAA as of 31 December 2020 was 102 (FTE: 99.6). The calculation was based on the employment level excluding persons on unpaid and parental leaves.

As of 31 December 2020, the PAA employed 23 nuclear regulatory inspectors, including 2 persons on unpaid leaves.





Council for Nuclear Safety and Radiological Protection

The Council for Nuclear Safety and Radiological Protection (the Council) is an advisory and consultative body to the President of the PAA. The Council is composed of the Chairman, Deputy Chairman, Secretary and not more than seven members appointed from among specialists in nuclear safety, radiological protection, physical protection, nuclear material safeguards and other specialities relevant to nuclear safety supervision.

Tasks of the Council

- Issuing opinions on licenses for activities involving exposure to ionizing radiation in the construction, commissioning, operation and decommissioning of nuclear sites,
- Issuing opinions on draft legislation and organizational-technical projects,
- Launching initiatives to improve the supervision over activities related to exposure to ionizing radiation.

The 2020 report of the Council on FY 2020 is posted on the PAA's Public Information Bulletin.

Composition of the Council

Composition of the FY 2020 Council:

Prof. **JANUSZ JANECZEK, PHD**
Chairman of the Council

Prof. **ANDRZEJ G. CHMIELEWSKI, PHD**
Deputy Chairman of the Council

Prof. **MAREK K. JANIAK, PHD**
Member of the Council

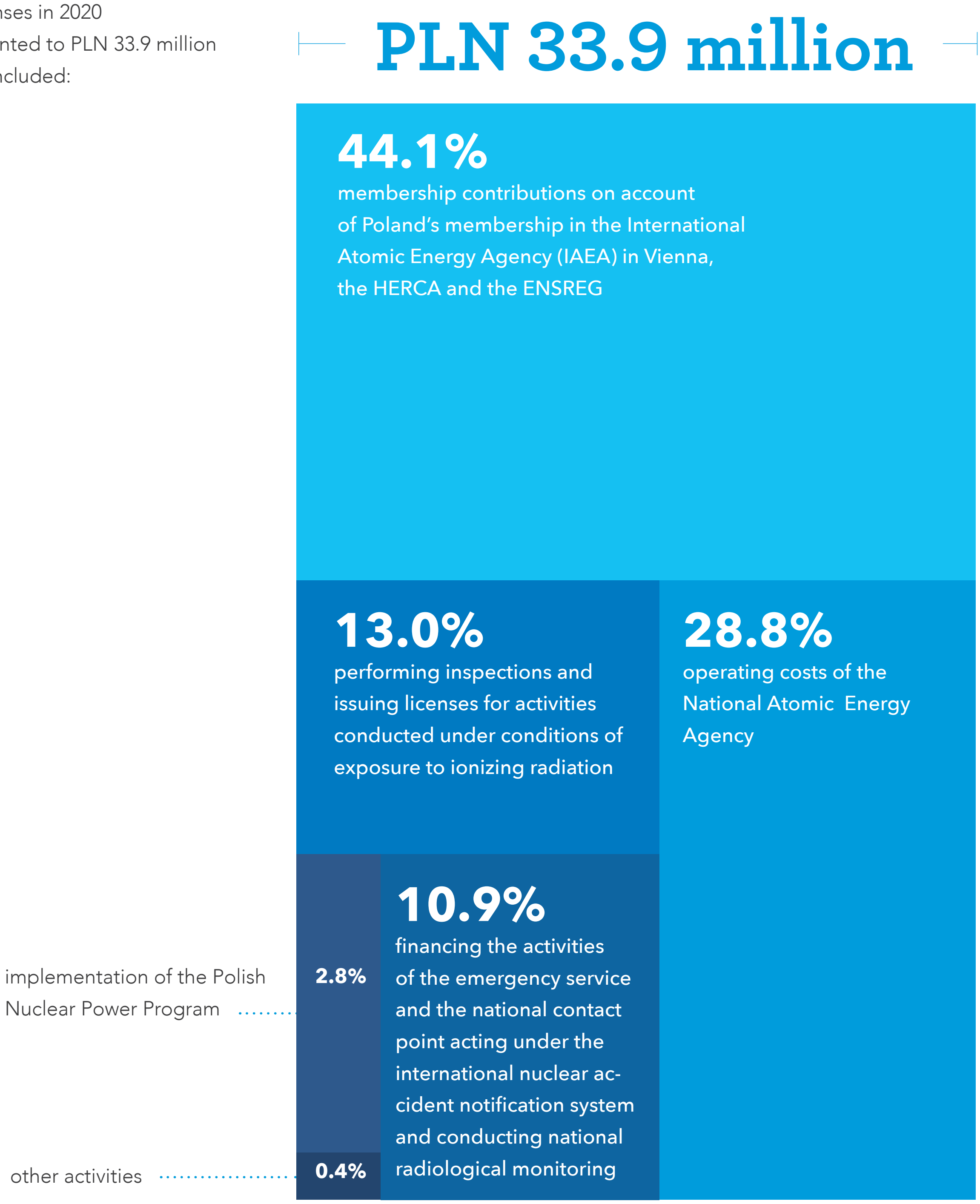
TOMASZ NOWACKI, PHD
Member of the Council

Prof. **KONRAD ŚWIRSKI, PHD**
Member of the Council (until September 2020)
As of March 2021, again in the composition of the Council

Budget

FIGURE 2.

The PAA's budgetary expenses in 2020 amounted to PLN 33.9 million and included:



Additional information:

In 2020, the full range of tasks planned (as revised) for implementation in the substantive departments was successfully executed.

The PAA's budgetary expenditures were incurred in a purposeful manner and in accordance with the planned aim based on the schedule of expenditures.

Assessment of the PAA's operations

Audits carried out by the Supreme Audit Office

As a result of the audit conducted in 2020, the Supreme Audit Office (NIK) positively assessed the implementation of the state budget in 2019 concerning Section 68 – National Atomic Energy Agency.

Proceedings before administrative courts

One complaint against a decision issued by the nuclear regulatory authorities was submitted to the Provincial Administrative Court in Warsaw.

National Atomic Energy Agency and the Polish Nuclear Power Programme

On 2 October 2020, Resolution No 141 was adopted by the Council of Ministers to update the multiannual Polish Nuclear Power Programme (Official Gazette of the Republic of Poland, item 946). The objective of the Polish Nuclear Power Programme (PPEJ) is to build between 6 and 9 GWe of installed capacity in Poland based on proven large-scale Generation III and III+ pressurised water nuclear reactors. The schedule calls for the construction and commissioning of 2 nuclear power plants with 3 reactors each. The technology is to be selected in 2021, and the site for the first power plant in 2022. Construction of the first reactor is planned to start in 2026, commissioning in 2033, and commissioning of the last reactor in the second plant in 2043.

The National Atomic Energy Agency is one of the main stakeholders of the PPEJ and plays the role of a regulator – it will supervise the safety and operation of nuclear facilities, carry out inspections and safety assessments, issue licenses and impose possible sanctions.

To prepare for its role as nuclear authority for the planned nuclear power plants in Poland, the PAA, in cooperation with the US Nuclear Regulatory Commission (US NRC), organised remote consultation meetings in 2020. The objective was to share experience concerning the US nuclear licensing and construction process, and to improve the PAA's system for assessing safety and issuing decisions on licenses for nuclear power plant construction.

Summary

The National Atomic Energy Agency is one of the main stakeholders of the PPEJ and plays the role of a regulator – it will supervise the safety and operation of nuclear facilities, carry out inspections and safety assessments, issue licenses and impose possible sanctions.

2 Nuclear regulatory infrastructure in Poland

Fot. NCBJ

Definition, structure and functions of the nuclear safety and radiological protection system

The system of nuclear safety and radiological protection includes all legal, organizational and technical undertakings assuring the highest standards of nuclear and radiation safety of nuclear facilities and activities using ionizing radiation sources in Poland. Security risks may arise from the operation of nuclear installations both at home and abroad and from other activities involving sources of ionizing radiation. In Poland, all issues related to radiological protection and radiation monitoring of the environment, in accordance with applicable legal provisions, are examined together with the issue of nuclear safety, as well as with physical protection and safeguards of nuclear materials. This ensures that there is there is one common nuclear regulatory approach and a single, common approach to aspects of nuclear safety, radiation protection, safeguards of nuclear materials and radioactive sources.

LEGAL BASIS

The nuclear safety and radiological protection system functions in accordance with the Atomic Law Act of 29 November 2000 and its secondary implementing acts, as well as the applicable directives and regulations of the EU Council/Euratom, and treaties and international conventions of which Poland is cosignatory.

Nuclear regulatory authorities in Poland:

- the President of the PAA,
- nuclear regulatory inspectors.

Essential elements of the nuclear safety and radiological protection system:

- supervision of activities involving nuclear materials and ionizing radiation sources, realised through:
  - regulatory safety verification of applications, granting licenses for performing such activities or registration of submissions and notifications of related activities,
  - verification over the manner of such activities and applying sanctions where the safety rules are breached,
  - control over doses received by workers,
  - supervision of training for radiation protection inspectors (experts in nuclear safety and radiological protection matters in entities which require permits for performed activities), workers performing jobs that are significant for nuclear safety and radiological protection and workers exposed to ionizing radiation,
  - control over trade of radioactive materials,
  - collection of records and users of radioactive sources and central register of individual doses, and in the case of activities involving nuclear material – also detailed records and accountancy for such materials, providing approvals for systems of physical protection of nuclear material and control of the technologies applied;
- identification and assessment of the national radiation situation through coordination (including standardisation) of works performed by local stations and units measuring the level of the radiation dose rate, content of radionuclides in selected elements of the natural environment and in drinking water, food products and fodder;
- maintaining services responsible for recognition and assessment of the national radiation situation and to respond in cases of radiation emergencies (in cooperation with other competent authorities and services operating under the national emergency response system);
- performing tasks aimed at fulfilling obligations resulting from membership in international organisations as well as treaties, conventions and international agreements in the area of nuclear safety and radiological protection, and bilateral agreements on mutual support in cases of nuclear accidents and cooperation with Poland's neighbouring countries in the scope of nuclear safety and radiological protection, as well as for the purpose of assessing the condition of nuclear facilities, radioactive waste management, and nuclear safety and radiological protection systems outside of Poland.

Nuclear regulatory tasks are performed by the President of the PAA with assistance from nuclear regulatory inspectors and employees of the PAA's specialised organizational units. In performing these tasks, the President of the PAA also relies on the expert support from the Members of the Council for Nuclear Safety and Radiological Protection and members of examination boards.

The supervision of the President of the PAA over activities performed in conditions of exposure to ionizing radiation includes:

- determining the conditions required to ensure nuclear safety and radiological protection;
- safety assessment as a basis for granting and formulating licence conditions and other administrative decisions;
- issuing licenses for exposure-related activities consisting in:
  - production, processing, storage, transport or use of nuclear material, radioactive material or radioactive sources (excluding waste containing radioactive substances which is not radioactive waste) and trading in such material or sources,
  - storage, transport, treatment or disposal of radioactive waste,
  - storage, transport, reprocessing of or trading in spent fuel,
  - isotopic enrichment,
  - operation or closure of uranium ore mines,
  - construction, commissioning, operation or decommissioning of nuclear facilities,
  - construction, operation or closure of radioactive waste disposal facilities,
  - production, installation, use and operation of or trading in equipment containing radioactive sources,
  - commissioning or use of devices that generate ionizing radiation,
  - commissioning of laboratories where sources of ionizing radiation are to be used, including X-ray or medical X-ray rooms,
  - intended addition of radioactive substances in the production process of consumer and medical devices, in vitro diagnostic medical devices, in vitro diagnostic medical device equipment, active implantable medical devices within the meaning of the Act of 20 May 2010 on medical devices (Journal of Laws of 2020, item 186 as amended), trade in such products and import to or export from the territory of the Republic of Poland of such products or equipment and products for common use to which radioactive substances have been added,
  - deliberate administration of radioactive substances to humans or animals for the purpose of medical or veterinary diagnosis, treatment or research,
  - activation of a material causing an increase in activity in a consumer product which cannot be disregarded as far as radiological protection is concerned.
- controlling the aforementioned activities with regard to compliance with the criteria specified in the applicable regulations and with the requirements of the licenses granted;
- imposition of sanctions enforcing compliance with the abovementioned requirements as a result of implemented administrative proceedings;
- with respect to activities involving nuclear materials and nuclear facilities, the President of the PAA's supervision also includes approval and control of physical protection systems and performance of activities provided for in the Republic of Poland's commitments with respect to nuclear material safeguards.

Within the framework of activities involving ionizing radiation sources, an exception is made for the use of X-ray equipment in medical diagnostics, surgical radiology, surface radiotherapy and radiotherapy of non-cancerous diseases, as supervision in this respect is performed by State Provincial Sanitary Inspectors (or appropriate bodies of the Military Sanitary Inspection subordinate to the Minister of National Defence).

Basic provisions of law on nuclear safety and radiological protection

Atomic Law Act

The Atomic Law Act of 29 November 2000, effective as of 1 January 2002, introduced a uniform system ensuring nuclear safety and radiological protection of workers and the general public in Poland.

Its most important provisions concern the issuance of licenses for activities involving exposure to ionizing radiation (i.e. licenses issued for activities listed in the subsection 'Definition, structure and functions of the nuclear safety and radiological protection system'), the responsibilities of heads of organizational units conducting activities involving ionizing radiation, and the powers of the President of the National Atomic Energy Agency to exercise control and supervision over these activities. The Act also defines other tasks of the President of the PAA, some of which are related to evaluation of the radiation situation in the country and the procedure to follow in case of radiation emergencies.

The rules and procedures set forth in the Act address the following issues:

- justification for undertaking activities involving exposure to ionizing radiation, its optimisation and the establishment of dose limits for workers and members of the public,
- procedure for obtaining licenses to carry out such activities and the procedure for and method of control of such activities,
- activities involving naturally occurring radioactive material,
- protection against exposure to radon in workplaces and buildings intended for human habitation,
- patient radiological protection requirements,
- principles of human exposure from non-medical imaging,
- record keeping and control of ionizing radiation sources,
- siting, design, construction, commissioning, operation and decommissioning of nuclear facilities,
- nuclear material accountancy and control,
- physical protection of nuclear material and nuclear facilities,
- management of high-activity radioactive sources,
- radioactive waste classification and management, and spent fuel management,
- classification of workers and workplaces according to the degree of hazard involved in the work and determination of protective measures appropriate to that hazard,
- training and entitlement to hold a position with specified specialities considered important to ensure nuclear safety and radiological protection, and to radiation protection inspectors,
- assessment of the radiation situation in Poland,
- handling of radiological incidents,
- development of a radiation emergency management system,
- managing existing exposure situations,
- civil liability for nuclear damage.

In 2020, the following amendments to the Atomic Law Act came into force:

1. Pursuant to Article 20 of the Act of 23 January 2020 amending the Act on departments of government administration and certain other acts (Journal of Laws, item 284), as of 29 February 2020, the words 'minister responsible for environmental matters' used in different cases in a number of provisions of the Atomic Law Act were replaced by the words 'minister responsible for climate matters', and the word 'environment' was replaced by the word 'climate' in Article 73(1) and in Article 74(1) of that Act.
2. Pursuant to Article 2 of the Act of 23 January 2020 amending the Act on the State Sanitary Inspection and certain other acts (Journal of Laws, item 322), as of 1 July 2020, in order to take into account the abolition of the State Sanitary Inspection of the Ministry of the Interior made by this law, the following amendments were made to the Atomic Law Act:

1) Article 5(4a) was replaced by the following:
 '4a. The licence, referred to in paragraph 4, for health protection units subordinated to the Minister of National Defence or supervised by him or for which he is the creating entity is issued by the competent

commanding officer of a military preventive medicine centre or a military sanitary inspector of a military preventive medicine centre authorised by the commanding officer';

2) Article 23e(3) was replaced by the following:
'3. The State Sanitary Inspection provides advice and information on indoor radon exposure and the health risks associated with radon exposure, on the importance of carrying out radon measurements, and on the technical measures available to reduce existing radon concentrations';
3) the second sentence of Article 33n(15) was deleted;
4) Article 33p(2) was replaced by the following:
'2. In the case of health care units subordinated to the Minister of National Defence or supervised by him or for which he is the creating entity, the consent referred to in paragraph 1 shall be issued by the Chief Sanitary Inspector of the Polish Armed Forces';
5) Article 33q(2) was replaced by the following:
'2. In the case of health protection units subordinated to the Minister of National Defence or supervised by him or for which he is the creating entity, the consent referred to in paragraph 1 shall be issued by the commanding officer of a military preventive medicine centre or a military sanitary inspector of a military preventive medicine centre authorised by him';
6) Article 33ze(5)(11) was replaced by the following:
'11) cooperation with the President of the PAA, Chief Sanitary Inspector and Chief Sanitary Inspector of the Polish Army';
7) in Article 63:
a) in paragraph 2(2) the words' or a state sanitary inspector of the Ministry of the Interior and Administration' were deleted;
b) paragraph 2a was repealed;
8) Article 124(1)(2) was replaced by the following:
'2) Chief Sanitary Inspector, state provincial sanitary inspector, Chief Sanitary Inspector of the Polish Army, commandant of a military preventive medicine centre or military sanitary inspector of a military preventive medicine centre – if these authorities are competent to issue a licence or consent or to accept a notification'.

Implementing acts to the Atomic Law Act

In 2020, work continued on draft implementing acts to the Atomic Law Act, which are necessary due to the adoption by the Parliament of the Act of 13 June 2019 on amendments to the Atomic Law Act and the Fire Protection Act (Journal of Laws, item 1593 and of 2020, item 284). The state of these works as of 31 December 2020 was as follows:

1. Regulations that came into force in 2020

On 4 October 2020, Regulation of the Minister of Climate of 27 August 2020 on the template of a service card of a nuclear regulatory inspector (Journal of Laws, item 1518) came into force. Taking into account the additional category of nuclear regulatory inspectors introduced into national law – nuclear regulatory inspectors for safeguards, who are authorised to perform inspections only in the field of nuclear technology control and nuclear material safeguards, the Regulation introduced a template of a service card for this category of nuclear regulatory inspectors.

On 30 December 2020, Regulation of the Council of Ministers of 30 November 2020 on the types of intervention measures to be introduced in the external zone and the values of the operational intervention levels underlying the introduction of these measures in the external zone (Journal of Laws, item 2247) came into force. The Regulation specified the values of operational intervention levels at which certain intervention activities may be implemented in the immediate intervention planning zone, which, in accordance with Article 86l(1)(2) and (2) of the Atomic Law Act, must be delimited around an organizational unit performing activities classified as hazard category I or II (e.g. operation or closure of a radioactive waste disposal facility or commissioning, operation or decommissioning of a nuclear facility, such as e.g. a nuclear reactor with thermal power exceeding 2 MW, a spent fuel storage facility requiring active cooling, an isotopic enrichment facility, a nuclear fuel fabrication or reprocessing facility).

2. Regulations published in the Journal of Laws

1) Regulation of the Council of Ministers of 30 November 2020 amending the Regulation on the basic requirements for controlled and supervised areas – **published in the Journal of Laws on 21**

December 2020 (Journal of Laws, item 2303), came into force on 5 January 2021;
2) Regulation of the Council of Ministers of 30 November 2020 on the protection against ionizing radiation of outside workers exposed during their work in a controlled or supervised area – **published in the Journal of Laws on 21 December 2020 (Journal of Laws, item 2313),** entered into force on 21 January 2021.
3) Regulation of the Council of Ministers of 30 November 2020 amending the Regulation on detailed conditions for safe work with sources of ionising radiation – **published in the Journal of Laws on 21 December 2020 (Journal of Laws item 2300)** entered into force on 7 February 2021.

3. Regulation signed by the President of the Council of Ministers

- Regulation of the Council of Ministers of 17 December 2020 on the list of building materials for which the radioactive concentration of radioactive isotopes of potassium K-40, radium Ra-226 and thorium Th-232 is determined, the detailed requirements for making these determinations and the value of the radioactive concentration index, the exceeding of which shall be reported to the competent authorities – **signed on 30 December 2020**; published on 7 January 2021 (Journal Laws 2021, item 33), entered into force on 7 February 2021.

4. Draft regulations provisionally accepted by the Council of Ministers and sent to the European Commission for an opinion, pursuant to Article 33 of the Euratom Treaty:

1) draft Regulation of the Council of Ministers on radiological protection inspectors;
2) draft Regulation of the Council of Ministers amending the Regulation on radioactive waste and spent nuclear fuel;
3) draft Regulation of the Council of Ministers on cases in which the carrying out of practices involving exposure to ionizing radiation from natural radioisotopes does not require notification;
4) draft Regulation of the Council of Ministers on cases in which activities involving exposure to ionizing radiation do not require licence, registration or notification and cases in which they may be performed on the basis of registration or notification.

5. Draft regulations at the Law Commission stage

1) draft Regulation of the Council of Ministers on the documents required when applying for a licence to conduct activities involving exposure to ionizing radiation or when registering the performance of such activities;
2) draft regulation of the Council of Ministers on the scope of the environmental radiation monitoring program developed and implemented by organizational units classified in risk category I or II;
3) draft Regulation of the Council of Ministers on securing radioactive sources;
4) draft Regulation of the Council of Ministers on nuclear regulatory inspectors.

6. Draft Regulation under consideration by the Standing Committee of the Council of Ministers

- draft Regulation of the Council of Ministers on the position of major importance for ensuring nuclear safety and radiological protection.

7. Draft regulations at the final stage of arrangements, opinions and consultations

1) draft Regulation of the Council of Ministers on the documents required when applying for a licence to conduct activities involving exposure to ionizing radiation or when registering the performance of such activities;
2) draft regulation of the Council of Ministers on the scope of the environmental radiation monitoring program developed and implemented by organizational units classified in risk category I or II;
3) draft Regulation of the Council of Ministers on securing radioactive sources;
4) draft Regulation of the Council of Ministers on nuclear regulatory inspectors.

Other acts

Provisions indirectly related to nuclear safety and radiological protection are also contained in other acts, in particular:

- Act of 19 August 2011 on transport of hazardous goods (Journal of Laws of 2020, item 154 and 875),
- Act of 18 August 2011 on maritime safety (Journal of Laws of 2020, item 680, and of 2021, item 234),
- Act of 21 December 2000 on technical supervision (Journal of Laws of 2021, item 272).

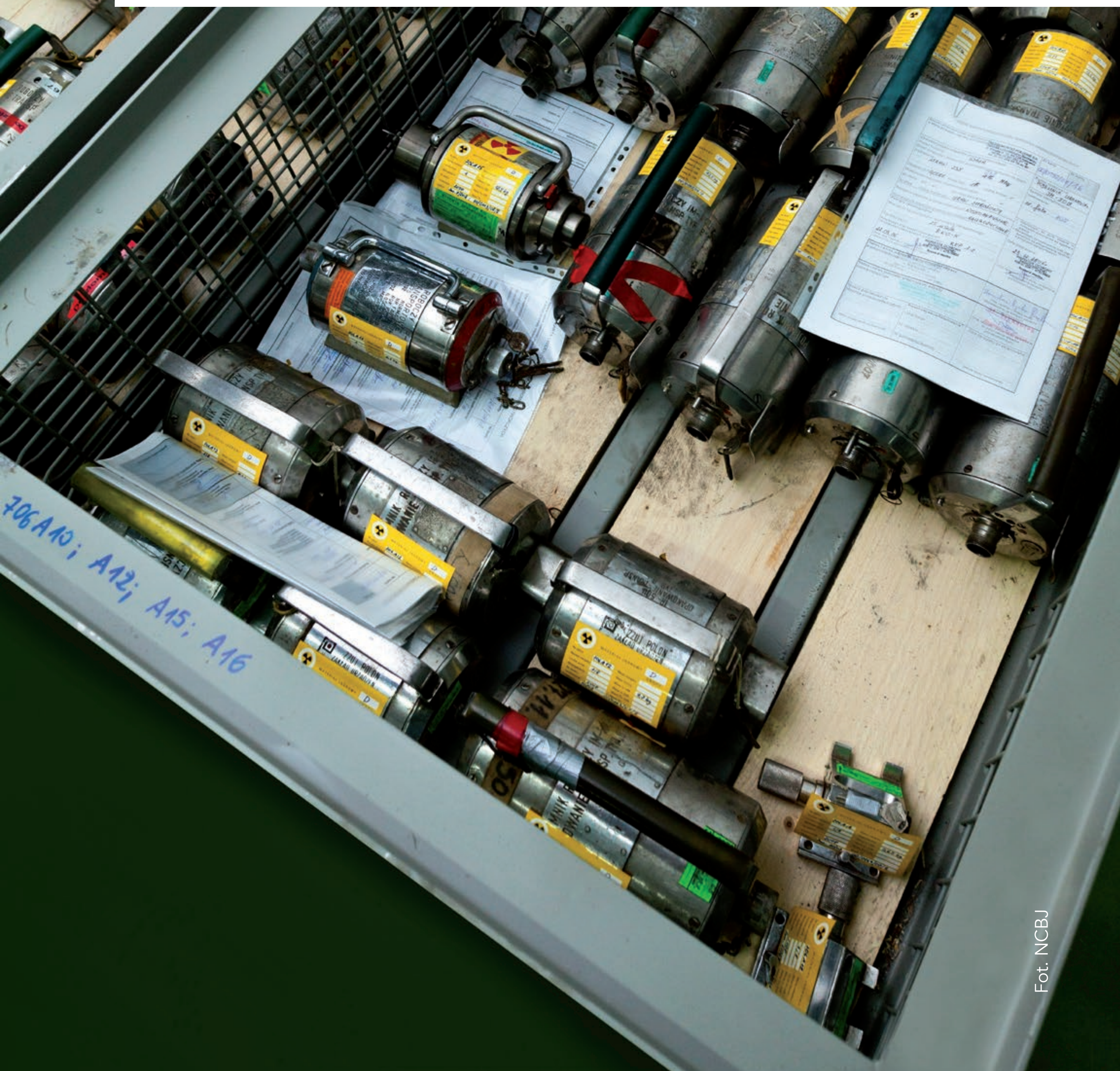
Summary

The basic legal act in the area of nuclear safety and radiological protection is the Atomic Law Act of 29 November 2000. In 2020, the Atomic Law Act was amended by:

1) Act of 23 January 2020 amending the Act on departments of government administration and certain other acts (Journal of Laws, item 284) – taking into account the establishment of a new department of government administration – climate;
2) Act of 23 January 2020 amending the Act on the State Sanitary Inspection and certain other acts (Journal of Laws, item 322) – taking into account the abolition of the State Sanitary Inspection of the Ministry of the Interior.

In 2020, legislative work was carried out on 19 draft implementing acts to the Atomic Law Act, of which 5 Regulations of the Council of Ministers and 1 Regulation of the Minister of Climate were adopted. Work on the remaining 13 projects was continued in 2021. The need to adopt these Regulations resulted from the Act of 13 June 2019 on amending the Atomic Law Act and the Act on fire protection (Journal of Laws, item 1593 and of 2020, item 284).

3 Supervision of the use of ionizing radiation sources



Fot. NCBJ

Tasks of the President of the PAA in terms of regulatory oversight of activities connected with exposure to ionizing radiation:

- issuing licenses and making other decisions concerning nuclear safety and radiological protection following the analysis and assessment of documentation submitted by users of ionizing radiation sources,
- preparing and performing inspections of organizational units which conduct activities connected with exposure,
- maintaining a register of such entities.

Users of ionizing radiation sources in Poland

The number of registered organizational units conducting activities (one or more) related to exposure to ionizing radiation, subject to supervision by the President of the PAA, is 4,545 (as of 31 December 2020).

The number of all registered activities involving exposure to ionizing radiation is 6,947 (as of 31 December 2020).

Issuance of licenses and collection of submissions

Draft licenses issued by the President of the PAA for activities involving exposure to ionizing radiation and other decisions on matters relevant to nuclear safety and radiological protection are prepared in the Radiological Protection Department (DOR) of the PAA.

BASIS FOR ISSUANCE OF THE LICENSE

Application referred to in Article 5(1) of the Atomic Law Act of 29 November 2000. Documents specified in Regulation of the Council of Ministers of 30 June 2015 on the documents required when applying for a licence to carry out activities involving exposure to ionizing radiation or when declaring the performance of such activities. Additional information referred to in Article 5(1b)(3) of the Atomic Law Act, if the documents attached to the application are insufficient to demonstrate that the conditions required by law for carrying out activities involving exposure have been met.

The issue of a licence, an annex to a licence, the acceptance of a notification or registration must be preceded by an examination and assessment of the documentation which is provided by the users of ionizing radiation sources.

In particular, the rationale for undertaking an exposure-related activity, the proposed dose constraints, the quality assurance programme for the undertaking and the company's emergency plan for dealing with radiation incidents must be examined.

In cases where practices with ionizing radiation sources do not require licensing, decisions to accept registration of practices involving exposure to ionizing radiation or notifications are issued. Such cases are specified in Regulation of the Council of Ministers of 6 August 2002 on cases in which activities involving exposure to ionizing radiation do not require licence, registration or notification and cases in which they may be performed on the basis of registration or notification (Journal of Laws, item 1153, as amended) and in Article 4(5) of the Act of 13 June 2019 on amending the Atomic Law Act and the Act on fire protection.

Regulatory inspections

Inspections in organizational units other than those having nuclear facilities and radioactive waste disposal sites are carried out by nuclear regulatory inspectors from the Radiological Protection Department of the PAA who work in Warsaw and Katowice. In 2020, 465 such inspections were carried out, including 6 re-inspections (a second inspection in the same year), of which 283 inspections were performed by inspectors from Warsaw and 182 by inspectors from Katowice. A detailed analysis

FIGURE 3.
The number of licenses for conducting operations in conditions of exposure to ionizing radiation and amending annexes to licenses granted by the President of the PAA in 2008–2020

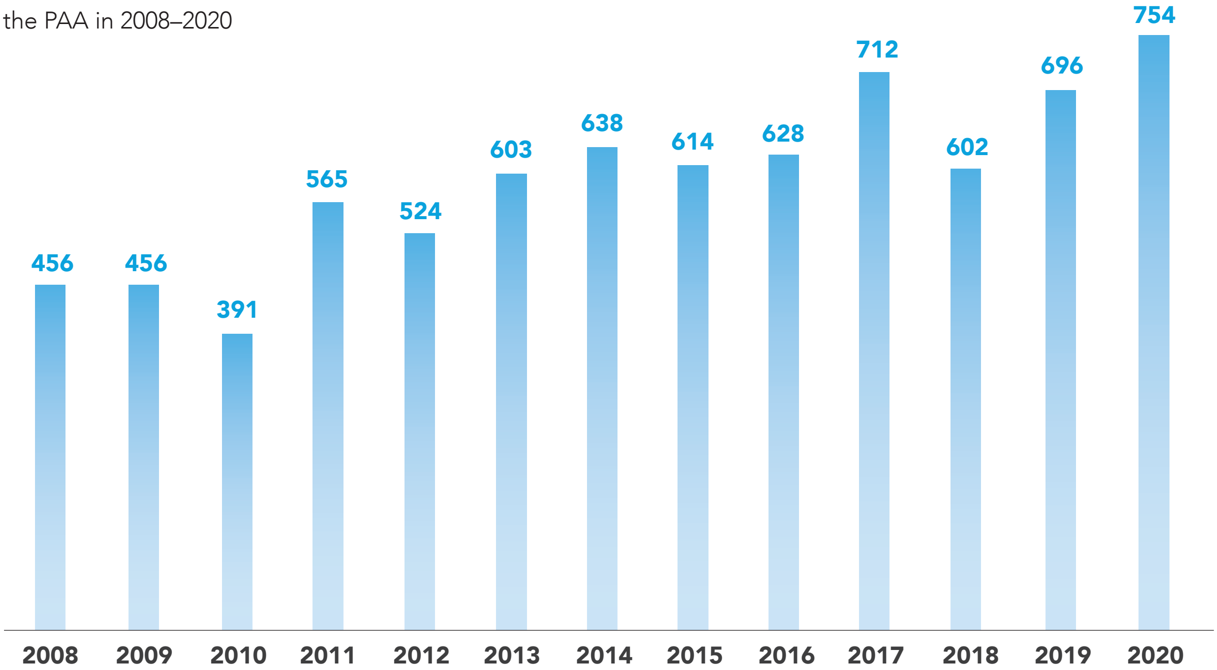


FIGURE 4.
Number of inspections carried out by PAA inspectors in 2008–2020

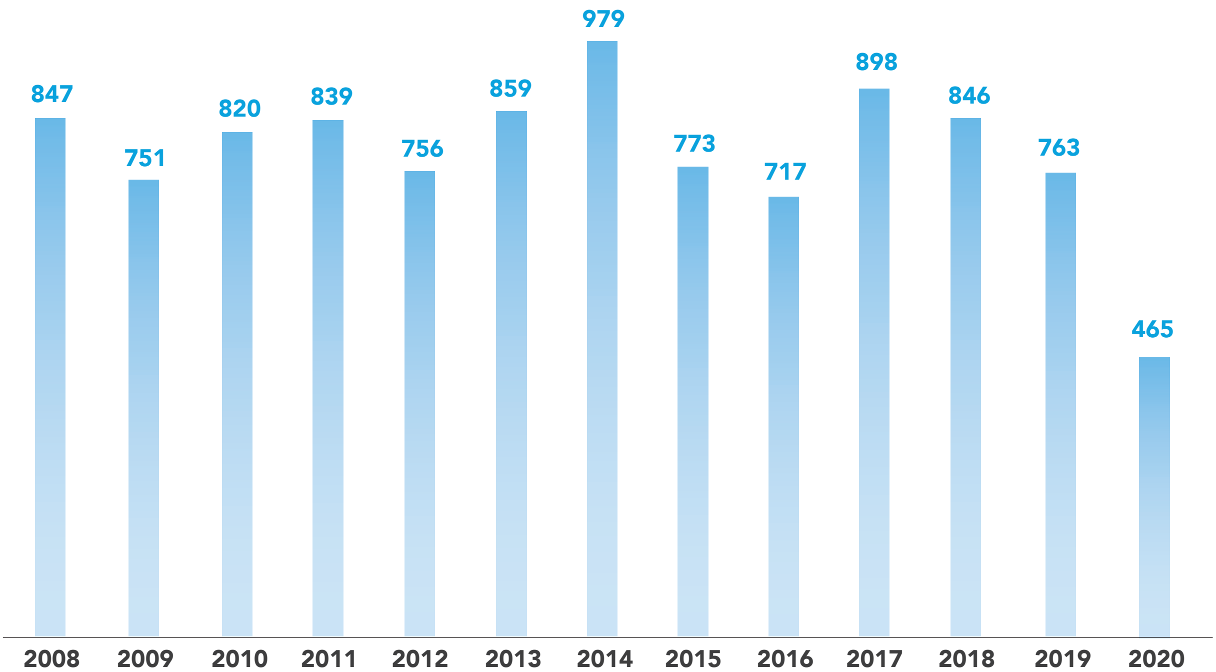


TABLE 1.
Ionizing radiation source users in Poland in numbers (as of 31 December 2020)

Type of activity	Symbol	Number of units	Number of types of activity
Class I laboratory	I	2	2
Class II laboratory	II	95	116
Class III laboratory	III	119	229
Class Z laboratory	Z	134	239
Isotope sensor installer	UIC	368	369
Equipment installer	UIA	211	277
Isotope device	AKP	532	689
Manufacture of isotope sources and devices	PRO	24	29
Trade in isotope sources and devices	DYS	80	88
Accelerator	AKC	81	233
Isotope applicators	APL	38	61
Telegamma therapy	TLG	4	4
Radiation device	URD	36	37
Gamma graphic apparatus	DEF	96	97
Storage facility for isotope sources	MAG	183	224
Work with sources outside registered laboratory	TER	86	100
Transport of sources or waste	TRN	503	517
Chromatograph	CHR	234	288
Veterinary X-ray apparatus	RTW	1412	1499
X-ray scanner	RTS	637	879
X-ray defectoscope	RTD	213	237
Other X-ray apparatus	RTG	493	733
Ad hoc checks			
Total:			**6947**

ISSUED IN 2019				INSPECTIONS	
licenses	annexes	registration decisions	notifications	Number of inspections 2020	Inspection frequency
0	0	0	0	0	every year
5	12	0	0	13	every 2 years
5	1	3	0	18	every 4 years
11	8	3	0	38	every 4 years
16	2	0	0	8	every 5 years
35	41	0	0	40	every 5 years
11	25	1	0	51	every 5 years
0	0	0	0	7	every 3 years
2	0	2	0	3	every 5 years
16	6	0	0	31	every 4 years
18	2	0	0	2	every 2 years
0	1	0	0	0	every year
0	0	0	0	7	every 3 years
6	8	0	0	37	every 2 years
22	4	1	0	22	every 3 years
14	8	0	0	4	every 3 years
9	1	0	0	6	every 5 years
0	0	3	0	0	every 10 years
177	4	1	0	18	every 10 years
109	40	0	0	73	every 10 years
19	12	0	0	55	every 2 years
89	15	0	36	27	every 10 years
				5	additional inspections
564	**190**	**14**	**36**	**465**	

of the documentation collected was carried out prior to each inspection on the inspected organizational unit and its operations in terms of preliminary assessment of the occurrence of potential critical points in those operations and the quality system in force in the unit.

Periodic and ad hoc inspections
Guided by the necessity to ensure an appropriate frequency of inspections depending on the risk posed by the performed activity, the inspection cycles were established for particular groups of activities.

Additional inspections are carried out in organizational units in which activities resulting or likely to result in exposure of people and the environment to ionizing radiation may be performed without authorisation from the President of the PAA.

In addition, inspections were performed by nuclear regulatory inspectors from the Radiological Protection Department in connection with license applications for activities involving exposure to ionizing radiation.

Data on inspections carried out by nuclear regulatory inspectors from PAA DOR in 2020 are presented in Table 1.

Register of sealed radioactive sources

The obligation of maintaining a sealed radioactive sources register stems from Article 43c(1) of the Atomic Law Act of 29 November 2000.

Heads of organizational units carrying out licensed activities involving the use or storage of sealed radioactive sources or equipment containing such sources provide the President of the PAA with copies of records regarding radioactive sources. Such documents include record sheets containing the following data about the sources: name of the radioactive isotope, activity level according to the source certificate, date of activity determination, certificate number and source type, container type or device name and place of the source use or storage.

The register covers data on 27,474 sources, including spent radioactive sources (decommissioned and transferred to the Radioactive Waste Management Plant), as well as information on their movements (i.e., timing of source receipt and transfer) and related documents.

27,474

RADIOACTIVE SOURCES IN THE REGISTER

Data from the record sheets are entered into the sealed radioactive source register, which is used to verify source information. The information contained in the register is used for the control of organizational units carrying out activities involving exposure to ionizing radiation. The inspection consists in comparing the entries in the record sheet with the scope of the licence issued. Data from the register are also used to prepare information and lists within the framework of cooperation and collaboration with government and local government bodies as well as for statistical purposes.

In Poland, sources are classified into three categories, depending on the purpose of the source, its activity and the radioactive isotope present:

Category 1 – sealed radioactive sources used in such fields as teleradiotherapy in medicine, industrial radiography, and radiation technologies.

The register contains 1,514 currently used Category 1 sources.

Category 2 – covers sealed radioactive sources used in such fields as medicine (brachytherapy), geology (borehole drilling), industrial radiography (mobile control and measurement instruments and stationary instruments for industrial applications) including level and density meters containing sources of Cs-137 with activity exceeding 20 GBq, and Co-60 with activity exceeding 1 GBq, thickness meters containing sources of Kr-85 with activity exceeding 50 GBq, sources of Am-241 with activity exceeding 10 GBq, sources of Sr-90 with activity exceeding 4 GBq, and Tl-204 with activity exceeding 40 GBq, belt conveyor weighbridges containing sources of Cs-137 with activity exceeding 10 GBq, and sources of Co-60 with activity exceeding 1 GBq, and Am-241 with activity exceeding 10 GBq.

TABLE 2.
Selected radioactive isotopes and sources containing them currently in use (as of 31 December 2020)

	Number of sources in the register		
Isotope	Cat. 1	Cat. 2	Cat. 3
Co-60	790	1269	1866
Ir-192	331	75	1
Cs-137	85	282	2267
Se-75	274	12	4
Am-241	14	374	800
Pu-239	2	92	98
Ra-226	-	75	59
Sr-90	-	40	772
Pu-238	1	79	22
Kr-85	5	70	176
Tl-204	-	-	94
Other	12	133	1705
Total	1514	2499	7864

The register contains 2,499 currently used Category 2 sources.

Category 3 – other sealed radioactive sources, including those used in fixed monitoring and measurement instruments.

The register contains 7,864 currently used Category 3 sources.

1,514
CATEGORY 1 SOURCES

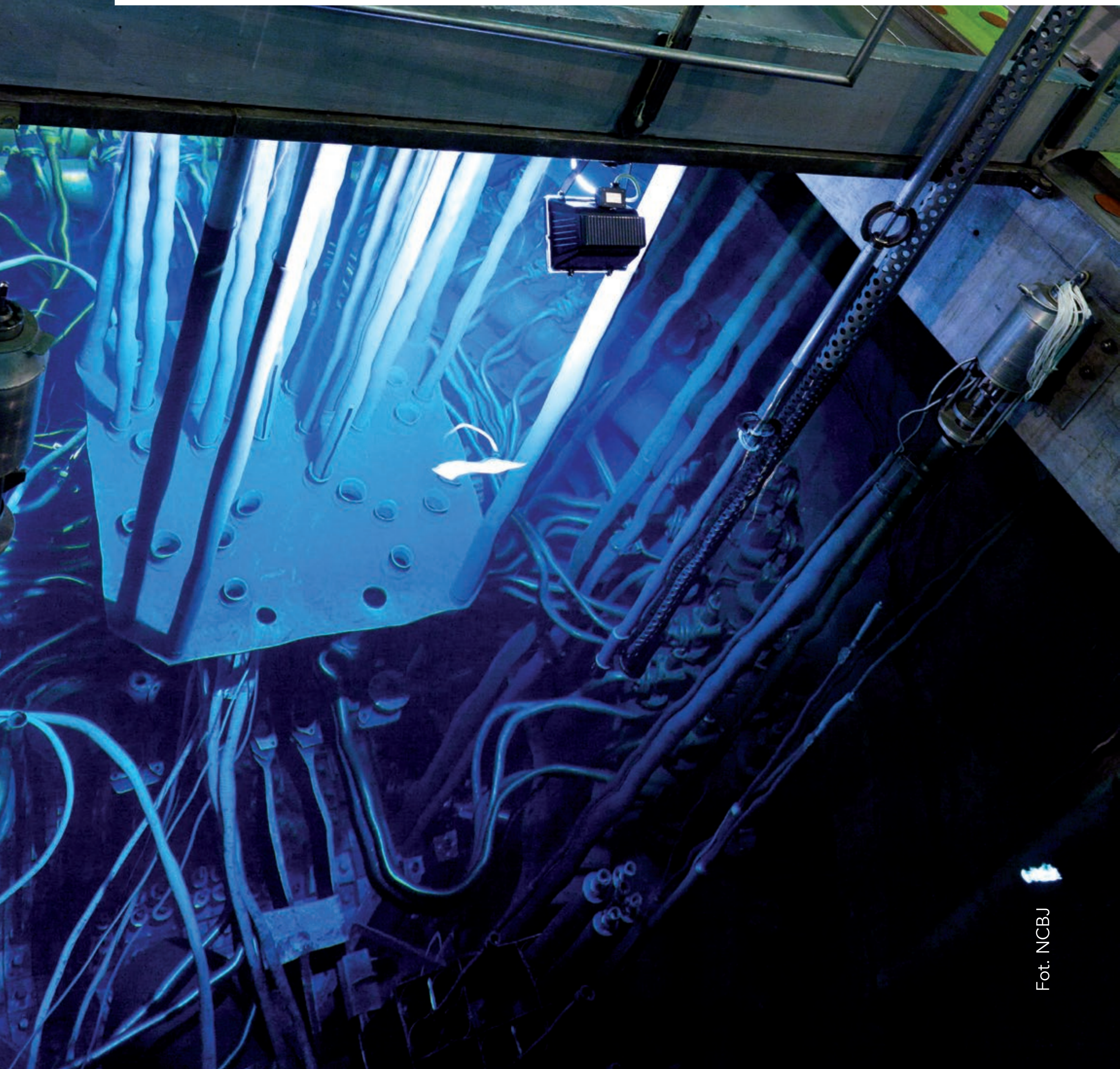
2,499
CATEGORY 2 SOURCES

7,864
CATEGORY 3 SOURCES

Summary

In 2020, the number of organizational units registered in the register of organizational units whose activities require at least notification increased from 4,373 to 4,545, with the largest increase in the number of units using equipment that produces ionizing radiation in veterinary medicine. The number of sealed radioactive sources used in organizational units, registered in the register of the President of the PAA, increased by 326. For the most part, these were sealed radioactive sources classified as Category 1 and used in defectoscopic measurements. At the same time, there were 298 fewer inspections of activities involving exposure to ionizing radiation in 2020 compared to 2019. The reason for this was that in 2020, a state of epidemic was declared in the territory of the Republic of Poland. Due to the epidemiological situation in the country related to COVID-19 and the impeded possibility of conducting field inspections in the organizational units, remote inspections were introduced. In 2020, nuclear regulatory inspectors conducted 125 inspections.

4 Supervision of nuclear facilities



Fot. NCBJ

Nuclear facilities in Poland

Nuclear facilities in Poland include:

- **MARIA research reactor** – at the National Centre for Nuclear Research (NCBJ),
- **EWA research reactor** (currently in decommissioning state) and **two spent nuclear fuel storages** – at the Radioactive Waste Management Plant (ZUOP).

These facilities are located in Świerk near Otwock in two organizational units. The directors of these units are responsible for ensuring nuclear safety, radiological protection, physical protection and nuclear material safeguards (Figure 5).

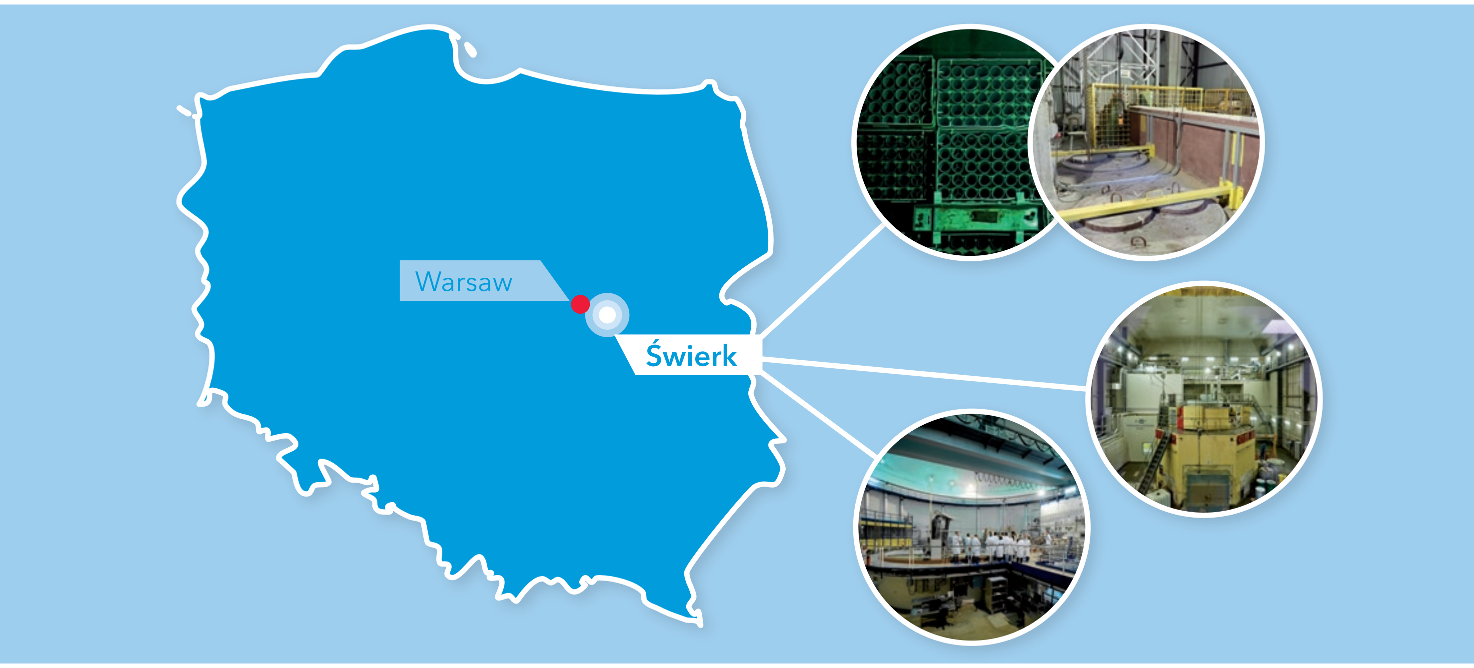
MARIA reactor

The MARIA research reactor is the second nuclear reactor built in Poland (excluding critical assemblies ANNA, AGATA, MARYLA), currently the only reactor operating in the country. It is a high flux pool type reactor with a nominal thermal power of 30 MWt and a maximum core thermal neutron flux density of $3.5 \cdot 10^{18} n/(m^2 \cdot s)$. The MARIA reactor started to operate in 1974 and it was shut-down between 1985 and 1993 for necessary upgrades, including the installation of a system for passive emergency core cooling using water from the reactor pool. From April 1999 to June 2002, a conversion of the reactor core was carried out, reducing the fuel enrichment from 80% to 36% of the U-235 isotope content (HEU fuel – High Enriched Uranium). In 2014, as part of the implementation of the international Global Threat Reduction Initiative (GTRI), the MARIA reactor was adapted to operate with low-enriched fuel (LEU – Low Enriched Uranium) with less than 20% of the U-235 isotope.

In 2020, the reactor operating schedule was adapted to:

- the irradiation requirement of uranium wafers for the production of molybdenum isotope (Mo-99);
- the irradiation of target materials for the Radioisotope Centre, i.e.: tellurium dioxide, potassium chloride, sulphur, samarium, lutetium, cobalt, and iron – intended for production of radioactive materials used in nuclear medicine (Figure 6);
- the irradiation of holmium targets in the form of 165Ho-PLLA MS microspheres, which are used in selective brachytherapy.

FIGURE 5.
There are four nuclear facilities in Poland: the MARIA research reactor, the EWA reactor (currently in decommissioning state) and spent fuel storage facilities. All of them are located on the premises of the Nuclear Research Centre in Świerk near Otwock.



In 2020, the MARIA reactor was in service for 4,216 hours, operating in 31 cycles at power outputs ranging from 100 kW to 25 MW (Figure 7). In 2020, use of MC-5 type fuel with 19.75% U-235 enrichment was terminated. At present, MR-6 type fuel with 19.7% enrichment is used.

In 2020, 17 unscheduled reactor shutdowns occured. Eleven of these were short-lived and did not require shortening of the reactor cycle. None of the unplanned shutdowns posed a threat to nuclear safety and radiological protection.

In 2020, the following work was carried out at the MARIA reactor:

- replacement of 4 beryllium blocks in the reactor core;
- modernisation of threshold systems and power supply separators connected to the measurement tracks of the reactor;
- modernisation of the voice alarm system;
- modernisation of the reactor buildings.

The MARIA reactor can also be used to conduct physical research using six horizontal ducts (H-3 to H-8). In 2020, these studies were not performed due to the fact that the ducts were shut down to prepare the physical room for modernisation. As part of this modernisation, modern research equipment acquired from another foreign research reactor is planned to be installed.

The technological pool of the MARIA reactor is currently used for storage of spent MC and MR nuclear fuel.

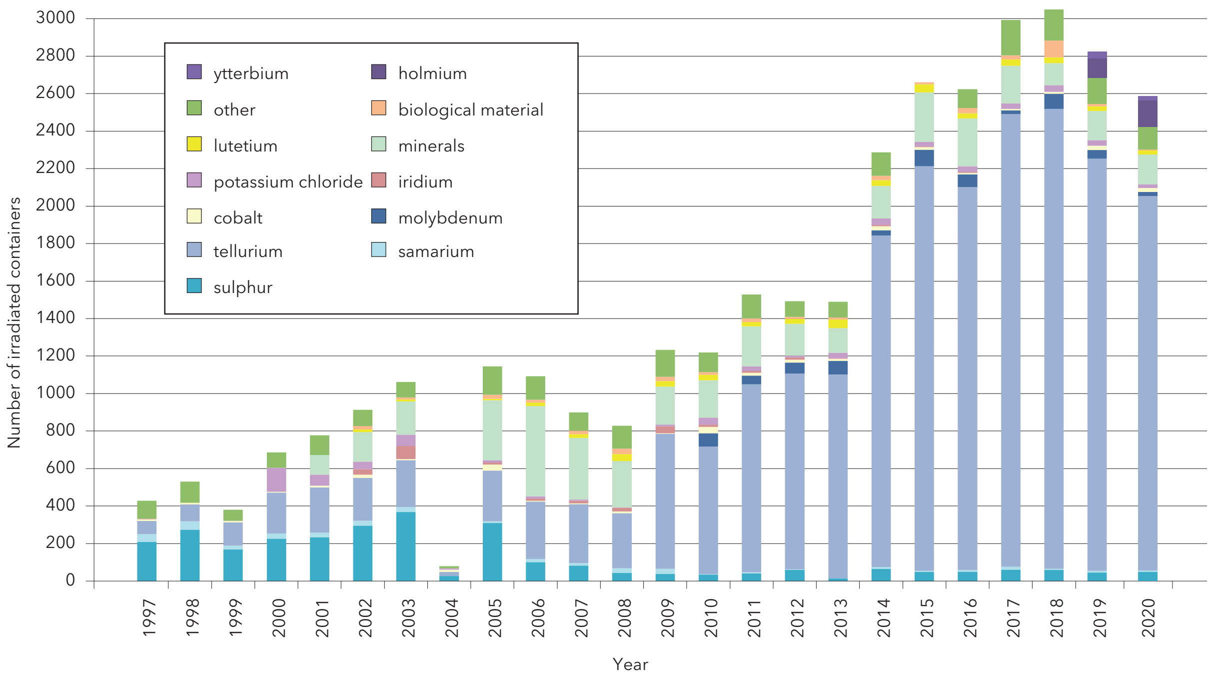
A summary of general information on reactor operation is presented on pages 30–31.

Summary

There are four nuclear facilities in Poland, including MARIA, the only operational research reactor. During its operation, the reactor was used to irradiate target materials and to conduct material and technological research. In order to increase the level of reliability and to ensure safe working conditions, pre-planned repair, maintenance and modernisation works were carried out in the reactor.

FIGURE 6.

Materials irradiated in the MARIA reactor until 2020 (data: NCBJ)



EWA reactor – currently in decommissioning state

The EWA research reactor was in operation from 1958 to 1995. The initial thermal power of the reactor was 2 MW_t and was later increased to 10 MW_t.

The decommissioning process of this reactor, which began in 1997, reached what was described as 'completion of phase two' in 2002. This means that the nuclear fuel and all irradiated equipment with activity levels of potential radiological protection significance had been removed from the reactor. This ensured that the EWA reactor does not emit radioactive substances into the environment. The reactor building has been renovated and is used by ZUOP.

Currently, the former EWA reactor building houses:

- a class I isotope laboratory,
- a radiometric analysis laboratory,
- a chemical laboratory,
- a contaminated laundry room.

Summary

The EWA reactor, which was the first nuclear reactor operating in Poland, is now in the process of decommissioning. Thanks to the decommissioning works carried out so far, the EWA reactor is safe for the environment, and its infrastructure can still be used for the needs of the ZUOP.

Spent nuclear fuel storages

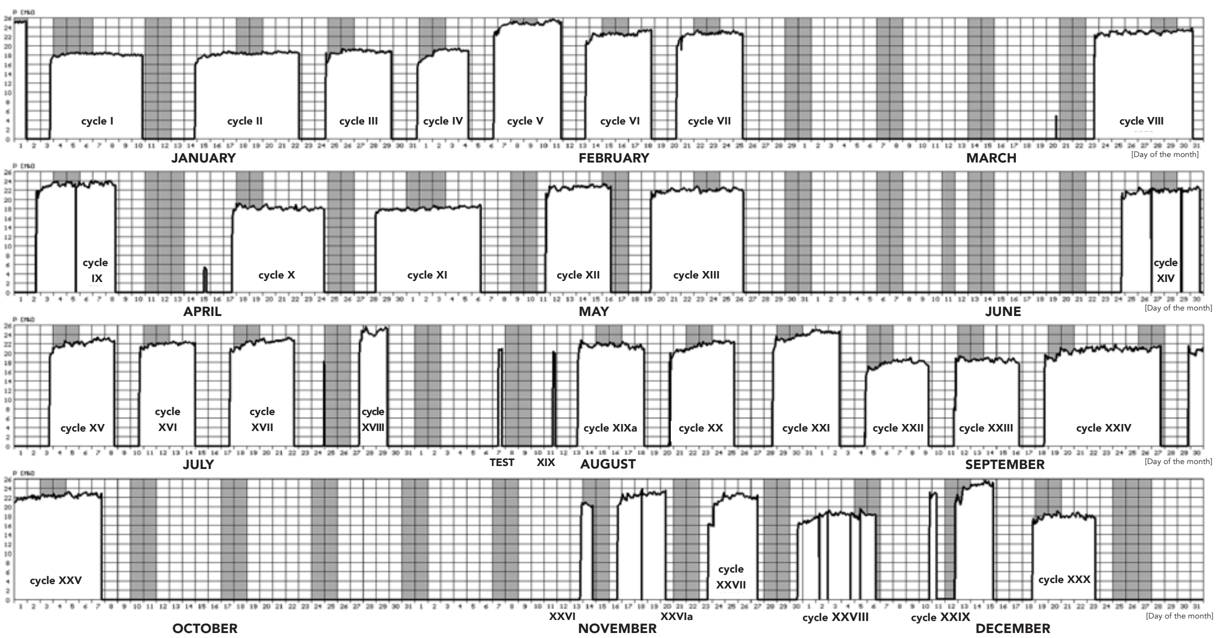
Spent fuel storage facilities, i.e. Facility 19 and Facility 19A, belonging to the ZUOP since January 2002, are also nuclear facilities. Both are wet storage facilities, i.e. they are adapted to store spent fuel in an aqueous environment.

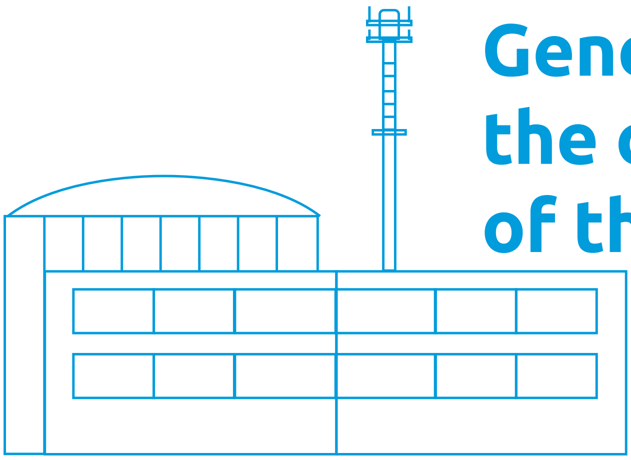
Facility no. 19 was used to store encapsulated low-enriched EK-10 spent fuel from the EWA reactor, which was returned to the producer country, i.e. to the Russian Federation, in September 2012.

The facility is currently used as a storage site for solid radioactive waste (structural elements) from the decommissioning of the EWA reactor and from the operation of the MARIA reactor, and spent high-activity gamma -ray sources.

FIGURE 7.

Summary of MARIA reactor cycles in 2020 (data: NCBJ), compiled and prepared by Andrzej Frydrysiak – DOM EJ2





General information the operation of the MARIA reactor

Time of operation at nominal power [h]

4216

I. 1286 II. 952
III. 1235 IV. 743

Number of work

I. 8 II. 7
III. 10 IV. 6

Average reactor power in cycles [MWt]

I. 0,1–25 II. 5 –24
III. 5 –24 IV. 19 –24

0,1–25

Number of fuel elements in the core

23-27

per quarter in 2020

OFF

Unplaned trips

Human error	Equipment malfunction (I.)	Instrumentation error (II.)	Short power outages
0	5	6	6

	Q1	Q2	Q3	Q4	Total
Malfunctions/defects and non-compliances found	1	1	0	2	4
Repair and maintenance works carried out	3	7	1	7	18
Tests, inspections and checks conducted	40	43	32	59	174

Facility no. 19A was used to store highly enriched spent nuclear fuel marked WWR-SM and WWR-M2 from the operation of the EWA reactor in 1967–1995, as well as encapsulated spent MR nuclear fuel from the operation of the MARIA reactor in 1974–2005. After returning all the spent fuel from Storage Facility 19A to the Russian Federation in 2010, this storage facility has been used as a reserve in case of a need to store spent fuel from the MARIA reactor.

Summary

There are two spent fuel storage facilities located at the Świerk site which are operated by the ZUOP. Currently, none of them contains spent fuel, and Storage Facility 19A serves as a reserve in case there is a need to store spent fuel from the MARIA reactor.

Licenses issued

The MARIA reactor is operated by the National Centre for Nuclear Research on the basis of the PAA President's License 1/2015/Maria dated 31 March 2015. This license is valid until 31 March 2025.

Other licenses issued by the President of the PAA for operation of the MARIA reactor, which are not licenses to operate a nuclear facility, include:

- Licence 1/2015/NCBJ dated 3 April 2015 for the storage of nuclear material,
- Licence 2/2015/NCBJ dated 3 April 2015 for the storage of spent nuclear fuel

In 2020, the President of the National Atomic Energy Agency issued Decision 1/2020/Maria of 9 March 2020, amending Licence 1/2015/Maria, allowing the use of MC-5, MR-6 and MR-2 fuel elements in the operation of the MARIA reactor, and issued Decision 2/2020/Maria of 3 September 2020 amending Licence 1/2015/Maria by updating Chapter 9 of the ERBM (MARIA Reactor Operational Safety Report), related to the change of the voltage supplying the OPT-11 and OPT-12 transformer stations from 6 kV to 15 kV.

Decommissioning of the EWA reactor and operation of the spent fuel storage facilities by ZUOP is based on Licence 1/2002/ECA of 15 January 2002, which is valid indefinitely.

PAA conducted:

3 ●●●

3 INSPECTIONS IN THE NATIONAL CENTRE FOR NUCLEAR RESEARCH (NCBJ),

4 ●●●●

4 INSPECTIONS AT THE RADIOACTIVE WASTE MANAGEMENT PLANT (ZUOP), INCLUDING: 3 INSPECTIONS AT THE NATIONAL RADIOACTIVE WASTE REPOSITORY (KSOP) IN RÓŻAN AND 1 INSPECTION AT THE ZUOP IN OTWOCK

Regulatory inspections

In 2020, PAA nuclear regulatory inspectors performed 7 inspections in the area of nuclear safety, radiological protection and physical protection of nuclear materials and facilities. The inspections did not indicate any threats to nuclear safety or radiological protection, however, in several cases nuclear regulatory inspectors found that the regulations were exceeded in terms of conducting day-to-day operation and breaching the terms of the licence.

The inspections carried out in the NCBJ concerned mainly the MARIA reactor and consisted in checking and evaluating the following:

- compliance of the MARIA reactor's day-to-day operation and operating records with the terms of the licence,
- security interlock system,
- reactor start-up,
- ventilation system,
- emergency power supply,
- handling of nuclear fuel,
- the cooling system for the fuel channels,
- the Integrated Management System,
- neutron measurement apparatus,
- technological control system apparatus,
- the manner of removing shortcomings and irregularities identified during previous regulatory inspections,

The inspections carried out in the ZUOP concerned the following

- state of radiological protection of facilities operated by the ZUOP,
- method of conducting technological processes of radioactive waste disposal,
- technical condition of ZUOP facilities,
- common radioactive waste inventory (computer database),
- verification of the manner of removal of shortcomings and irregularities identified during previous regulatory inspections,
- physical protection of ZUOP facilities.

The inspections carried out in KSOP in Różan belonging to the ZUOP concerned:

- compliance of day-to-day operations with regulations,
- acceptance of waste into the repository at the KSOP,
- measurements at the repository,
- compliance with the rules of physical protection at KSOP premises,
- verification of the removal of shortcomings and irregularities identified during previous regulatory inspections.

During the conducted inspections, 7 non-conformances were found – 4 at the site of the MARIA research reactor, 3 at the ZUOP site and 2 non-conformances for the MARIA reactor. In 2020, the President of the PAA issued 2 decisions that concerned irregularities for 2019, ordering the removal of irregularities found during the aforementioned inspections, and 3 post-inspection notices.

Functioning of the coordination system for inspection and supervision of nuclear facilities

In accordance with the provisions of the Atomic Law Act, nuclear regulatory bodies cooperate with other administration bodies through the **coordination system** in performing supervision and control in the area of nuclear safety and radiological protection of nuclear facilities. The cooperating authorities include, among others, the Office of Technical Inspection (UDT), the State Fire Service, the authorities of environmental protection inspection, construction supervision, the State Sanitary Inspection, the State Labour Inspection, as well as the Internal Security Agency.

Summary

In 2020, the supervision of the nuclear facilities proceeded smoothly and showed no deviations from the nuclear safety status demonstrated in previous years. The operation of the most important nuclear facility, i.e. the MARIA research reactor, proceeded without significant interruptions, and performed modernisations, and other maintenance works, as well as unplanned shutdowns, did not pose a threat to nuclear safety or radiological protection. In 2020, PAA inspectors carried out a total of 7 inspections related to nuclear facilities at the NCBJ and the ZUOP. The inspections carried out in 2020 confirmed that there were no threats to nuclear safety or radiological protection of the nuclear facilities operating in Poland, despite several instances of non-compliance with the rules for day-to-day operation and breaches of licence terms. The organizational units responsible for the operation of the nuclear facilities have rectified or are in the process of rectifying the irregularities and shortcomings identified during the inspections.

NUCLEAR POWER PLANTS IN NEIGHBOURING COUNTRIES

There are 8 nuclear power plants operating 22 power reactors with a total capacity of about 15.5 GWe within 300 km of the Polish borders.

SWEDEN

Oskarshamn NPP

PL — 298 km

1 BWR unit
1450 MWe

CZECH REPUBLIC

Dukovany NPP

PL — 119 km

4 WWER-440 units
500 MWe
500 MWe
500 MWe
500 MWe

CZECH REPUBLIC

Temelin NPP

PL — 192 km

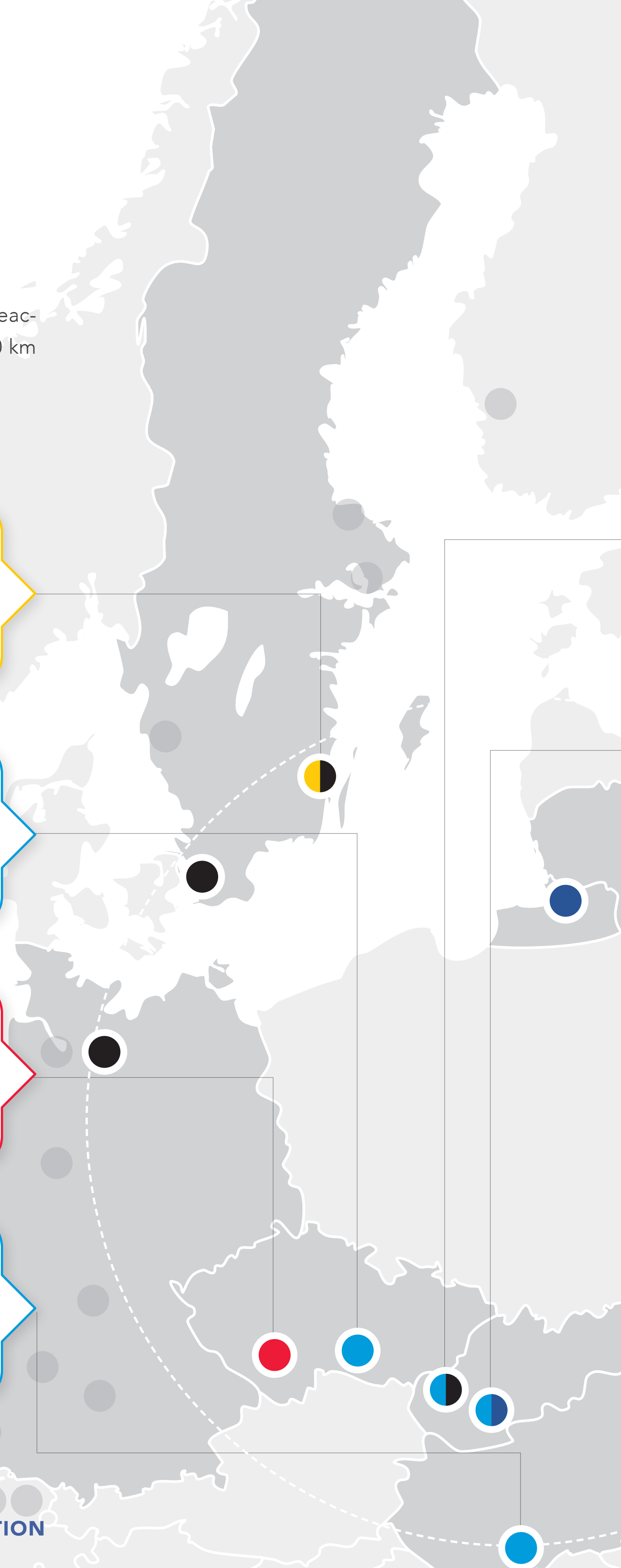
2 units WWER-1000
1082 MWe
1082 MWe

HUNGARY

Paks NPP

PL — 300 km

4 WWER-440 units
500 MWe
500 MWe
500 MWe
500 MWe



NUCLEAR REACTORS UNDER CONSTRUCTION

2 WWER-440 reactors at **Mochovce NPP** (Slovakia)

1 WWER-1200 reactor at **Astravets NPP** (Belarus)

1 WWER-1200 reactor at **Baltic NPP** (Kaliningrad Region, Russia)

2 WWER-1000 reactors at **Khmelnytskyi NPP** (Ukraine)

NPPS FURTHER THAN 300 KM FROM POLAND

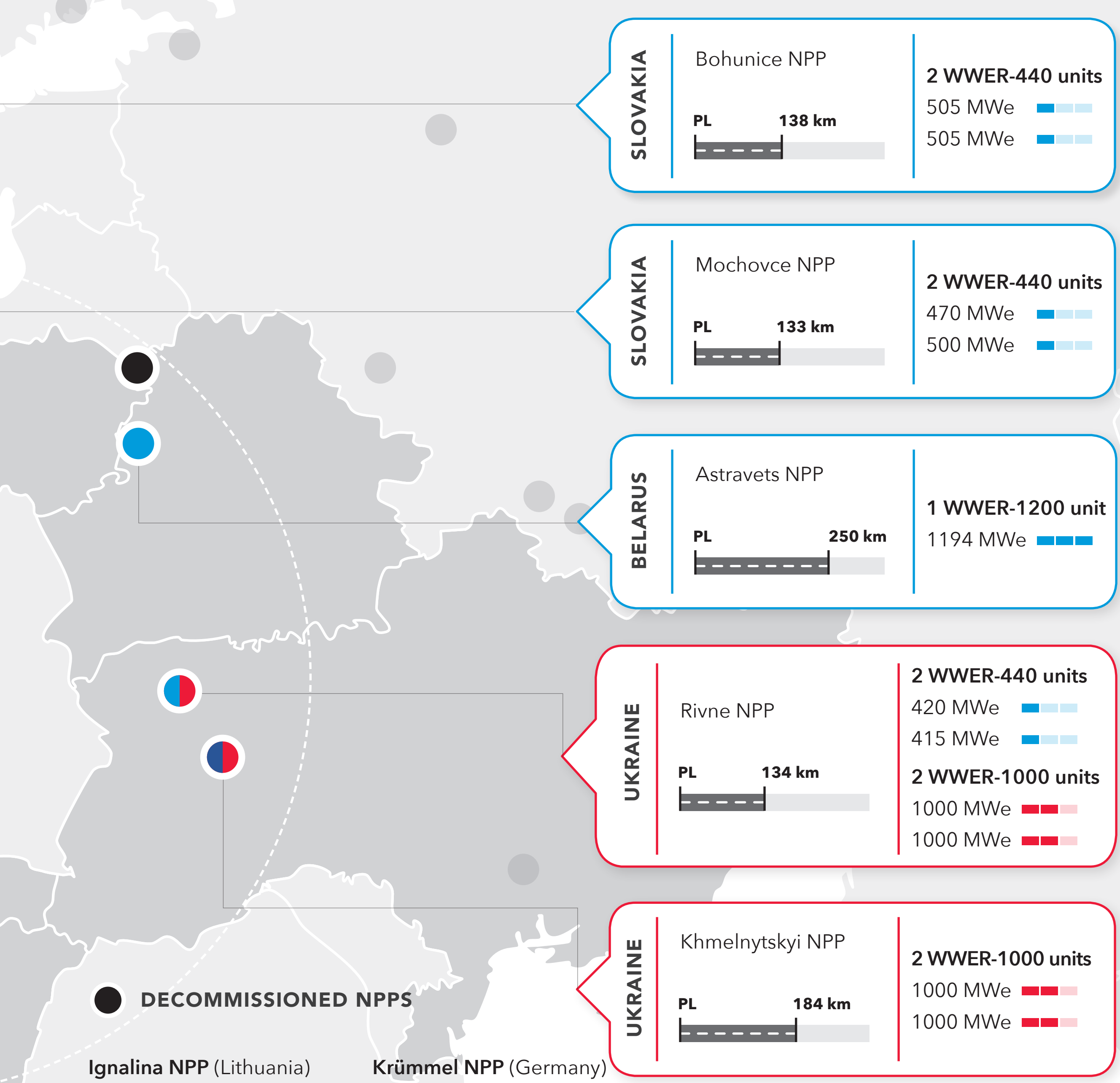
8 NPPS IN OPERATION

14 WWER-440 REACTORS

1 WWER-1200 REACTORS

6 WWER-1000 REACTORS

1 BWR



DECOMMISSIONED NPPS

Ignalina NPP (Lithuania)
two 1300 MWe RBMK reactors shut down in 2004 and 2009 r.

Krümmel NPP (Germany)
one 1,402 MWe BWR shut down in 2011

Bohunice NPP (Slovakia)
two 440 MWe WWER-440 reactors shut down in 2006 and 2008

Barsebäck NPP (Sweden)
two 615 MWe BWRs shut down in 1999 and 2005

Oskarshamn NPP (Sweden)
two 492 MWe and 661 MWe BWRs shut down in 2017 and 2016

See more: Power Reactor Information System **www.iaea.org/pris**

5 Safeguards

Fot. NCBJ

Legal basis for safeguards

LEGAL BASIS

In the field of nuclear safeguards, Poland fulfils its obligations arising from the following international obligations:

- The Treaty establishing the European Atomic Energy Community (Euratom Treaty) of 25 March 1957. In Poland, the provisions of the Treaty have been in force since accession to the European Union;
- Article III of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). The NPT entered into force on 5 March 1970. In 1995, it was extended indefinitely. Poland ratified the NPT on 3 May 1969. The NPT came into force in Poland on 5 May 1970;
- Agreement between Poland, the European Atomic Energy Community and the International Atomic Energy Agency in connection with the implementation of Article III of the Treaty on the Non-Proliferation of Nuclear Weapons, also known as the Tripartite Safeguards Agreement INFCIRC/193). The Agreement has been in force in Poland since 1 March 2007;
- Protocol Additional to the Tripartite Safeguards Agreement in Implementation of Article III of the Treaty on the Non-Proliferation of Nuclear Weapons (INFCIRC/193/Add.8). The Protocol entered into force on 1 March;
- Commission Regulation (Euratom) No 302/2005 of 8 February 2005 on the application of Euratom safeguards (OJ L 54, 28 February 2005)

The most common nuclear safeguards agreement under the NPT between non-nuclear weapon states and the International Atomic Energy Agency (IAEA) is based on IAEA Model Document - INFCIRC/153.

On this basis, an all-party agreement on nuclear material safeguards was concluded in 1972 between Poland and the International Atomic Energy Agency, as presented in IAEA document INFCIRC/179.

In March 2006, the so-called integrated safeguards system was introduced in Poland. This became possible after all relevant information nuclear material safeguards was submitted to the IAEA. On this basis, the IAEA concluded that nuclear materials in Poland are used exclusively for peaceful purposes. The introduction of the integrated safeguards system enabled a significant reduction of the number of inspections performed by the IAEA in Poland. The bilateral nuclear and the IAEA was in force until the end of February 2007.

Following Poland's accession to the European Union, the agreement between Poland and the IAEA was suspended. The integrated system of nuclear material safeguards has been in force since 1 March 2007 under a trilateral agreement between Poland, the European Atomic Energy Community and the International Atomic Energy Agency. The responsibility for the implementation of the agreement lies with the President of the PAA.

Under the trilateral agreement, the IAEA and EURATOM have the right to carry out nuclear safeguards inspections in Poland. The purpose of these inspections is to verify the compliance of reports with operator's documentation, to identify and verify where nuclear material is stored, to verify the quantity and composition of nuclear material under safeguards, to explain why there may be unaccounted-for-material, and to clarify differences in the information provided by the shipper and receiver of nuclear material. Checks are also performed before or after nuclear material is exported from or imported to Poland.

Users of nuclear materials in Poland

The tasks of the national nuclear material accountancy and control system are performed in the PAA by the Nuclear Safety Department, which is responsible for collecting and storing information on nuclear materials and carrying out controls in all material balance areas.

The national nuclear material accountancy and control system is based on a structure of so-called material balance areas (MBA). Nuclear materials in Poland are used in the following units which constitute separate MBAs:

- MARIA Reactor Operations Division and the associated research laboratories of the (National Centre for Nuclear Research (NCBJ) **WPLC**;
- POLATOM Radioisotopes Centre at the NCBJ – **WPLD**;
- 22 medical and scientific facilities that use small amounts of nuclear material, and 83 industrial, diagnostic, and service facilities that have primarily depleted uranium shielding. All of the sites form a material balance area Locations outside Facilities – **WPLE**;
- Institute of Nuclear Chemistry and Technology (IChTJ) in Warsaw – **WPLF**;
- Radioactive Waste Management Plant (ZUOP), which is responsible for spent fuel storage facilities, shipping warehouse and National Radioactive Waste Repository in Różan – **WPLG** material balance area.

There is also a WPLB material balance area defined for the partially dismantled ANNA and AGATA critical assemblies at the NCBJ. There are no nuclear materials in the area.

Reports on the quantitative change in the stock of nuclear material in each MBA (the so-called Inventory Change Report) are submitted monthly to the Nuclear Material Accounting and Control System maintained by the European Commission's Nuclear Safeguards Office in Luxembourg. A copy of this information is also forwarded by the organizational units to the PAA. Monthly reports on changes in the status of nuclear materials in the WPLE area are prepared by the PAA and then sent to the European Commission.

In matters concerning control over exports and imports of nuclear materials, strategic goods and dual-use technologies, the PAA cooperates with the Department of Sensitive Goods Trade and Technical Safety of the Ministry of Development, Labour and Technology. On the basis of opinions provided under the Tracker system by the PAA and other ministries, the Ministry of Development, Labour and Technology issues decisions on matters relating to export and import control of nuclear materials, goods and technologies.

The European Commission's Nuclear Safeguards Office sends copies of the reports to the International Atomic Energy Agency in Vienna.

INFOGRAPHIC

Balance of nuclear materials in Poland, in kg
(as of 31 December 2020)

- **Plutonium** **2.45 kg**
- **High enriched uranium** **7.27 kg**
- **Low enriched uranium** **499.04 kg**
- **Natural uranium** **3,921.50 kg**
- **Depleted uranium** **23,045.90 kg**
- **Thorium** **276.72 kg**

Inspections of nuclear material safeguards

In 2020, PAA nuclear regulatory inspectors carried out, individually or jointly with IAEA and EURATOM inspectors, 36 nuclear material safeguards inspections in all MBAs in Poland. EURATOM inspectors participated in 8 inspections and IAEA inspectors in 5 inspections. 4 inspections were carried out with the joint participation of IAEA, EURATOM and PAA inspectors. Due to the establishment of certain restrictions, orders, and prohibitions due to the SARS-CoV-2 virus epidemic, 10 of all inspections were conducted remotely.

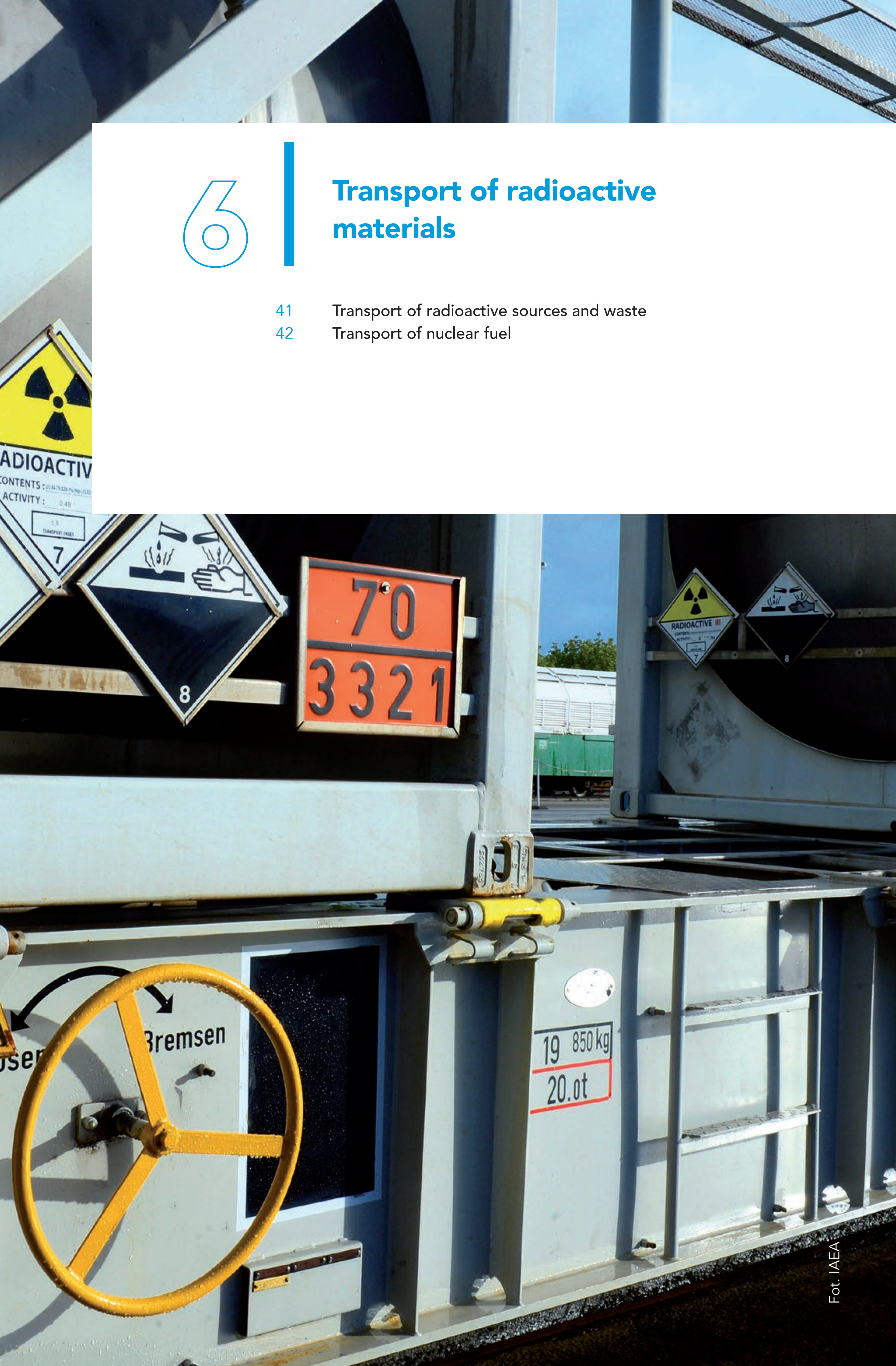
No major nuclear safeguards concerns were identified by IAEA or EURATOM inspectors during any of the conducted inspections.

Pursuant to the Protocol Additional to the Tripartite Agreement on Nuclear Safeguards under Article III of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the IAEA carried out a complementary access in September at the premises of the NCBJ and the ZUOP in Świerk, in which inspectors from the PAA and the European Commission also participated. In the course of their activities, IAEA inspectors confirmed the absence of undeclared nuclear material and activities.

Fulfilling the obligations arising from the Protocol Additional to the Tripartite Agreement, a declaration updating information on the technical or research activities related to the nuclear fuel cycle conducted in Poland, information on non-export of goods listed in Annex II to that Protocol, and a declaration regarding users of small quantities of nuclear materials in Poland were submitted to EURATOM.

No irregularities related to nuclear material safeguards in Poland were found as a result of all inspections carried out. In particular, it was confirmed that all nuclear materials located in Poland are used for peaceful purposes.

6 Transport of radioactive materials



Fot. IAEA

Transport of radioactive sources and waste

LEGAL BASIS

Transport of radioactive materials is based on the following national regulations:

- Atomic Law Act of 29 November 2000,
- Act of 19 August 2011 on transport of hazardous goods,
- Act of 18 August 2011 on maritime safety,
- Aviation Law Act of 3 July 2002,
- Transport Law Act of 15 November 1984.

The Polish regulations stem from the following international modal regulations such as:

- European Agreement concerning the International Carriage of Dangerous Goods by Road – **ADR** (French: L'Accord européen relatif au transport international des marchandises dangereuses par route);
- Regulations concerning the International Carriage of Dangerous Goods by Rail – **RID** (French: Réglement concernant le transport international ferroviaire des marchandises dangereuses);
- European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways – **ADN** (French: Accord européen relatif au transport international des marchandises dangereuses par voie de navigation intérieure);
- International Maritime Dangerous Goods Code – **IMDG Code**;
- International Civil Aviation Organization (**ICAO**) Technical Instructions for the Safe Transport of Dangerous Goods by Air;
- International Air Transport Association (**IATA**) Dangerous Goods Regulations.

Transport of radioactive material is based on the IAEA SSR-6 transport guidelines. They are the basis for international organisations developing modal rules or are directly implemented into national law and constitute the basic legal form in international transport.

In line with Poland's commitments to the IAEA, radioactive sources in relevant categories are transported in accordance with the principles set out in the Code of Conduct on the Safety and Security of Radioactive Sources and the supplementary Guidance on the Import and Export of Radioactive Sources.

When it comes to transportation of radioactive materials, it is particularly important to prevent all attempts of illegal (i.e. unlicensed or undeclared) import of radioactive substances and nuclear materials into Poland. Such attempts are prevented primarily by the Border Guard, who have **379 stationary radiometric devices, so-called radiometric gates**, installed at border crossings, over **1,500 portable signalling and measuring devices, as well as 2 vehicles with systems of ionizing radiation detectors enabling the measurement of ionizing radiation in the field.**

Following the conducted inspections, due to exceeded permissible levels of ionizing radiation dose power, the Border Guard prohibited further transport in seven cases.

As in previous years, the Border Guard received equipment from the US under a Memorandum of Understanding concluded in 2009 between the US Department of Energy (DoE) and the Minister of the Interior and Administration and the Minister of Finance of the Republic of Poland on cooperation in combatting illicit trafficking of special nuclear and other radioactive materials. As part of the support, in 2020 the Border Guard received 5 spectrometers for the identification of radioactive isotopes and 35 ionizing radiation signalling and metering units. Four radiometric gates were also put into service. Since 2010, a total of 147 radiometric gates have been installed and 434 portable radiometric devices and 2 vehicles with ionizing radiation detectors have been supplied to organizational units of the Border Guard. Further installation of radiometric gates and implementation of an IT system for processing and analysis of radiometric inspection data are planned.

In 2020, 101,034 shipments of radioactive materials were made in Poland and 156,224 shipments were transported by road, rail, inland waterway, sea and air on the territory of Poland, covering 3,612,129 km. The 10 most commonly transported isotopes are: Se-75, Ir-192, Am-241, Cs-137, Co-60, I-131, Mo-99, Am241-Be, Kr-85, Lu-177. The Radioactive Waste Management Plant also performed 7 transports of radioactive waste to the National Radioactive Waste Repository in Różan. No accidents occurred during the transport of radioactive materials and radioactive waste.

Transport of nuclear fuel

Shipments of fresh and spent nuclear fuel are licensed by the President of the PAA. In 2020, there were no shipments of fresh or spent nuclear fuel on the territory of the Republic of Poland.

Fresh nuclear fuel

Since 2007, fresh nuclear fuel has been imported to Poland 9 times, including: MR fuel from the Russian Federation – twice, and MC fuel from France – 9 times, in connection with the operation of the MARIA research reactor at the National Centre for Nuclear Research in Świerk, 9 transits and 2 exports.

Spent nuclear fuel

The last export of spent nuclear fuel from the MARIA and EWA research reactors to the Russian Federation took place in 2016. Between 2007 and 2016, there were 9 such exports (high-enriched fuel 8 times and low-enriched fuel once).

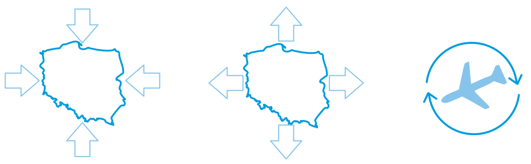
Summary

The Commander-in-Chief of the Border Guard and the President of the National Atomic Energy Agency, under the agreement on cooperation in the field of radiological protection, undertake to provide information to prevent illegal movement of radioactive materials across the state border. The Radiation Emergency Centre duty officer systematically cooperates with Border Guard officers in cases where the radiometric gate is activated, giving recommendations on further action.

Transports were carried out in accordance with regulations, no dose limits were exceeded. Materials that were not permitted to be transported further did not pose a threat to the health and life of the public or to the environment. However, they exceeded the permissible values of radioactive concentrations contained in the Atomic Law Act.

INFOGRAPHIC

Number of controls carried out by Border Guard units.



	import to	transit, export from	transfer at airports
TRANSPORT OF RADIOACTIVE SOURCES – 3 252 INSPECTIONS, IN PARTICULAR:	781 inspections	2374 inspections	97 inspections
TRANSPORT OF MATERIALS CONTAINING NATURAL RADIOACTIVE ISOTOPES – 28 006 INSPECTIONS, IN PARTICULAR:	14 760 inspections	13 146 inspections	100 inspections
TRANSPORT OF OTHER UNDECLARED ITEMS (E.G. ITEMS CONTAINING PARTS PAINTED WITH RADIUM PAINT, CONTAMINATED CLOTHING, SCRAP METAL) – 9 INSPECTIONS, IN PARTICULAR:	4 inspections	4 inspections	1 inspection
PERSONS AFTER TREATMENT OR EXAMINATION WITH RADIOACTIVE ISOTOPES – 377 INSPECTIONS.		377 inspections	

In 2020, Border Guard posts conducted: **31 644 inspections**

7 Radioactive waste

Fot. NCBJ

Management of radioactive waste

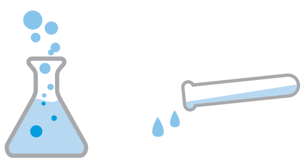
Radioactive waste is produced from activities involving radioactive sources in medicine, industry and research facilities and during the operation of a research reactor. Radioactive waste can take a gaseous, liquid or solid form.

INFOGRAPHIC

Radioactive waste may appear in the following states:

SOLID WASTE

includes used sealed radioactive sources, personal protection equipment contaminated with radioactive substances (rubber gloves, protective clothing, footwear), laboratory materials and equipment (glass, pieces of apparatus, lignin, cotton wool, foil), used tools and elements of technological equipment (valves, pipeline segments, parts of pumps), used sorption and filtration materials used in the process of cleaning radioactive solutions or air released from reactors and isotope laboratories (used ionites, post-precipitation sludge, filtration cartridges, etc.) The qualification of radioactive waste takes into account the radioactive concentration and the half-life of the radioactive isotopes contained in the waste.



LIQUID WASTE

mainly includes aqueous solutions and suspensions of radioactive substances.

GASEOUS WASTE

mainly comprises noble gases (argon, xenon, krypton) and iodine.

The categories of radioactive waste are as follows: low-, intermediate-, and high-level radioactive waste, classified into three subcategories: transitional, and short- and long-lived. Used sealed radioactive sources, which represent a separate category of radioactive waste, are classified according to their activity level into three subcategories of low-, intermediate- and high-level sources which may be further divided into short- and long-lived, based on the period of half-life degradation of the relevant radioactive isotopes.

> Radioactive waste containing nuclear material and spent fuel, which becomes high-level waste when a decision is made to dispose of it, are subject to specific, separate provisions for management at all stages (including storage and disposal).

Under the Atomic Law Act, all organizational units carrying out activities involving exposure to ionizing radiation must plan and carry out these activities in such a way as to prevent the generation of radioactive waste (the so-called waste minimisation principle). Where this is not possible, the waste generated must be properly treated (i.e. separated, de-scaled, solidified and packaged) and then stored or disposed of in such a way that the measures taken and barriers provided effectively isolate the waste from humans and the environment.

Radioactive waste is temporarily **stored** in such a manner as to ensure the protection of humans and the environment, under normal conditions and in emergencies, for example by providing protection against spillage, dispersion or release. Specially dedicated facilities or rooms (radioactive waste storage facilities) are used for this purpose and are equipped with mechanical or natural ventilation and purification of the air discharged from the room.

Disposal of radioactive waste is only permitted in dedicated facilities, i.e repositories. Under Polish regulations, they are divided into surface and deep geological repositories, and the nuclear safety and radiological protection licensing process, which is the responsibility of the President of the PAA, defines in detail the types of waste of each category that may be stored at a given facility.

Radioactive waste in Poland

The collection, transport, processing and storage of waste generated by users of radioactive materials in the country is handled by the Radioactive Waste Management Plant (ZUOP).

Supervision over the safety of waste handling, including supervision over the safety of waste storage by the ZUOP is exercised by the President of the PAA.

TABLE 3.

Quantities of radioactive waste received by ZUOP in 2020.

Sources of waste	Solid waste [m³]	Liquid waste [m³]
From outside the Świerk Nuclear Centre (medicine, industry, research)	5	0.4
National Centre for Nuclear Research OR POLATOM	9.2	0.4
National Centre for Nuclear Research + MARIA reactor*	6	23
Radioactive Waste Management Plant	2	25
Total:	22.2	48.8

*total value of waste from the MARIA reactor and the National Centre for Nuclear Research

ZUOP's facilities at the Świerk Nuclear Centre are equipped with radioactive waste treatment installations.

The National Radioactive Waste Repository (KSOP) in Różan, Poland is dedicated for the disposal of radioactive waste. KSOP is a surface disposal facility for short-lived, low- and intermediate-level radioactive waste (with a radionuclide half-life of less than 30 years). It is also used for storing long-lived waste, mainly alpha-radioactive materials awaiting disposal in a deep geological repository. KSOP was established in 1961 and is the only facility of its kind in Poland.

In 2020, the ZUOP received 255 orders for radioactive waste collection from 165 institutions. Table 3 shows the quantities of radioactive waste received (including the waste generated in the ZUOP).

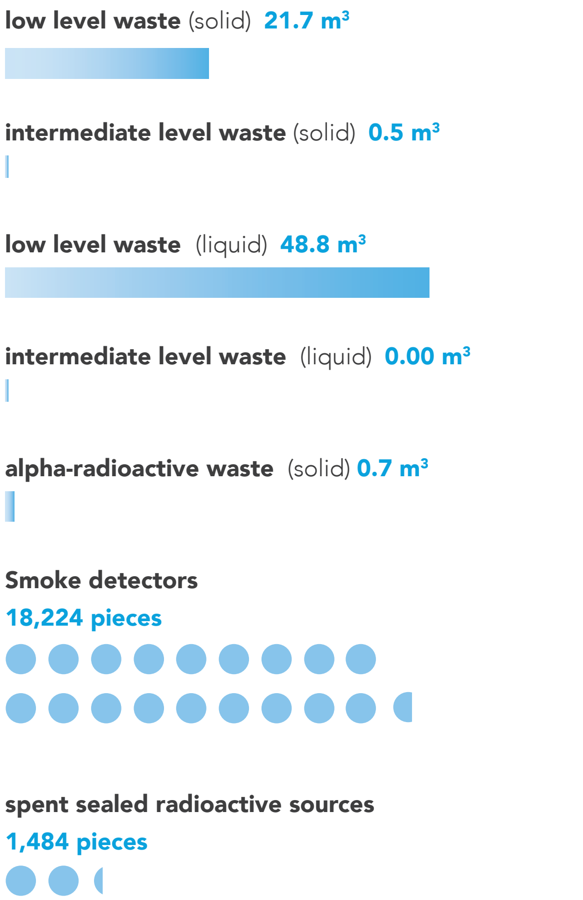
After treatment, the radioactive waste is placed in 200 and 50 dm^3 drums and then always solidified for disposal.

In 2020, one hundred and forty-four 200-litre drums with treated radioactive waste with a total activity of 14 Gbq were transferred to KSOP (data as at 31 December 2020).

Waste from dismantling smoke detectors is also sent to the ZUOP for storage.

FIGURE 8.

The collected solid and liquid waste by type and category may be broken down as follows:



The conducted inspections of radioactive waste stored and disposed of at the KSOP and ZUOP premises did not indicate any threat to the public nor the environment.

Radioactive waste management at the ZUOP is performed on the basis of four permits issued by the President of the PAA:

- License D-14177, dated 17 December 2001, for nuclear activities involving transport, processing and storage of radioactive waste collected from entities involved in nuclear activities across the country at the Świerk Nuclear Centre,
- Licence 1/2002/KSOP – Różan dated 15 January 2002 for the operation of KSOP in Różan,
- Licence 1/2016/ZUOP dated 15 December 2016 for the performance of exposure-related activities involving the storage of radioactive waste in Facility 8a at the National Radioactive Waste Repository in Różan,
- Licence D-19866 dated 4 July 2016 to carry out activities referred to in Article 4(1)(1a) of the Atomic Law Act, consisting in the storage of radioactive waste generated in a Class III isotopic laboratory operated under license number D-18527 and radioactive waste received from other entities under license number D-14177 in the Shipping Warehouse (Buildings 35A and 35B on the premises of the State Radioactive Waste Management Plant in Otwock-Świerk at ul. Andrzeja Sołtana 7).

These licenses are valid indefinitely and the first two require submission of reports (annual in the former case and quarterly in the latter), which are analysed by the PAA staff. Information contained in the reports is subsequently verified during inspections.

PAA nuclear regulatory inspectors carried out four inspections of radioactive waste management at the ZUOP in 2020, including the following:

- three inspections were carried out at the KSOP in the following scope: control of radioactive waste storage and acceptance, ionizing radiation dose power measurements at selected points of the repository, verification of documentation of waste accepted for storage, verification of operation of physical protection at the KSOP, and verification of implementation of recommendations, orders and bans, and verification of removal of shortcomings and irregularities identified during previous regulatory inspections;
- one inspection in ZUOP facilities in Świerk Nuclear Centre concerning technological processes of radioactive waste processing, technical condition of ZUOP facilities and radiological protection, common records of radioactive waste, implementation of recommendations, orders and bans, and verification of removal of shortcomings and irregularities from previous regulatory inspections.

Conclusions and observations from the conducted inspections were implemented by the management of the ZUOP on an ongoing basis, while irregularities and shortcomings identified by the nuclear regulatory inspectors were removed in accordance with provisions included in inspection protocols or post-inspection notices.

INFOGRAPHIC
Classification of radioactive waste.

RADIOACTIVE WASTE

The following categories of radioactive waste can be distinguished: low-, intermediate- and high- level radioactive waste, classified into three sub-categories: transitional, short- and long-lived waste.

LOW–LEVEL | **INTERMEDIATE–LEVEL** | **HIGH–LEVEL**

- **TRANSITIONAL**
- **SHORT-LIVED**
- **LONG-LIVED**

NUCLEAR MATERIAL AND SPENT NUCLEAR FUEL
Specific, separate provisions for management at all stages (including storage and disposal) apply to radioactive waste containing nuclear material and spent fuel, which becomes high-level waste when a decision is made to dispose of it.

SPENT SEALED RADIOACTIVE SOURCES
which constitute a separate radioactive waste category, are classified according to their activity level into three subcategories: low-, intermediate- and high-level radioactive waste.

Summary

The amount of radioactive waste disposed of at the ZUOP in 2020 was comparable to previous years.

According to the reports presented by the ZUOP, radioactive waste management in 2020 was carried out in accordance with the terms of the applicable licenses. No radiation emergencies occurred, the submitted environmental and radiation monitoring results are consistent with the levels recorded last year, and indicate that there is no radiation hazard to staff or the environment.

The conducted inspections of radioactive waste stored and disposed of at the KSOP and ZUOP premises did not indicate any threat to the public or the environment.

8 Radiological protection of the Population and workers in Poland

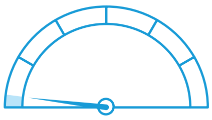
Fot. NCBJ

Exposure of the population to ionizing radiation

For individuals in the general population, the dose limit, expressed as an effective dose, is 1 mSv per calendar year.

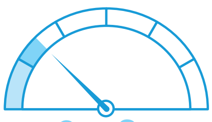
For occupational workers with exposure to ionizing radiation and school students, tertiary education students and apprentices aged 18 and older, the dose limit is 20 mSv per calendar year. In the case of workers, this dose may be exceeded up to 50 mSv per year, if such an excess is authorised by the President of the National Atomic Energy Agency or another authority competent to issue licenses or accept a notification or information concerning the relevant activity.

The dose limit for school students, tertiary education students and apprentices aged 16 to 18 is 6 mSv. The dose limit for the general population applies to school students, tertiary education students and apprentices under the age of 16.



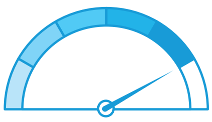
1 mSv

for persons in the general population



6 mSv

for school students, tertiary education students and apprentices aged 16 to 18



20 mSv

for workers and school students, tertiary education students and apprentices aged 18 and older

There are three components to the dose limit:

- the presence of artificial radionuclides in food and the environment from nuclear explosions and radiation accidents,
- the use of consumer products which emit radiation or contain radioactive substances,
- professional practices involving the use of ionizing radiation sources.

Human exposure to ionizing radiation results from two main sources:

- natural radiation sources – ionizing radiation emitted by radionuclides which are natural components of all elements of the environment and cosmic radiation;
- artificial (man-made) sources of radiation – all artificial sources of radiation, such as radioactive isotopes of elements and radiation-producing devices, including X-ray machines, accelerators, nuclear reactors and other radiation devices.

Ionizing radiation is a phenomenon that has always been present in the human environment, and therefore its presence cannot (and does not have to) be eliminated, but can be limited. This is because man has no influence on, for example, the level of cosmic radiation, the content of natural radionuclides in the Earth's crust, or even in his own body. **For this reason, the established dose limit (the limit of the effective dose for the general population) takes into account only artificial radiation sources**, and excludes doses received:

- by patients as a result of the medical use of radiation;
- during radiation emergencies (i.e. when the radiation source is not under control).

LEGAL BASIS

The primary national normative act establishing this limit until 22 September 2019 was the Regulation of the Council of Ministers of 18 January 2005 on dose limits for ionizing radiation (Journal of Laws, item 168). Currently, it is Annex 4 to the Atomic Law Act.

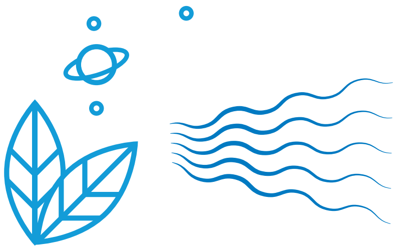
INFOGRAPHIC

The percentage of different ionizing radiation sources in the annual average effective dose.

3.96 mSv

annual total effective dose of ionizing radiation received per capita in Poland in 2020

NATURAL SOURCES

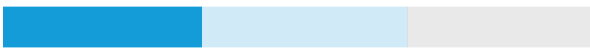


61.9%

2.45 mSv

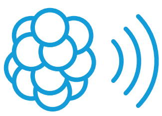
RADON

30.3% **1.2 mSv**



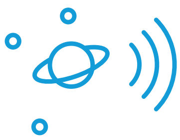
GAMMA RADIATION

14.1% **0.56 mSv**



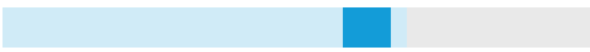
COSMIC RADIATION

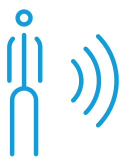
8.3% **0.33 mSv**



INTERNAL RADIATION

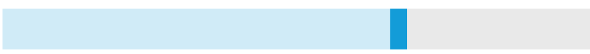
6.6% **0.26 mSv**





THORON

2.5% **0.1 mSv**

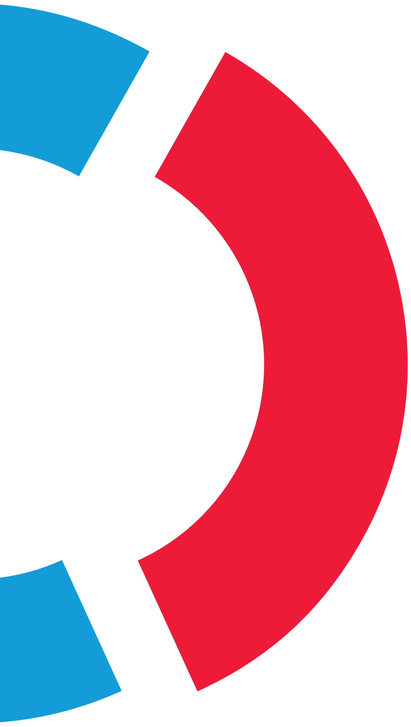


Exposure to natural sources:

- radon and its decay products,
- cosmic radiation,
- terrestrial radiation, i.e. radiation emitted by natural radionuclides found in the intact crust of the Earth,
- natural radionuclides contained in the human body approx. 0.001 mSv dose of exposure to ionizing radiation from common objects (e.g. TV, ceramic tiles, isotopic smoke detectors).

approx. 0.001 mSv
dose of exposure to ionizing radiation from common objects (e.g. TV, ceramic tiles, isotopic smoke detectors).

approx. 0.091 mSv
exposure dose from radionuclides naturally occurring in food (Ra-226, Pb-210, Po-210 and U+Th).



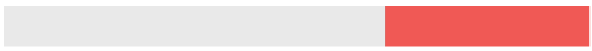
ARTIFICIAL SOURCES

38.1%

1.51 mSv

MEDICAL DIAGNOSTICS

37.9% 1.5mSv



This overall dose predominantly includes doses received during tests performed with the use of:

- computed tomography **0.9 mSv**
- conventional radiography and fluoroscopy **0.2 mSv**

For other diagnostic tests, the single doses are as follows:

- mammography **0.02 mSv**
- X-ray **1.2 mSv**
- chest radiographs **0.11 mSv**
- spinal column and lung scans **3 mSv – 4.3 mSv**

DEFECTS

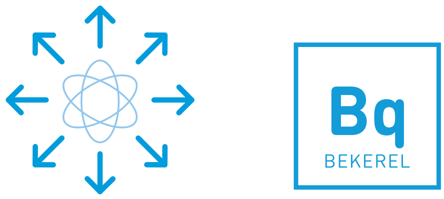
0.1% 0.005 mSv

OTHER

0.1% 0.005 mSv

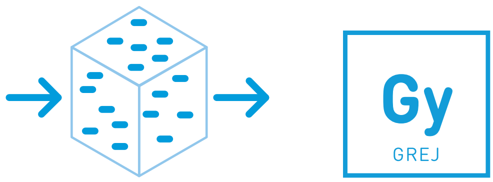
INFOGRAPHIC

Basic terms and units used in radiological protection.



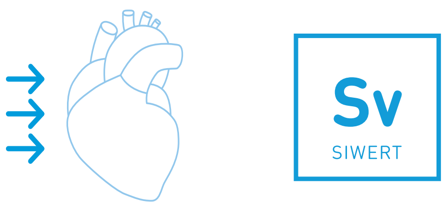
RADIOACTIVITY

Determines the number of radioactive decays in a given material per unit time.



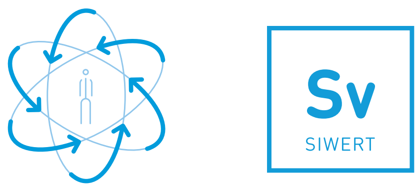
ABSORBED DOSE

Determines the average energy absorbed by the medium through which the radiation passes.



EQUIVALENT DOSE

Determines the dose absorbed in a tissue or organ, taking into account the type and energy of radiation. It enables the biological effects of radiation on exposed tissue to be determined.



EFFECTIVE DOSE

Illustrates whole body exposure to radiation. It determines the degree of exposure of the whole body to radiation even when only certain parts of the body are irradiated.

Exposure limits for individuals in the general population take into account external irradiation and internal irradiation caused by radionuclides that enter the human body by oral or inhalation routes, and are defined as:

- effective dose, reflecting whole body exposure, and
- equivalent dose, which expresses the exposure of individual organs and tissues of the body.

The annual total effective dose of ionizing radiation received per capita in Poland has remained at a similar level for several years. In 2020, taking into account radiation from natural and artificial sources of ionizing radiation (including those used in medical diagnosis), this value was **3.96 mSv on average.** The percentage of this exposure to different radiation sources is shown in the infographic on pages 50–51[1].

Exposure of the general public to sources of ionizing radiation

Exposure to the following natural sources accounts for **61.9%** of the total effective dose and is about **2.45 mSv/year:**

- radon and its decay products,
- cosmic radiation,
- terrestrial radiation (radiation emitted by natural radionuclides found in the intact crust of the Earth),
- natural radionuclides that make up the human body.

1. The sources of data obtained included the Central Laboratory for Radiological Protection in Warsaw, the National Radiological Protection Centre in Łódź, the Institute of Meteorology and Water Management in Warsaw, the Institute of Occupational Medicine in Łódź, and the Central Mining Institute in Katowice.

Radon and its decay products account for the largest share of this exposure, with an average per capita dose of approx. **1.20 mSv/year.**

The average per capita exposure to medical radiation sources in Poland, mainly in medical diagnostics including X-ray examinations and in vivo examinations (i.e. administration of radioactive preparations to patients) in **2020** is estimated at **1.5 mSv.**

This dose consists primarily of doses received during examinations in which computed tomography was used (**0.9 mSv**) and conventional radiography and fluoroscopy (**0.2 mSv**). For other diagnostic tests, the doses are much smaller.

The average effective dose per X-ray examination is 1.2 mSv, and for the most frequently performed examinations, these values are as follows[2]:

- chest radiographs – approx 0.11 mSv,
- spinal column and lung scans from 3 mSv to 4.3 mSv.

It should also be recalled that the public exposure limits do not cover exposure resulting from the therapeutic use of ionizing radiation.

Annual effective dose

National regulations set an effective annual dose limit of 1 mSv for the population. The value of the effective dose for a statistical Pole covered by this limit consists of three elements:

- the presence of artificial radionuclides in food and the environment from nuclear explosions and radiation accidents,
- the use of consumer products which emit radiation or contain radioactive substances,
- professional practices involving the use of ionizing radiation sources.

The average per capita exposure to radionuclides of natural origin (Ra-226, Pb-210, Po-210 and U+Th) in food in Poland has been estimated at 0.091 mSv on the basis of measurements carried out in previous years (this constitutes **9%** of the dose limit for the population). These values were determined on the basis of measurements of radionuclide content in foodstuffs and food products constituting the basic components of an average diet, taking into account current data on the intake of its individual components. As in previous years, dairy, meat, vegetables (mainly potatoes) and cereals account for the largest share of this exposure, while mushrooms, forest fruits and game, despite their elevated caesium isotope content, do not contribute significantly to this exposure due to their relatively low consumption. Since the concentration of post-Chernobyl Sr-90 in food products is virtually unmeasurable at present, it was assumed that the dose from food products was from Cs-137 only.

The values illustrating exposure caused by radiation emitted by artificial radionuclides contained in such environmental components as soil, air and open waters were determined on the basis of measurements of content of particular radionuclides in samples of environmental materials collected in various regions of the country (the results of the measurements are given in Chapter 10 'Assessment of the radiation situation in Poland'). Taking into account local variations in the isotope Cs-137, which is still present in soil and in food, it can be estimated that the maximum dose may be around 4–5 times higher than the average value, which means that exposure due to artificial radionuclides does not exceed 5% of the dose limit.

In 2020, exposure to ionizing radiation from common household objects was **approx. 0.001 mSv, which is 0.1%** of the dose limit for the population. This value was determined mainly on the basis of measurements of radiation emitted by cathode-ray tubes and isotope smoke detectors and gamma radiation emitted by artificial radionuclides used for colouring ceramic tiles or porcelain. The calculated value also takes into account the dose from cosmic radiation received by passengers during airplane flights. In connection with the increasingly widespread use of LCD screens and monitors inste-

2. The range of variability of these values for individual examinations reaches up to two orders of magnitude and results from both the quality of the apparatus and the use of maximally different examination conditions.

ad of the previously used CRTs, the dose received by a statistical Pole from these devices is systematically reduced.

The per capita exposure during occupational activity with sources of ionizing radiation (presented in more detail in Chapter 8.2 'Control of exposure to ionizing radiation') in 2020 was **approx. 0.002 mSv, which is 0.01% of the dose limit (for an occupationally exposed person).**

In **2020 r.** the total per capita radiation exposure to artificial sources of ionizing radiation, excluding medical exposure (and with the dominant share of exposure to Cs137, present in the environment as a result of nuclear explosions and the Chernobyl accident), in Poland was approx. **0.01 mSv, i.e. 0,1%** of the artificial radioisotope dose limit for people in the general population of 1 mSv per year, and **only 0.25%** of the per capita dose from all sources of ionizing radiation.

In light of the radiological protection regulations adopted worldwide and in Poland, the radiation exposure of a statistical inhabitant of Poland in 2020 resulting from use of artificial ionizing radiation sources, should be considered as low.

Control of exposure to ionizing radiation

Occupational exposure to artificial sources of ionizing radiation

Occupational duties associated with work in nuclear facilities, radioactive waste management units, and units carrying out activities involving exposure to ionizing radiation result in radiation exposure to workers.

LEGAL BASIS

The requirements for nuclear safety, radiological protection and health protection of workers are contained in Chapter 3 of the Atomic Law Act.

In accordance with the principles of control of exposure to ionizing radiation, the primary responsibility for compliance with the requirements in this regard rests with the head of the organizational unit responsible for controlling the doses received by his or her subordinate workers. Such control must be based on the results of environmental measurements or individual dosimetry carried out by a specialised accredited radiometric laboratory. The following accredited laboratories conducted individual dose measurements and assessments at the request of the concerned organizational units in 2020:

- Laboratory of Individual and Environmental Dosimetry of the H. Niewodniczański Institute of Nuclear Physics (IFJ) in Kraków.
- Department of Radiological Protection of the J. Nofer Institute of Occupational Medicine (IMP) in Łódź,
- Dose Control and Calibration Department of Central Laboratory of Radiological Protection (CLOR) in Warsaw,
- Dosimetry Laboratory of the National Centre for Nuclear Research (NCBJ) in Świerk,
- in the field of monitoring doses of natural radioactive isotopes received by miners working underground – Silesian Centre for Environmental Radioactivity of the Central Mining Institute (GIG) in Katowice.

Provisions of the Atomic Law Act introduced an obligation to keep a dose register and to apply personal control to category A workers exposed to ionizing radiation, i.e. those who, according to the assessment of the head of the organizational unit, may under normal working conditions be exposed to an effective dose from artificial radiation sources exceeding 6 mSv per year or to an equivalent dose exceeding 15 mSv per year for eye lenses or 150 mSv per year for skin or limbs.
The assessment of the doses for category B workers, i.e. those workers who are not classified as category A, is based on measurements in the working environment. At the discretion of the head of the organizational unit,

workers in this category may (but are not required to) be subject to exposure monitoring with personal dose meters.

For workers, the dose limit, expressed as an effective dose, is 20 mSv per calendar year. In view of the special conditions or circumstances of carrying out activities involving exposure to ionizing radiation, it may be possible to exceed this dose limit up to 50 mSv per year only with the consent of the authority competent to issue licenses or accept a notification or information referred to in Article 4(1) or (1a) of the Atomic Law Act, and on the condition that the annual average effective dose in any period of five consecutive calendar years, including years in which the dose limit has been exceeded, does not exceed 20 mSv. Thus, the sum of doses received in the current year and in the previous four calendar years needs to be checked in the process of controlling the exposure of workers who work with ionizing radiation sources. This means that heads of organizational units have to keep a record of doses of exposed workers and transfer the data on exposure of category A workers to the central register of individual doses kept by the President of the PAA.

Jobs involving exposure to ionizing radiation affect tens of thousands of people. However, only a small percentage of workers routinely work with significant exposure to ionizing radiation. For most people, dose monitoring is conducted to confirm that the use of radiation sources does not pose a risk and is not expected to cause adverse health effects. This ionizing radiation exposure group is classified as category B workers. The largest subgroup in category B is the medical staff of diagnostic X-ray laboratories.

More than 2,000 people who are subject to individual dose measurements are classified annually as category A workers.

Subsection summary:

Two categories of workers, i.e. categories A and B, are introduced in order to adapt the way the risk of workers in organizational units is assessed to its expected level, depending on the magnitude of the risk. The assessment of workers' exposure is carried out on the basis of the results of environmental measurements or individual dosimetry. The Atomic Law Act defines the dose limit, which is expressed as an effective dose and equals 20 mSv in a calendar year for workers and only in exceptional situations may be exceeded up to 50 mSv per year on the condition that the average annual effective dose in any period of five consecutive calendar years, including years in which the dose limit was exceeded, may not exceed 20 mSv. In Poland, 95% of workers exposed to ionizing radiation are category B workers.

Central Register of Doses of the President of the PAA

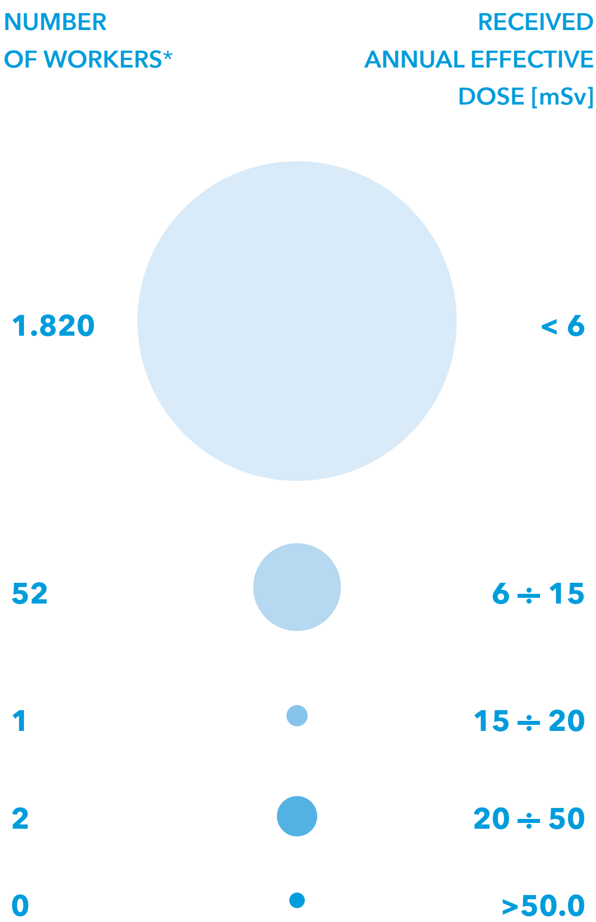
LEGAL BASIS

Detailed information on the procedure for recording, reporting and registering individual doses is contained in the Regulation of the Council of Ministers of 23 March 2007 on the requirements for registering individual doses (Journal of Laws of 2007 No 131, item 913).

The data on doses for workers classified by heads of individual units as category A workers are collected in the central register of doses of the President of the PAA. Workers from this ionizing radiation risk category are required to undergo measurement of effective doses to the whole body and/or to a specific, most exposed part of the body (e.g. hands). Exceptionally, in cases of exposure to contamination by dispersive radioactive substances called open sources, an assessment of the internal contamination burden dose is performed.

INFOGRAPHIC

Statistics on individual annual effective doses of workers assigned to category A for exposure to ionizing radiation in 2020.



* According to submissions to the Central Register of Doses sent by 30 April 2021.

Since the creation of the Central Register of Doses in 2002, a total of 6,696 individuals have been reported through 30 April 2021, and data for 2,947 of those reported have been updated over the past four years. The data of 2,064 people were updated in 2020.

With proper radiological protection, 1,820 category A individuals received effective doses not exceeding 6 mSv per year (the lower exposure limit assumed for category A workers), and doses above 6 mSv were received by 55 individuals with only two cases measured exceeding an annual dose of 20 mSv (the dose limit that can be received over a calendar year from routine work with ionizing radiation). In cases where the dose limit was exceeded, working conditions and causes of radiation exposure were analysed in detail.

Summary data for 2020 on exposures of category A workers reported to the Central Register of Doses by individual organizational units is provided in the infographic on page 56.

The data show that within the group of category A workers, the percentage of workers who did not exceed the lower limit for this exposure category, i.e. 6 mSv/year, was 97.1% in 2020, and the percentage of workers who did not exceed the limit of 20 mSv/year was 99.9%. Thus, only about 0.1% of occupationally exposed persons classified as category A workers received doses higher than those expected for workers in that category.

Summary

The exceedances of the dose limits were associated with the use of isotope defectoscopes during industrial radiography and with the manufacture of radioactive sources. The highest dose of over 26 mSv/year was received by an industrial radiography worker. Another problem is the high doses received on the hands and eyes by surgeons performing hours-long surgical procedures under X-rays especially during operations on major blood arteries and the heart. Since the implementation of the new Directive 2013/59/Euratom, there is a new annual dose limit for the lens of the eye – 20 mSv/year. This condition is so restrictive that exceeding it is quite common in interventional surgery, but suitable dosimeters to measure the equivalent dose in the eye lens are still rarely appropriate. Such a dose risks a post-radiation deterministic effect in the form of lens opacity or cataracts.

All cases of exceeding the annual dose limit were subject to detailed investigation by nuclear regulatory inspectors.

Exposure to radon

Radon (Rn) is a radioactive noble gas that occurs naturally in the environment. It is present in every building and dwelling in different concentrations depending on the geological structure of the land on which it is founded. The materials used in construction also matter. Radon enters with air drawn up from the ground through cracks in foundations, walls, sewer manholes, leaks around sewer pipes, from building materials, etc.

In nature, the most common isotope found is radon-222 (designated Rn-222), which makes up about 80% of all isotopes and is also considered the most dangerous to the environment. Its short-lived decay products account for about 30% of the ionizing radiation dose received by Polish residents from natural sources.

Radon does not directly affect our body. In contrast, its short-lived derivatives can enter our respiratory system as dust and undergo radioactive decay there. Thus, they may increase the risk of lung cancer.

According to the Atomic Law Act, the reference level for average annual concentrations of radon in indoor workplaces and in rooms intended for human habitation is 300 Bq/m^3.

In 2019, the provisions of the Act of 13 June 2019 amending the Atomic Law Act and the Act on fire protection introduced a number of changes including in the area of protection from exposure to radon, including the following:

- establishment of reference levels for annual average concentrations of radon in air,
- introduction of an obligation to measure radon concentrations or the potential alpha energy concentration of short-lived radon decay products in workplaces located at ground or basement level and in workplaces related to groundwater remediation in areas where annual average concentrations of radon in the air in a significant number of buildings are liable to exceed the reference level,
- introduction of an obligation to provide, at the request of the buyer or lessee, information on the value of annual average concentrations of radioactive radon in the air in a building, premises or room,
- placing an obligation on the President of the National Atomic Energy Agency to monitor measures preventing radon ingress into new buildings and to conduct information campaigns in this regard.

Summary

Radon can pass from the ground into a building, which means that the risk of radon exposure can occur in residences, workplaces, and mixed-use buildings. The provisions of the Atomic Law Act introduced by the Act of 13 June 2019 amending the Atomic Law Act and the Act on fire protection have changed the guidelines for protection from exposure to radon.

Control of exposure from natural sources of ionizing radiation in mining

In contrast to radiation hazards from artificial radioactive isotopes and radiation emitting devices, radiation hazards in mining (coal mining and mining of other natural resources) are primarily caused by elevated levels of ionizing radiation in mines caused by natural radioactivity. Sources of this threat include:

- radon and products of its decay in mine air (one of the main hazard sources, next to external gamma radiation),
- gamma radiation emitted by natural radioactive isotopes (mainly radium) contained in rock masses, (primary, short-lived decay products of radon in the air, source of hazard),
- mine waters (and sediments from those waters) with elevated radium isotope contents.

The first two factors mentioned above affect virtually all miners working underground, while radiation hazards from mine water and sediments occur in special cases and affect a limited number of workers.

This means that when making the calculations necessary for classifying workings into particular radiation hazard classes, the dose resulting from the natural background on the surface for the assumed operation time should be subtracted from the dose calculated on the basis of measurements. Table 4 shows the values of limits of working hazard indicators for both classes of radiation -prone workings. The proposed values result from the developed and implemented model for calculating the loading doses caused by specific working conditions in underground mines.

The following radiation hazard factors are examined:

- concentration of potential alpha energy of short-lived radon decay products in mine air,
- gamma radiation dose rate in excavation mining,
- radium concentration in mine water,
- radium concentration in sediment precipitated from mine water.

The assessment of miners' exposure to natural radiation sources is conducted by the Central Mining Institute (GIG) in Katowice. In underground mines, in radiation -prone workings, special methods of work organisation have been introduced to prevent exceeding the dose limit of 20 mSv.

Table 5 shows the number of mines in which (on the basis of determined exceedances of values of particular radiation hazard factors) there may be workings classified as class A and B radiation hazard. It should be emphasised that the classification of a particular category of radiation-prone workings is made by the heads of relevant mining plants on the basis of the sum of effective doses for all radiation risk factors in real working time. Therefore, the number of workings included in particular radiation hazard categories is actually smaller.

LEGAL BASIS

In terms of radiation hazards, in addition to implementing acts to the Atomic Law Act, in 2020 there were implementing acts to the Geological and Mining Law Act of 9 June 2011 (Journal of Laws of 2020, item 1064, as amended):

- Regulation of the Minister of Energy of 23 November 2016 on the requirements for conducting underground mining operations (Journal of Laws of 2017, item 1118, as amended),
- Regulation of the Minister of Environment of 29 January 2013 on natural hazards in mining plants (Journal of Laws of 2015, item 1702, as amended):
  - class A, located in controlled areas within the meaning of the Atomic Law Act, in which the working environment creates the potential for the worker to be exposed to an annual effective dose exceeding 6 mSv,
  - class B, located in supervised areas within the meaning of the Atomic Law Act, in which the working environment creates the potential for exposure to an annual effective dose greater than 1 mSv but not exceeding 6 mSv.

Total employment in hard coal mines, according to the State Mining Authority data as of 31 December 2020, amounted to: 107,130 people.

Taking into account the estimated number of workings where there is a possibility of exceeding the working limits of the hazard, the percentage of people working in workings belonging to particular hazard classes was estimated. The result of this evaluation is shown in Figure 9.

TABLE 4.

Limit values of working hazard indicators for both classes of radiation-prone workings (GIG)

Hazard indicator	Class A*	Class B*
Concentration of potential energy α of short-lived radon decay products (Cα), μJ/m^3	Cα > 2.5	0.5 < Cα ≤ 2.5
Kerma power of γ radiation (K), μGy/h	K > 3.1	0.6 < K ≤ 3.1
Specific activity of radium isotopes in sediments (C_{RaO}), kBq/kg	C_{RaO} > 120	20 < C_{RaO} ≤ 120

* These values correspond to doses of 1 mSv or 6 mSv, under the additional assumption that there is no cumulative effect from individual hazard sources and that the annual operating time is 1,800 hours.

The analysis took into account the number of mines with radiation-prone workings, the type of workings, the source of the risk and the number of mining staff. Based on the information collected by the State Mining Authority, the share of miners working in potentially radiation-prone workings was determined. This is especially true for sites that may have waters and sediments with elevated radium isotope concentrations, elevated alpha potential energy concentrations, and higher than average gamma dose powers.

In 2020, the Central Mining Institute carried out 3,664 measurements of the concentration of potential alpha energy of short-lived radon decay products, 636 measurements of exposure to external gamma radiation in underground mines and 575 analyses of the radioactivity of mine waters collected in underground workings of coal mines and 136 analyses of radionuclide concentrations in samples of sediments precipitating from underground waters.

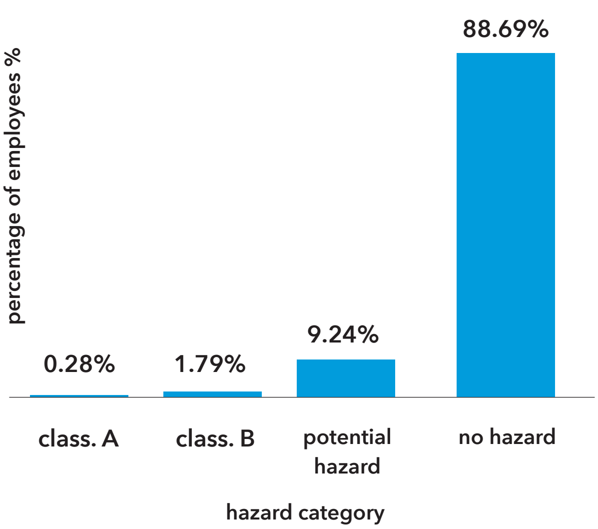
In 2020, individual gamma radiation dose measurements were performed at six coal mines. No such measurements were performed at the remaining mines. The 95 analysed persons were employed mainly in the disposal of radioactive mine water sediments or worked in places where such sediments could accumulate. In two hard coal mines, the annual dose, estimated from the results of individual dose measurements, exceeded 1 mSv (taking uncertainty into account) but was less than 6 mSv (category B). In 2020, in one case, the dose exceeded 6 mSv (category A).

On the basis of the conducted control of radiation hazards, it was stated that under unfavourable conditions (lack of proper ventilation) it may occur in almost every mine working. The hazard assessment carried out by the GIG for hard coal mines showed that class A pits were active in four mines (the hazard applies to 0.28% of the total number of miners employed) and class B pits were active in 22 mines (the hazard applies to 1.79% of the total number of miners employed). Workings with a slightly elevated natural radiation background (but below the level corresponding to class B) employ 9.24% of the total number of miners employed, while 88.69% of miners work in non-hazardous workings.

TABLE 5.
Number of hard coal mines with radiation-prone workings (GIG)

Hazard class	A	B
Number of mines	2	13
Radiation hazard from short-lived products of radon decay	-	9
Risk of γ-rays	1	2
External γ radiation (individual dosimetry)	1	2

FIGURE 9.
Percentage of hard coal miners employed in workings included in particular radiation hazard classes. Employment as of 31 December 2020: own crew 76,852; external service companies 30,278 – total 107,130.



The assessed value of the miner's potential (maximum) dose in 2020 was 32.7 mSv, taking into account the measurement uncertainty and assuming an annual working time of 1,800 hours and a background of 0.1 μGy/h. With a realistic operating time assumption of 750 hours, the maximum dose is about 13.6 mSv.

The Silesian Centre for Environmental Radioactivity of the Central Mining Institute has precise information on working time in particular workings only for calculating effective loading doses. For the remaining radiation hazard factors, the analysis of the magnitude of the hazard was performed by making certain assumptions: nominal working time of 1,800 hours and frequently reported working time in water galleries of 750 hours. Estimates made on the basis of such values may therefore deviate significantly from the actual situation.

In 2020, the maximum annual additional effective dose associated with each hazard source was:

- for short-lived radon decay products E_α = 3.6 mSv (assuming an annual working time of 1,800 hours),
- for the environmental measurement of gamma radiation E_α = 13.6 mSv (assuming an annual working time in water galleries of 750 hours),
- and, expressed as an effective loading dose E_{Ra} = 0.63 mSv for radium isotope penetration (for a declared working time of 213 hours per year).

In accordance with the requirements of the Atomic Law Act concerning controlled and supervised areas, category B (supervised area) underground workings should be reclassified to category A (controlled area) in cases where there is a possibility of spreading contamination, e.g. during works related to the removal of sediments or sewage.

The analysis of the measurement results against the data from recent years has shown that class B workings, which include positions where the dose exceeds 1 mSv, are the most common in underground mines (with the assumed working times for individual hazard factors). Workings which should be classified as class A radiation hazards, i.e. those where the dose received by miners could exceed 6 mSv, are very rare.

In 2020, the main causes of elevated effective doses for miners included exposure to external gamma radiation and to short-lived radon decay products.

No mine was found to exceed the dose of 20 mSv during the year. This is the dose limit for people whose occupational activity is associated with radiation hazards.

Chapter summary:

- In 2020, 6.5 times as many mines were classified as class B workings in terms of radiation hazard as compared to class A workings. From the data obtained, it can be concluded that last year, for class B workings, the threat of short-lived radon decay products prevailed.
- In 2020, individual gamma radiation dose measurements were performed at six coal mines.
- In two hard coal mines, the annual dose, estimated from the results of individual dose measurements, exceeded 1 mSv (taking uncertainty into account) but was less than 6 mSv (category B). In 2020, in one case, the dose exceeded 6 mSv (category A). However, no mine was found to exceed the dose of 20 mSv during the year.

Granting of personal licenses in the area of nuclear safety and radiological protection

In nuclear facilities and other units where exposure to ionizing radiation occurs, specific positions are occupied by individuals who are certified by the President of the PAA. The prerequisite for obtaining the license is completing a training course for persons applying for a radiation protection expert authorization or an authorization to hold a position of major importance for ensuring nuclear safety and radiological protection in the scope adjusted to the type or specialisation of the required authorization and passing the examination before the examination board of the President of the PAA.

LEGAL BASIS

Article 7(3) and (10) and Article 12(1) of the Atomic Law Act of 29 November 2000 and the Regulation of the Council of Ministers of 2 September 2016 on the position of significant importance for ensuring nuclear safety and radiological protection and radiation protection expert.

The required training courses are conducted by organizational units authorised to conduct such activities by the President of the PAA, which provide lecturers and appropriate technical facilities to conduct practical exercises, on the basis of training programmes developed for each unit and consistent with the type of training approved by the President of the PAA. A total of 318 people participated in the training in 2020. Information on units that provided such training is presented in Table 6.

In 2020, there were two Examination Boards, appointed by the President of the PAA pursuant to Article 71(1) and Article 12a(6) of the Atomic Law Act:

- Examination Board responsible for the competence of the Radiation Protection Expert,
- Examination Board competent for the granting of licenses for employment in a position of significant importance for ensuring nuclear safety and radiation protection.

In 2020, due to COVID-19 counter-pandemic constraints, the number of training courses and examinations for radiation protection expert and for positions of significant importance for ensuring nuclear safety and radiation protection was reduced, resulting in fewer decisions granting such authorizations. To ensure continuity of duties of the radiation protection expert and performance of work by persons employed in positions of significant importance for ensuring nuclear safety and radiological protection, pursuant to Art. 15zzzzn of the Act of 2 March 2020 on special solutions related to prevention, counteraction and combatting of COVID-19, and other infectious diseases and crisis situations caused thereby (Journal of Laws, items 374, as amended) authorizations of radiation protection experts and authorizations to hold a position of significant importance for ensuring nuclear safety and radiation protection that expire within 30 days after the end of the epidemic emergency or outbreak of disease remain valid for a further 18 months from the date of expiry during an epidemic emergency or an outbreak of disease.

TABLE 6.

Bodies providing training in 2020 for persons applying for a radiation protection expert authorization and for a position of significant importance for ensuring nuclear safety and radiation protection

Licence type	Name of body	Number of training courses held	Number of trainees	Number of licenses obtained*
Radiation Protection Expert	Central Laboratory for Radiological Protection	1	27	36
	Polish Federation of Engineering Associations	1	22	
	War Studies University	1	12	
	Association of Radiation Protection Expert	6	139	
Position of significant importance for ensuring nuclear safety and radiation protection	Central Laboratory for Radiological Protection	1	50	313
	Institute of Nuclear Chemistry and Technology	2	61	
	National Research Institute of Oncology	1	17	
	National Centre for Nuclear Research	4	74	

* Also includes individuals who received training prior to 2020 or were eligible to take the exam without attending training.

INFOGRAPHIC

Number of persons certified as radiation protection experts and entitled to hold a position of significant importance for ensuring nuclear safety and radiation protection.

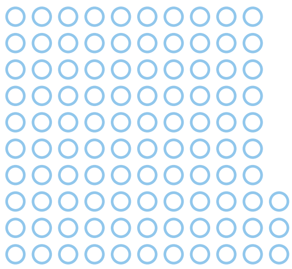
In total, the competence of a radiation protection expert and the competence to hold a position of major importance for nuclear safety and radiological protection were granted to

349 persons

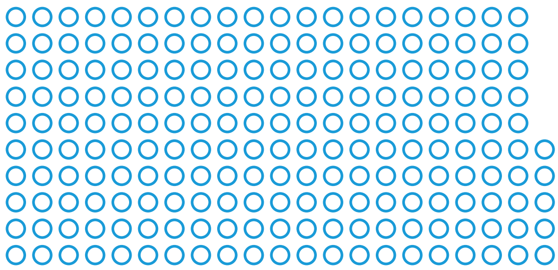
As a result of passing the examination and meeting other licensing requirements, 36 persons obtained a radiation protection expert authorization, whereas 308 persons obtained authorizations for positions of significant importance to nuclear safety and radiological protection, including:

308 persons

103 persons
qualified as non-medical accelerator operators



205 persons
qualified as: medical accelerator and tele-radiotherapy equipment operators and/or operators of brachytherapy equipment containing



In addition, 5 persons obtained the authorization to hold a position of significant importance for ensuring nuclear safety and radiological protection in an organizational unit performing activities involving the construction, commissioning, operation or decommissioning of a nuclear facility, including:

5 persons

2 persons
Research Reactor Shift Supervisor

1 person
Research Reactor Operator

1 person
Research Reactor Shift Supervisor

1 person
Radioactive Waste Disposal Plant Manager

9 National radiological monitoring

Fot. PAA

In Poland, there is continuous monitoring of gamma dose rate and measurements of radioactive isotope content in the environment and in food products. The monitoring system operates 24 hours a day, 7 days a week and allows for ongoing monitoring of the radiation situation in the country and early detection of potential threats.

There are two types of monitoring:

- nationwide – to obtain data needed to assess the radiation situation throughout the country under normal conditions and in emergency situations. It serves as a basis for a study of long-term changes in the radiation situation of the environment and food products;
- local – allows to obtain data from areas where activities are (or were) conducted that may cause a local increase of radiation exposure of the population (this applies to the Nuclear Centre in Świerk, National Radioactive Waste Repository in Różan and areas of former uranium ore mining and processing facilities in Kowary).

Measurements made as part of the monitoring are conducted by:

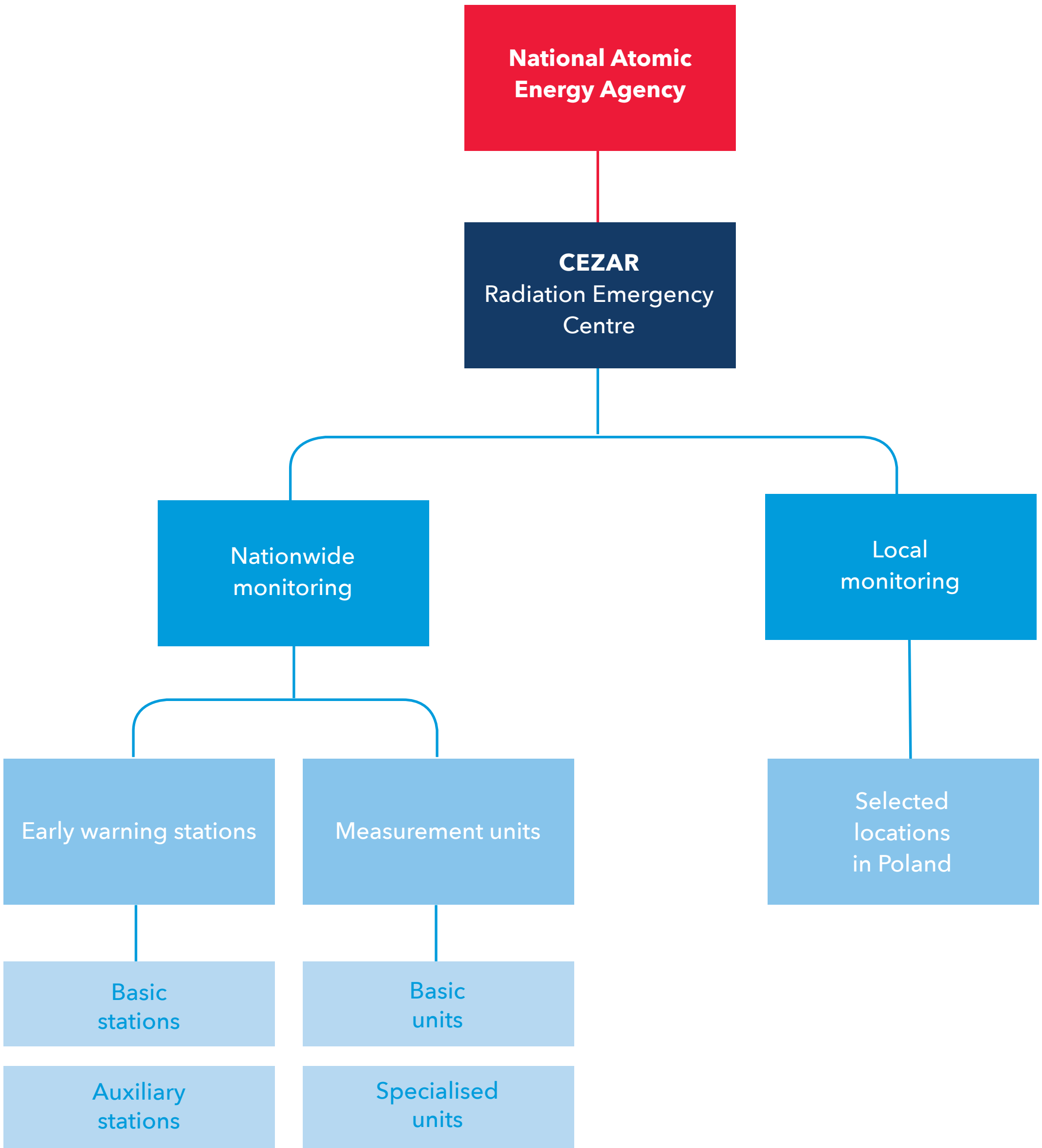
- **measuring stations**, forming the early warning network for radioactive contamination;
- **measurement facilities**, measuring the radioactive contamination of the environment and foodstuffs;
- **services of entities operating nuclear facilities and the nuclear regulatory authorities** conducting local monitoring.

The PAA Radiation Emergency Centre (CEZAR) is responsible for coordination of the network of measurement stations and facilities.

The general structure diagram of this system is shown in Figure 10.

In Poland, there is continuous monitoring of gamma dose rate and measurements of radioactive isotope content in the environment and in food products. The monitoring system operates 24 hours a day, 7 days a week and allows for ongoing monitoring of the radiation situation in the country and early detection of potential threats.

FIGURE 10.
Radiation monitoring system in Poland



The results of radiation monitoring are the basis for the evaluation of Poland's radiation situation published regularly by the President of the PAA:

- at gov.pl/paa/sytuacja-radiacyjna – gamma dose rate,
- in quarterly notices published in the Official Gazette of the Government of the Republic of Poland – gamma dose rate and Cs-137 isotope content in air and milk,
- in the annual report of the President of the PAA – the full range of measurement results.

In the case of emergency situations, the frequency of information is determined individually. The information presented is the basis for assessing the radiation risk for the population and for conducting intervention actions, should the situation require it.

Nationwide monitoring

Early warning stations for radioactive contamination

The task of stations of the early warning system is to enable ongoing assessment of the radiation situation in Poland as well as early detection of radioactive contamination in the event of a radiation emergency. This system consists of so-called basic and auxiliary stations (see infographic on page 68).

Basic stations:

- **35 automatic Permanent Monitoring Stations (PMS)** owned by the PAA and operating under the international systems of the EU and of the Baltic States (Council of the Baltic Sea States), conducting ongoing measurements of:
  - the ambient dose equivalent rate $\dot{H}^*(10)$ and the gamma-ray spectrum arising from the presence of radioactive elements in the air and on the ground,
  - basic weather parameters (precipitation and ambient temperature), which enables verification whether the indications of the radiometric devices are correct in changing weather.

Since 2016, the PAA has been expanding the PMS stations network. In 2020, a total of 13 new stations were installed and put into operation, including two old stations replaced with new ones (Białystok, Sanok). Further expansion of the entire station network is planned in the coming years.

- **12 ASS-500 stations** owned by the Central Laboratory for Radiological Protection, whose tasks include:
  - continuous collection of atmospheric aerosols on filters,
  - spectrometric determination of individual radioisotopes in weekly samples.
- **9 IMiGW stations** belonging to the Institute of Meteorology and Water Management, which perform the following measurements:
  - continuous measurement of gamma dose rate,
  - continuous measurement of alpha activity of atmospheric aerosols from natural isotopes and alpha and beta activity of these aerosols due to isotopes of artificial origin (7 stations),
  - measurement of total beta activity in daily and monthly samples of total fallout,
  - determination of Cs-137 (spectrometrically) and Sr-90 (radiochemically) in combined monthly samples of total fallout from all 9 stations (once a month).

Auxiliary stations:

- 13 measuring stations belonging to the Ministry of National Defence (MON), which perform continuous measurements of gamma dose rate, recorded automatically in the Centre of Contamination Analysis (COAS).

Units conducting measurements of radioactive contamination of the environment and foodstuffs

It is a network of units, which perform measurements of radioactive contamination content in samples of environmental materials, foodstuffs and animal feed, using laboratory methods. The network includes:

- 30 basic units, operating in Sanitary and Epidemiological Stations, which perform:
  - determination of total beta activity in samples of milk and food products (quarterly),
  - determination of the content of Cs-137, Sr-90 in selected agricultural and food products (twice a year on average),
- specialised units, which perform more extensive contamination analyses of environmental samples.

The distribution of the basic measurement facilities is shown in the infographic on page 69.

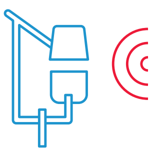
Nationwide monitoring
of the radiation situation

Number of measuring stations

▲	PMS stations	35
⬢	ASS-500 stations	12
●	IMiGW stations	9
■	MON stations	13

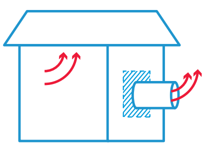
- the number of PMS and ASS-500 stations at the end of 2020.

▲ PMS stations - - - - -



PMS Stations – Permanent Monitoring System (PMS) stations provide 24/7 monitoring of ionizing radiation levels throughout the country. With spectrometric measurements (gamma-ray spectrum), they help detect isotopes of artificial origin in the environment.

⬢ ASS-500 stations - - -



ASS-500 Stations – The high-performance ASS-500 atmospheric aerosol sampling stations are designed for radioactive air pollution control. The station pumps the air through a special filter at an average rate of approx. 500 m³/h. Aerosols are collected on the filter and subjected to a detailed laboratory analysis that can detect even trace amounts of radioisotopes present in the air. In a normal situation, the filter is replaced once per week.

● IMiGW stations - - -

The IMiGW stations perform measurements of gamma dose rate and activity of atmospheric aerosols and total fallout.

■ MON stations - - - -

The Ministry of National Defence stations perform gamma dose rate measurements (auxiliary stations) rate.

Basic units operating in Sanitary and Epidemiological Stations – conduct measurements of the presence of radioisotopes in agricultural and food products

Current results of ionizing radiation dose rate monitoring can be found here:
https://remap.jrc.ec.europa.eu/Advanced.aspx
https://www.gov.pl/paa/sytuacja-radiacyjna

Local monitoring

TABLE 7.
Measurements of radioactive isotopes in the area and surroundings of the Nuclear Centre in Świerk

Type of measurement and sample	Monitored isotopes	On-site	Surrounding area
Air (aerosols)	γ-spectrum	●	●
Drainage water	total α total β γ-spectrum Sr-90 H-3	●	
Tap water	total β	●	
River waters (Świder, Wisła)	total β γ-spectrum		●
Well water	total β γ-spectrum		●
Total fallout	total β γ-spectrum	●	
Process water	total α,β total γ γ-spectrum Sr-90 HTO	●	
Sanitary waste water	total γ total β γ-spectrum Sr-90 total β	●	●
Waste water from treatment plant	total α,β total γ γ-spectrum Sr-90 HTO	●	
Milk	γ-spectrum		●
Cereals	γ-spectrum		●
Grasses	γ-spectrum	●	●
Soils	γ-spectrum	●	●
Sludge	γ-spectrum Sr-90	●	●

Summary

Data obtained in 2020 and in previous years confirm that there is no negative impact of the operation of the Nuclear Centre in Świerk or the KSOP on the natural environment, and the radioactivity of waste water and drainage and rainwater discharged from the site of the Nuclear Centre in Świerk in 2020 was much lower than the applicable limits.

Nuclear Centre in Świerk

Radiation monitoring of the environment and radiological supervision over the premises of the National Centre for Nuclear Research (NCBJ) in Otwock-Świerk is carried out by the NCBJ Dosimetry Measurements Laboratory. The monitoring is carried out as follows:

- in on-line mode (measurements every 2 minutes) – covers gamma radiation fields at the gates of the facility and at selected points of the area, and radioactive concentrations of media released to the environment (sanitary waste water);
- in off-line mode (in accordance with the measurement schedule) – conducted on site and in the surrounding area of the Centre. The NCBJ Laboratory of Dosimetric Measurements measured the content of the radioactive isotopes listed in Table 7.

Gamma radiation measurements were also conducted for selected locations in and around the site using thermoluminescent dosimeters (TLD) to determine annual dose rates.

Gamma radiation measurements using thermoluminescent dosimeters (TLDs) are also conducted in and around the site to determine annual dose rates.

At the request of the President of the PAA, independent monitoring is carried out to include:

- measurement of natural and artificial radioisotopes in:
  - water from the nearby Świder river,
  - water from the waste water treatment plant in Otwock,
  - well water,
  - soil,
  - grass.

- gamma dose rate measurements at five selected locations,
- gamma radioisotope measurements in atmospheric aerosols,
- measurement of gaseous iodine isotopes,
- measurement of radioactive noble gases.

National Radioactive Waste Repository

Radiological monitoring of the environment of the KSOP premises and the surrounding area is conducted by the operator of the ZUOP in accordance with licence requirements.

On-site monitoring in 2020 included:

- measurements of radioactive substances in tap water and ground water (measurement of beta and tritium activity),
- measurement of radioactive substances in atmospheric aerosols (spectrometric analysis of filters),
- measurement of radioactive substances in soil and grass (spectrometric analysis),
- measurement of photon background using thermoluminescent detectors.

Monitoring of the KSOP's surrounding area included:

- measurements of radionuclide concentrations in tap water, surface water (Narew river), ground water (water intake from piezometers and wells) and spring water for total beta and tritium activity,
- ambient dose equivalent measurements using thermoluminescent detectors (1 point) and gamma dose rate measurements (4 points),
- measurement of radioactive substances in soil and grass,
- measurement of dose power,
- measurement of photon background using thermoluminescent detectors.

Additionally, measurements ordered by the President of the PAA are carried out in the vicinity of the repository.

The range of the measurements in 2020 was as follows:

- measurement of radioactive substances in spring waters (measurement of gamma spectrum, measurement of total caesium concentration (Cs-137 and Cs-134), measurement of tritium and Sr-90 concentration);
- measurement of radioactive substances in groundwater (piezometers; measurement of total beta activity, potassium K-40 and tritium concentrations);
- measurement of gamma-isotope concentrations in soil and grass;
- artificial gamma radioisotope measurements in atmospheric aerosols;
- gamma dose rate measurements at five fixed locations.

The most important measurement results and data illustrating the radiation situation in the area and surroundings of the Nuclear Centre in Świerk and the KSOP are presented in Chapter 10 'Assessment of the radiation situation in Poland'.

Former uranium ore mining and processing sites

A Radiation Monitoring Programme for Areas Degraded by Mining and Processing of Uranium Ores has been carried out in former uranium ore mining areas since 1998. The following works were performed under this programme in 2020:

- measurements of alpha and beta radioactive isotopes content in drinking water (public drinking water intakes) in the areas of the Union of Karkonosze Communes and the city of Jelenia Góra and in surface and underground waters (outflows from underground workings);
- determination of radon concentrations in water from public intakes, in water supplying living quarters and in surface and underground waters (outflow from underground workings).

The results of the measurements are given in Chapter 10 'Assessment of the radiation situation in Poland'.

International exchange of radiological monitoring data

The National Atomic Energy Agency participates in the international exchange of radiation monitoring data. The PAA Radiation Emergency Centre, within the framework of implementing the provisions of Article 36 of the EURATOM Treaty, prepares and publishes data from radiation monitoring carried out in Poland, and receives and analyses data on the radiation situation in other countries. It also participates in data exchange within the Council of the Baltic Sea States.

The European Union measurement data exchange system based on routine radiological monitoring of the environment, deployed in Member States

The system includes data on gamma dose rate, air contamination, contamination of drinking water, surface water, milk and food (diet). Data are transmitted once a year by the PAA Radiation Emergency Centre to the Joint Research Centre (JRC) located in Ispra, Italy.

Exchange of data from early warning stations under the European Union's EURDEP system

The European Radiological Data Exchange Platform (EURDEP) involves the automatic exchange of data from early warning stations for radioactive contamination. Results of gamma dose rate measurements are mainly published. Many countries also publish measurements of atmospheric aerosol activity and other measurements relevant to assessing the radiation situation, which are available in automatic mode. The current radiological situation in Europe is published on an ongoing basis on the EURDEP map.

Poland transmits the following measurements on an hourly basis:

- gamma dose rate (PMS and IMiGW stations),
- total alpha and beta activity from artificial radionuclides in atmospheric aerosols (IMiGW stations).

Exchange of data from early warning stations operating under the system of the Council of the Baltic Sea States

The scope and format of data provided by Poland within the exchange within the Council of the Baltic Sea States (CBSS), i.e. the regional exchange, is identical to the EURDEP system in the European Union.

Radiation emergencies

Principles of proceeding

A radiation emergency, as defined in the Atomic Law Act, is an abnormal situation or event associated with a source of ionizing radiation requiring urgent intervention to mitigate serious adverse effects on human health, safety, quality of life, property or the environment or to reduce the risks that could lead to such consequences. Radiation emergencies are classified by the extent of the effects:

- limited to the area of the organizational unit ('local' emergencies),
- extending beyond the organizational unit ('regional' emergencies),
- extending beyond the territory of the province or with cross-border effects ('national' emergencies).

The National Atomic Energy Agency plays an informative and consultative role in the assessment of dose and contamination levels and other expertise and activities performed at the scene of an emergency. In addition, it disseminates information on radiation hazards to communities affected by the incident and to international organisations and neighbouring countries. The above procedure is also applied in the situation of detecting illicit trafficking in radioactive substances (including attempts to illegally transport them across the state border).

INFOGRAPHIC

Classification of radiation emergencies

On-site
Remedial actions managed by
head of organizational unit
In the plant's emergency response plan.

Regional level
Remedial actions managed by
the provincial governor in cooperation with the state provincial sanitary inspector in accordance with the provincial emergency plan.

National level
Remedial actions managed by
the minister responsible for internal affairs
with the assistance of the PAAs President.

The President of the PAA manages a dosimetry team which can perform on-site measurements of dose rate and radioactive contamination, identify contaminants and abandoned radioactive substances, and secure the area around the incident site.

The PAA Radiation Emergency Centre (CEZAR) performs a number of functions such as: emergency service of the President of the PAA[3], National Contact Point (NCP) for the International Atomic Energy Agency (Unified System for Information Exchange in Incidents and Emergencies System), European Commission (European Community Urgent Radiological Information Exchange System), Council of Baltic Sea States, NATO and countries connected with Poland by bilateral agreements, including in terms of notification and cooperation in case of radiation events – it keeps on duty officers 7 days a week, 24 hours a day. The Centre performs regular assessment of the radiation situation in the country and in case of a radiation emergency uses computer decision support systems (RODOS and ARGOS).

Radiation emergencies in Poland

The Dosimetry Team managed by the President of the PAA was dispatched six times to support local services in situations which were not radiation emergencies in the meaning of the Atomic Law Act. The departures involved assisting in the identification of radioisotope and suspected out-of-control radioactive material at utility companies.

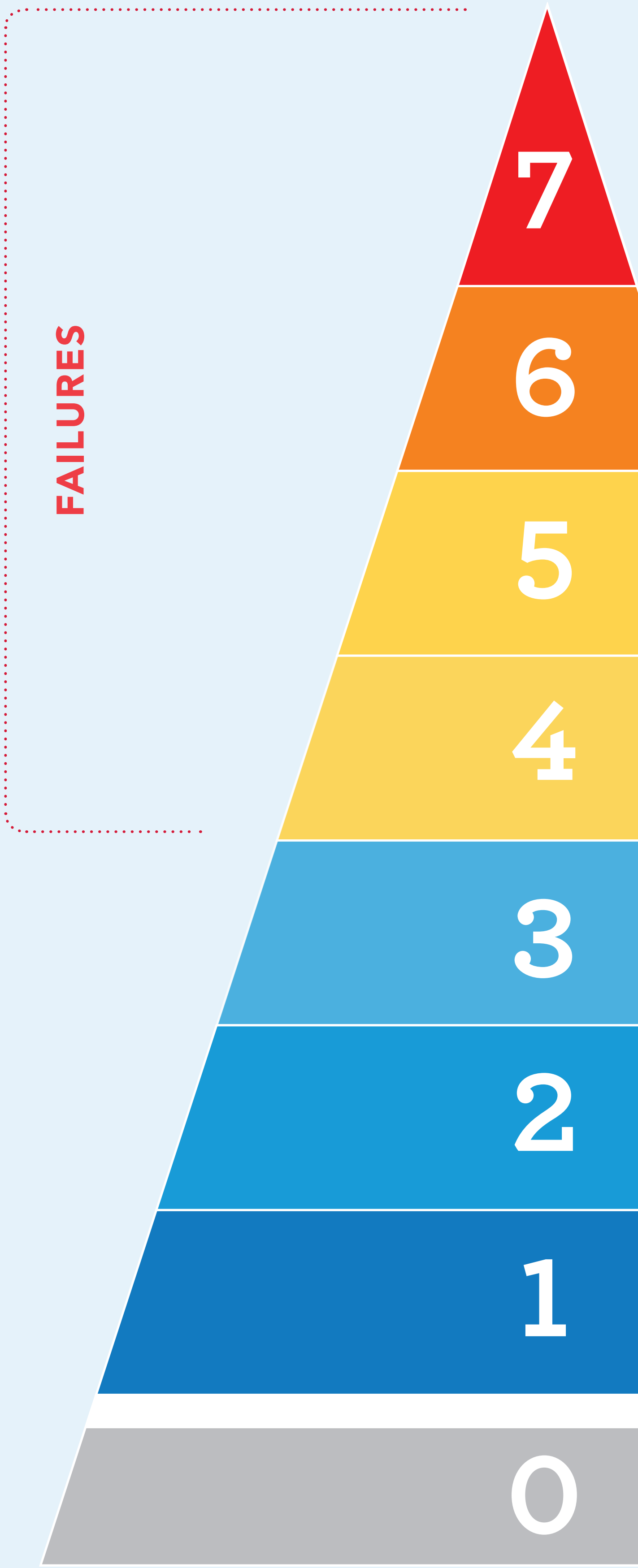
CEZAR duty officers provided 553 consultations (not related to the elimination of radiation emergencies and their consequences), and most of them (486 cases) were addressed to Border Guard Posts, in connection with the detection of elevated radiation levels. The consultations concerned: transit transport, export or import to Poland for domestic customers of ceramic materials, mineral materials, charcoal, chamotte bricks, LPG, electronic and mechanical parts, chemicals, radioactive sources (405 cases in total) as well as border crossings by persons sub-

3. Together with the Central Radiological Protection Laboratory (based on a contract concluded by the PAA President and CLOR).

INES SCALE

The International Nuclear Event Scale is used to illustrate the safety implications of ionizing radiation events. Events are classified at levels from 0 (no safety impact, below scale) to 7 (most severe nuclear accident).

Introduced for use in 1990, it is regularly updated and developed. The scale is widely used by member countries of the International Atomic Energy Agency (IAEA) and the OECD Nuclear Energy Agency (OECD NEA).



7

MAJOR ACCIDENT

Fukushima, Japan 2011

Large quantities of radioactive substances released into the environment

Chernobyl, USSR 1986

Large quantities of radioactive substances released into the environment

6

SERIOUS ACCIDENT

Kyshtym, USSR 1957

Significant quantities of radioactive substances released into the environment after a high-level explosion materials

5

ACCIDENT WITH WIDER CONSEQUENCES

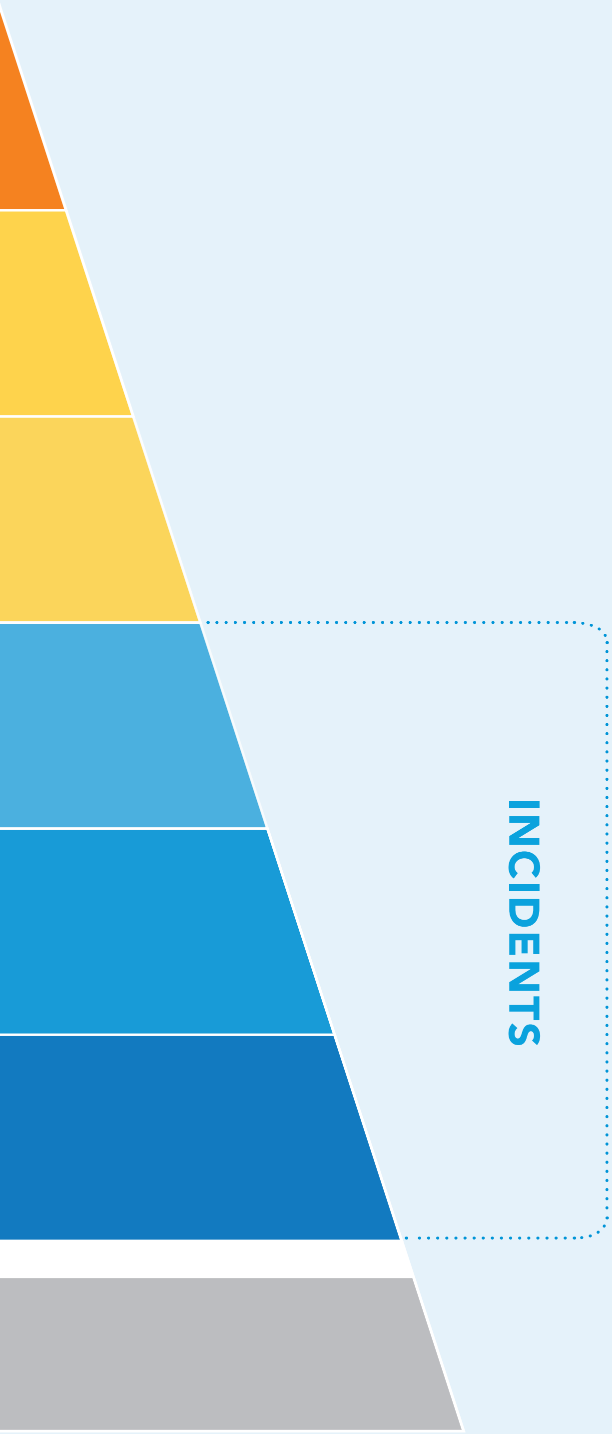
Goiânia, Brasil 1987

Death of 4 people from exposure to dumped high-level radioactive source

Three Mile Island, USA 1979

Severe damage to the reactor core

INFOGRAPHIC
INES Scale



4

ACCIDENT WITH LOCAL CONSEQUENCES

Stamboliyski, Bulgaria 2011
Exposure of 4 radiation plant workers to high ionizing radiation doses

New Delhi, India 2010
Irradiation of a person following contact with a radioactive substance in scrap

3

SERIOUS INCIDENT

Fleurus, Belgium 2008
Radioactive iodine released from a production facility into the environment

Lima, Peru 2012
Irradiation of an industrial radiography worker

2

INCIDENT

Laguna-Verde-2 NPP, Mexico 2011
Automatic reactor shutdown due to elevated pressure in the reactor pressure vessel

Paris, France 2013
Annual radiation dose limit exceeded by an interventional radiologist

1

ANOMALY

Rajasthan-5 NPP, India 2012
Dose application limits 2 exceeded by nuclear power plant workers

Olkiluoto-1 NPP, Finland 2008
Quick stop of main circulation pumps and disconnection of the flywheel at reactor shutdown

0

DEVIATIONS
No safety significance

jected to diagnosis or therapy with radiopharmaceuticals (81 cases). In addition, CEZAR duty officers provided 67 consultations to other institutions and individuals.

In addition, CEZAR duty officers received a total of 8,347 notifications (including reports from radiometric control, messages transmitted through official channels of information exchange at the international level).

No radiation emergency was registered in Poland in 2020.

Radiation emergencies outside the country
The National Contact Point did not receive any notification of an event that was classified at level 3 or higher on the seven-point INES scale through the USIE System.

On the other hand, 22 reports on incidents related to ionizing radiation sources or nuclear facilities, mainly unplanned exposures of workers to ionizing radiation, were received. Moreover, the National Contact Point received several dozen messages of an organizational and technical nature or else related to the international drills being conducted.

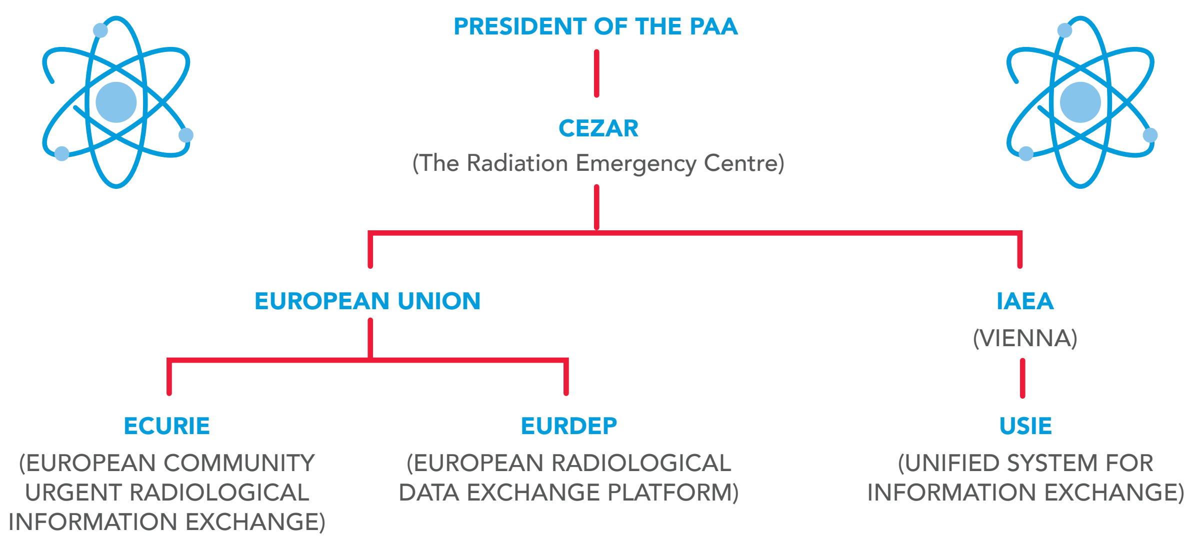
No radiation emergencies registered in 2020 outside of Poland caused a threat to humans and the environment in Poland.

Summary
No radiation emergencies were registered in Poland in 2020, and the emergencies registered worldwide did not affect the health and life of the population or the environment in Poland.

Situations which are not radiation emergencies in the meaning of Atomic Law Act did not pose a threat to the health or life of the population or to the environment. These were incidents detected by dosimetric gates operated by the Border Guard or located at the entrances to enterprises dealing with metal trade or municipal waste management.

The National Contact Point, operating in the Radiation Emergency Centre, despite the ongoing pandemic, worked smoothly, 24 hours a day, 7 days a week.

INTERNATIONAL NOTIFICATION AND INFORMATION EXCHANGE SYSTEMS



10 Assessment of the radiation situation in Poland

Fot. NCBJ

The level of gamma radiation in Poland and in the surrounding area of the National Centre for Nuclear Research and the National Radioactive Waste Repository in 2020 did not differ from the previous year's level.

Concentrations of natural radionuclides in the environment have remained at similar levels over the past several years. On the other hand, the concentration of artificial isotopes (mainly Cs-137), whose source was mainly the Chernobyl accident and earlier nuclear weapons tests, is gradually decreasing, in accordance with the natural process of radioactive decay. The detected radionuclide contents do not pose a radiation hazard to humans and the environment in Poland.

Gamma dose rate

The level of gamma radiation in Poland and in the surroundings of the Nuclear Centre in Świerk and KSOP did not deviate in 2020 from the previous year's level. The variation in gamma dose rate (even for the same locality) is due to local geological conditions that determine the level of terrestrial radiation.

The values of the ambient dose equivalent rate, taking into account cosmic radiation and the radiation coming from radionuclides contained in the ground (terrestrial component), presented in Table 8, indicate that its daily average values in Poland in 2020 ranged from 52 to 172 nSv/h, with an annual average of 88 nSv/h.

In the surrounding area of the Nuclear Centre in Świerk, the values of gamma exposure rate, taking into account only the terrestrial component, ranged from 55 to 75 nGy/h (average 64 nGy/h), whereas in the surrounding area of the KSOP – from 44 to 54 nGy/h (average 48 nGy/h).

These values do not differ significantly from the dose rate measurement results obtained in other regions of the country.

.

TABLE 8.
Dose power values obtained from early warning stations in 2020 (PAA)

Stations*	Location	Range of average daily dose rate [nSv/h]	Annual average [nSv/h]
PMS	Białystok	87-101	91
	Bielsko Biała	82-119	91
	Częstochowa	59-93	65
	Gdynia	101-123	106
	Gołdap	63-84	68
	Katowice	82-120	88
	Kielce	86-112	90
	Koszalin	84-101	90
	Kraków	115-143	119
	Legnica	72-102	79
	Łódź	85-102	90
	Lublin	98-110	103
	Olsztyn	52-72	56
	Opole	65-97	71
	Radom	52-84	57
	Rzeszów	82-115	89
	Sanok	109-144	116
	Suwałki	81-104	87
	Szczecin	86-102	91
	Tarnów	72-108	80
	Toruń	82-97	85
	Warszawa	86-102	90
	Wrocław	79-102	85
	Zielona Góra	85-104	90
IMiGW	Gdynia	81-101	85
	Gorzów	64-93	77
	Legnica	90-125	98
	Lesko	97-131	108
	Mikołajki	94-114	100
	Świnoujście	73-86	78
	Warszawa	75-114	80
	Włodawa	74-95	80
	Zakopane	85-172	111

* Station symbols as defined in Section 'National radiological monitoring'. The table does not include measurement results from 13 new stations installed in late 2020, which began regular data publication in January 2021.

Atmospheric aerosols

In 2020, artificial radioactivity of ground-level aerosols, determined from measurements made at 12 early warning stations (ASS-500), showed, as in the last few years, mainly the presence of trace amounts of Cs-137. Its average concentrations during this period ranged from less than 0.09 to 6.92 µBq/m^3 (0.47 µBq/m^3 on average). Average values of I-131 concentrations during this period ranged from less than 0.10 to 33.60 µBq/m^3 (mean 0.69 µBq/m^3), whereas the mean values of concentrations of naturally occurring radionuclide Be-7 were several thousand µBq/ m^3.

Figures 11 and 12 show the annual average concentrations of Cs-137 in atmospheric aerosols from 2011 to 2020 in Poland as a whole and in Warsaw, respectively.

Measurements of the concentrations of radioactive isotopes in the air in a weekly cycle were also conducted in the area of the nuclear research centre in Świerk and in its vicinity (Wólka Mlądzka) as well as in the KSOP area. The results of the 2020 measurements at the NCBJ site are shown in Table 9, while average concentrations of Cs-137 in air at the KSOP site in 2020 ranged from less than 0.17 to 5.22 µBq/m^3 (average 0.9 µBq/m^3).

FIGURE 11.

Annual average Cs-137 concentration in aerosols in Poland from 2011 to 2020 (µBq/m^3; PAA, CLOR data)

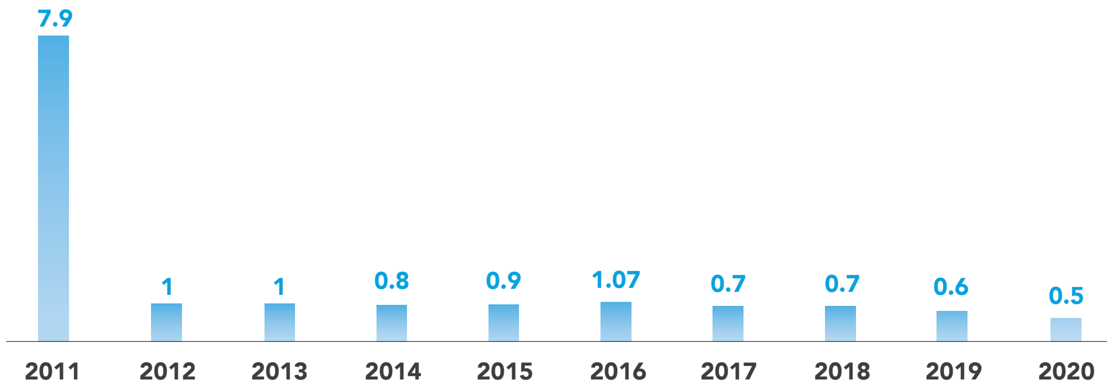


FIGURE 12.

Annual average Cs-137 concentration in aerosols in Warsaw from 2011 to 2020 (µBq/m^3)(PAA, CLOR data)

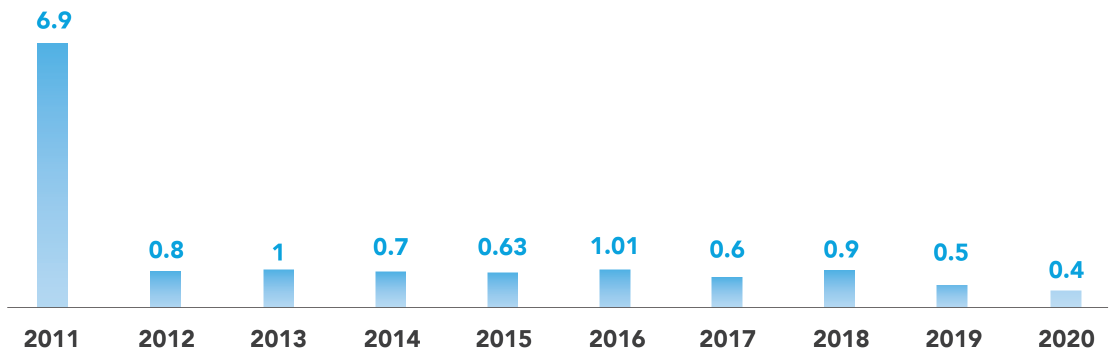


TABLE 9.
Summary of weekly measurements of radionuclide concentrations in atmospheric aerosols at the Świerk site in 2020 (μBq/m³; PAA, NCBJ data)

	Be-7 [μBq/m³]	**K-40** [μBq/m³]	**I-131** [μBq/m³]	**Cs-137** [μBq/m³]
Average	3,101	21.80	5.97	1.31
Minimum	1,150	15.00	1.17	0.48
Maximum	5,710	27.00	63.90	4.28

TABLE 10.
Mean Cs-137 and Sr-90 activity and mean beta activity in total annual fallout in Poland in 2008–2020 (Chief Inspectorate of Environmental Protection (GIOŚ), measurements performed by IMiGW)

Year	**Activity** [Bq/m²]		**Beta activity** [kBq/m²]
	Cs-137	Sr-90	
2008	0.5	0.1	0.3
2009	0.5	0.1	0.33
2010	0.4	0.1	0.33
2011	1.1	0.2	0.34
2012	0.3	0.1	0.32
2013	0.3	0.2	0.31
2014	0.5	0.1	0.32
2015	0.6	0.1	0.31
2016	0.5	0.1	0.31
2017	0.3	0.2	0.32
2018	0.4	0.1	0.33
2019	0.3	0.2	0.31
2020	0.2	0.1	0.31

Total fallout

Total fallout is dust contaminated with isotopes of radioactive elements that are deposited on the earth's surface due to the gravitational field and precipitation.

The measurement results shown in Table 10 indicate that the contents of artificial radionuclides Sr-90 and Cs-137 in annual total fallout in 2020 were at the level observed in previous years.

TABLE 11.

Cs-137 and Sr-90 concentrations in river and lake waters of Poland in 2020 [mBq/dm^3] (GIOŚ, measurements carried out by the CLOR)

		Wisła, Bug and Narew rivers	Odra and Warta rivers	Lakes
Sr-90	Range	1.72-3.00	1.46-3.37	1.25-7.84
	Average	2.34	2.52	2.76
Cs-137	Range	1.81-5.76	2.25-6.01	1.27-6.01
	Average	3.69	4.21	3.00

Waters and bottom sediments

The radioactivity of water and bottom sediments was defined by determining selected artificial and natural radionuclides in samples collected at fixed sampling points.

Open waters

The concentrations of caesium Cs-137 and strontium Sr-90 remain at the previous year's levels and are at levels observed in other European countries.

In 2020, in surface waters of the southern Baltic Sea zone, radioactive concentrations were determined for isotopes Cs-137, Ra-226 and K-40 (measurements performed by the CLOR). The average concentrations of these isotopes remain at the following levels: for Cs-137 – 22.4 Bq/m^3 – water from the surface layer – and 19.2 Bq/m^3 – bottom waters, 3.31 Bq/m^3 for Ra-226 and 3,700 Bq/m^3 for K-40, and do not differ from results of previous years.

The last completed measurement cycle of radionuclide concentrations in river and lake water samples was conducted in 2020. The measurement results are shown in Table 11.

The total contents of Cs-134 and Cs-137 in open water samples collected in 2020 from sampling points located near the Nuclear Centre in Świerk were on average:

- the Świder River: 1.60 mBq/dm^3 (upstream from the Centre) and 1.62 mBq/dm^3 (downstream from the Centre),
- water from the waste water treatment plant in Otwock discharged into the Wisła River: 8.05 mBq/dm^3.

Sr-90 concentrations in bulk samples of river water collected from the surrounding area of the National Centre for Nuclear Research in Świerk were 12.60 and 20.98 mBq/dm^3.

The tritium concentration in open water samples collected in 2020 from sampling points located near the Nuclear Centre in Świerk was:

- the Świder River (upstream and downstream from the Centre): 1 Bq/dm^3 on average,
- water from the waste water treatment plant in Otwock discharged into the Wisła River: 2.5 Bq/dm^3.

Groundwater – local monitoring

The results of measurements of radioactive isotope concentrations in waters conducted as part of local monitoring in 2020 do not differ significantly from the results of previous years.

Nuclear Centre in Świerk

The average concentrations of radioactive isotopes of caesium and strontium in well water of the farms in the vicinity of the Nuclear Centre in Świerk in 2020 were 4.47 mBq/dm^3 for caesium isotopes (Cs-134, Cs-137) and 16.8 mBq/dm^3 for Sr-90. The concentration of tritium (H-3) was also determined and averaged 2.12 Bq/dm^3.

National Radioactive Waste Repository (KSOP) in Różan

Concentrations of radioactive isotopes Cs-137 and Cs-134 in spring waters in the vicinity of the National Radioactive Waste Repository in Różan averaged 3.20 mBq/dm^3.

In 2020, tritium concentrations were also investigated in groundwater in the vicinity of the KSOP in Różan, and averaged less than 2.73 Bq/dm^3.

Areas of former uranium ore mining and processing plants

The interpretation of measurement results was based on recommendations of the World Health Organization (WHO) – Guidelines for drinking water quality, Vol. 1 Recommendations. Geneva, 1993 (item 4.1.3, p. 115) introducing so-called reference levels for drinking water. They state that, in principle, the total alpha activity of drinking water should not exceed 100 mBq/dm^3, while the beta activity should not exceed 1,000 mBq/dm^3. It should be noted that these levels are indicative only – if exceeded, identification of the radionuclides is recommended.

Alpha and beta activity measurements were conducted for 42 water samples in former uranium ore mining areas with the following results[4]:

- public drinking water intakes:
  - total alpha activity
    – from 1.9 to 103,7 mBq/dm^3,
  - total beta activity
    – from 17.9 to 291/1 mBq/dm^3.
- water flowing from mine workings (adits, rivers, ponds, springs, wells):
  - total alpha activity
    – from 6.6 to 123.5 mBq/dm^3,
  - total beta activity
    – from 26.2 to 224.7 mBq/dm^3.

Radon concentrations in water from public intakes and domestic wells in the localities comprising the Union of Karkonosze Communes ranged from 1.3 to 459.4 Bq/dm^3. The radon concentration in waters flowing from mining facilities characterised by the highest total alpha and beta radioactivity had the highest value of 314.5 Bq/dm^3 in water flowing out of Adit 17 of the Pogórze mine.

Requirements for the quality of water intended for human consumption in terms of the content of radioactive substances are set out in the Regulation of the Minister of Health of 7 December 2017 on the quality of water intended for human consumption (Journal of Laws, item 2294). The parametric value, set at a radon activity concentration of 100 Bq/l, defines the content of radioactive substances in water above which it is necessary to assess whether the presence of radioactive substances presents a risk to human health that requires action and, if necessary, to take remedial action to improve the water quality to a level compatible with the requirements for the protection of human health against radiation.

Bottom sediments

The last completed measurement cycle of radionuclide concentrations in dry matter samples of river and lake bottom sediments was conducted in 2020. Radionuclide concentrations in dry matter samples of river and lake bottom sediments in 2020 and in the Baltic Sea in 2020 remained at levels observed in previous years. The measurement results are shown in Table 12 and Table 13.

4. The upper levels of activity occurred in waters flowing out of Adit 19a of the former Podgórze mine in Kowary.

TABLE 12.
Concentrations of caesium and plutonium radionuclides in bottom sediments of rivers and lakes of Poland in 2020 [Bq/kg of dry matter] (GIOŚ, measurements carried out by the CLOR)

		Wisła, Bug and Narew rivers	Odra and Warta rivers	Lakes
Pu-239, 240	Range	0.003-0.062	0.004-0.088	0.003-0.748
	Average	0.016	0.022	0.112
Cs-137	Range	0.30-3.69	0.33-20.69	0.72-64.86
	Average	1.76	3.59	11.47

TABLE 13.
Concentrations of the artificial radionuclides Cs-137, Pu-238, Pu-239, 240, Sr-90 and natural radionuclide K-40 in bottom sediments of the southern Baltic Sea zone in 2020 (PAA, CLOR data)

		Layer thickness 0-19 cm
Cs-137	kBq/m²	3.26
Pu-238	Bq/m²	1.82
Pu-239, 240	Bq/m²	57.2
K-40	kBq/m²	37.9
Sr-90	Bq/m²	149.33

Soil

Concentrations of radioactive isotopes in soil are determined on the basis of regular spectrometric measurements conducted every few years on samples of uncultivated soil, taken from 10 cm and 25 cm thick layers.

The last completed measurement cycle was conducted between 2018 and 2020. In 2019, 264 soil samples were collected from 254 fixed sampling points distributed across the country. Spectrometric measurements of these samples were then performed and the concentrations of artificial (Cs-137, Cs-134) and natural (Ra-226, Ac-228 and K-40) radioactive isotopes were determined.

Average concentration of Cs-137 and Cs-134 in soil

The conducted studies indicate that the average concentration of Cs-137 in the surface layer of soil in Poland is 0.19 kBq/m² to 13.35 kBq/m² and amounts on average to 1.35 kBq/m².

The average deposition of the Cs-137 isotope in Poland, during the period of soil radioactive contamination monitoring, decreased from 4.64 kBq/m² in 1988 to 1.35 kBq/m² in 2019. The deposition value for Cs-134 in soil samples varied during the monitoring period in accordance with the half-life time and this isotope is not present in measurable amounts in Polish soils.

The average deposition of Cs-137 in individual provinces is presented in Table 14, and the average concentrations of natural radioactive isotopes in soil in 2019 in Table 15.

For comparison, the average values of surface soil Cs-137 contamination in 2020 in the vicinity of the Nuclear Centre in Świerk and KSOP in Różan were 7.9 Bq/kg and 15.2 Bq/kg, respectively.

The average deposition of this radionuclide in soil for the whole of Poland in individual years from 1988 to 2019 is given in Fig. 13.

TABLE 14.
Average, minimum and maximum values of Cs-137 deposition in soil samples collected in individual provinces and in Poland for soil samples collected in autumn 2019 (GIOŚ, measurements carried out by the CLOR)

Province	Cs-137 concentration [kBq/m²]		
	Average	Range	
		Minimum	Maximum
dolnośląskie	2.05 ± 0.62	0.33	13.35
kujawsko-pomorskie	0.54 ± 0.05	0.39	0.84
lubelskie	1.13 ± 0.27	0.39	4.24
lubuskie	0.60 ± 0.12	0.32	1.08
łódzkie	0.69 ± 0.13	0.30	1.52
małopolskie	1.76 ± 0.26	0.30	9.11
mazowieckie	1.59 ± 0.31	0.47	6.00
opolskie	3.66 ± 0.68	0.44	6.88
podkarpackie	0.68 ± 0.06	0.21	1.37
podlaskie	0.95 ± 0.08	0.59	1.21
pomorskie	0.75 ± 0.09	0.34	1.78
śląskie	1.92 ± 0.26	0.38	4.61
świętokrzyskie	1.23 ± 0.21	0.49	2.89
warmińsko-mazurskie	0.98 ± 0.15	0.22	1.87
wielkopolskie	0.65 ± 0.06	0.20	1.19
zachodniopomorskie	0.43 ± 0.07	0.19	0.90
Poland	**1.35 ± 0.10**	**0.19**	**13.35**

FIGURE 13.

Average Cs-137 deposition in Poland in 1988–2019 (PAA based on data provided by GIOŚ, measurements carried out by the CLOR)

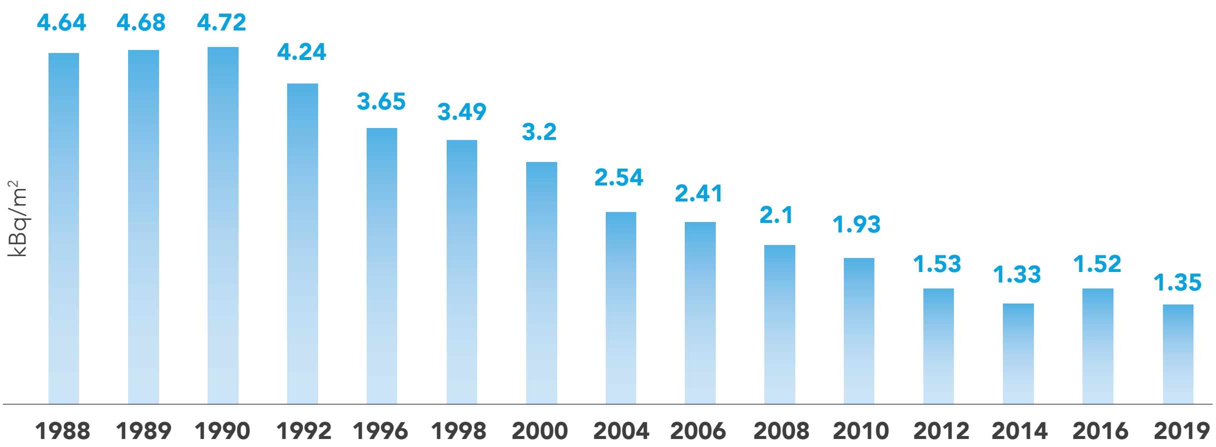


TABLE 15.

Average concentrations of natural radioactive isotopes in soil in 2019

	for Ra-226	for Ac-228	for K-40
Range	5.3 ÷ 193.0 Bq/kg	3.1 ÷ 126.8 Bq/kg	59 ÷ 964 Bq/kg
Average	28.8 Bq/kg	23.9 Bq/kg	430 Bq/kg

TABLE 16.

Average, minimum and maximum concentrations of natural isotopes in soil samples collected in individual provinces in October 2020 (GIOŚ, measurements carried out by the CLOR)

Province	Concentration [Bq/kg]								
	Ac-228			K-40			Ra-226		
	Average	Min.	Max.	Average	Min.	Max.	Average	Min.	Max.
dolnośląskie	37.0 ± 4.8	6.2	126.8	558 ± 44	207	964	49.2 ± 7.8	6.6	193.0
kujawsko-pomorskie	16.5 ± 1.9	9.3	23.8	427 ± 43	232	563	19.8 = 1.9	11.7	26.2
lubelskie	18.2 ± 2.3	10.2	35.9	356 ± 35	207	628	22.2 ± 2.4	13.8	39.5
lubuskie	13.6 ± 1.8	9.4	20.7	337 ± 34	247	453	16.6 ± 2.2	12.1	26.0
łódzkie	12.9 ± 1.2	8.6	20.8	295 ± 23	200	402	15.7 ± 1.1	10.8	21.7
małopolskie	34.0 ± 1.2	11.2	49.4	531 ± 20	244	868	39.2 ± 1.7	12.1	71.0
mazowieckie	14.6 ± 1.4	6.5	30.3	342 ± 26	180	643	16.4 ± 1.3	7.9	27.5
opolskie	27.7 ± 2.9	12.2	41.2	491 ± 43	259	693	33.2 ± 3.8	14.3	50.9
podkarpackie	33.6 ± 2.3	4.2	44.9	506 ± 32	123	732	38.7 ± 2.8	6.8	60.1
podlaskie	19.2 ± 2.9	3.1	24.4	472 ± 73	59	603	21.4 ± 2.3	12.3	31.3
pomorskie	14.0 ± 1.5	3.4	29.7	335 ± 28	105	640	19.1 ± 2.7	5.3	53.5
śląskie	26.6 ± 2.6	8.0	47.3	402 ± 29	166	593	31.1 ± 2.5	1.9	48.9
świętokrzyskie	20.0 ± 2.6	8.1	34.3	334 ± 49	126	535	24.5 ± 2.3	15.9	36.8
warmińsko-mazurskie	16.1 ± 1.8	8.9	26.8	415 ± 34	226	618	19.4 ± 1.6	11.3	27.9
wielkopolskie	13.0 ± 0.8	6.9	20.3	333 ± 15	219	468	15.7 ± 0.9	9.4	22.5
zachodniopomorskie	13.9±2.4	4.1	26.8	350 ± 35	187	556	16.9 ± 2.6	5.3	32.5
Poland	**23.9 ± 0.9**	**3.1**	**126.8**	**430 ± 10**	**59**	**964**	**28.8 ± 1.2**	**5.3**	**193.0**

Measurements of radioactive contamination in agricultural and food products are performed by sanitary and epidemiological stations.

Radioisotope activities in foods and food products should be compared to the values laid down in Commission Implementing Regulation (EU) No 2020/1158. The document states that the concentration of Cs-137 must not exceed 370 Bq/kg in milk and milk products and 600 Bq/kg in all other foodstuffs and food products. Currently, the concentration of Cs-134 in foodstuffs and food products is below 1‰ of Cs-137 activity. For this reason, Cs-134 is omitted from further discussion.

The data presented in this subsection come from the results of measurements carried out by institutions measuring radioactive contamination (sanitary and epidemiological stations) submitted to the PAA.

Milk

The concentration of radioactive isotopes in milk is an important indicator for the assessment of oral radiation exposure.

In 2020, Cs-137 concentrations in liquid (fresh) milk ranged from 0.24 to 1.43 Bq/dm^3 and averaged about 0.63 Bq/dm^3 – see infographic on pages 90–91.

Meat, poultry, fish and eggs

The results of the 2020 measurements of Cs-137 activity in different types of meat from farmed animals (beef, pork), as well as in poultry meat, fish and eggs were as follows (range and annual average value of Cs-137 concentration):

- livestock meat – from 0.23 to 2.41 Bq/kg, average: 0.87 Bq/kg,
- poultry – from 0.23 to 1.02 Bq/kg, average: 0.50 Bq/kg,
- fish – from 0.19 to 2.14 Bq/kg, average: 0.77 Bq/kg,
- eggs – from 0.13 to 1.55 Bq/kg, average: 0.55 Bq/kg.

The temporal distribution of Cs-137 activity between 2011 and 2020 in different types of livestock meat (beef, pork), as well as in poultry meat and eggs and fish is presented in the infographic on pages 90–91. The data obtained indicate that in 2020, the average activity of the caesium isotope in meat, poultry, fish and eggs was at the same level as in the previous year.

Vegetables, fruit, cereals, feed and mushrooms

The results of artificial radioactivity measurements in vegetables and fruit carried out in 2020 indicate that the concentration of Cs-137 in vegetables ranged from 0.25 to 2.09 Bq/kg, averaging 0.93 Bq/kg, and in fruit from 0.23 to 6.08 Bq/kg, averaging 1.69 Bq/kg (see infographic on pages 90–91). In long-term comparisons, the 2020 results were at the 1985 level, and several times lower than in 1986.

Cs-137 activity in cereals in 2020 ranged from 0.31 to 1.90 Bq/kg (average: 0.95 Bq/kg) and were similar to values observed in 1985.

Cs-137 activity in feed in 2020 ranged from 0.12 to 8.19 Bq/kg (average: 2.84 Bq/kg).

Average Cs-137 isotope activity in grass in the surrounding area of the Nuclear Centre in Świerk and the KSOP (on a dry matter basis) in 2020 ranged from <2.34 to 4.68 Bq/kg (average: 3.25 Bq/kg) for the Nuclear Centre in Świerk, and from 0.14 to 39.2 Bq/kg (average: 19.7 Bq/kg) for the KSOP.

The average caesium activity in the primary fresh mushroom species in 2020 did not differ from previous years' values. It should be noted that in 1985, i.e. in the period before the Chernobyl accident, Cs-137 activity in mushrooms were also much higher than in other food products. At that time, this radionuclide came from the period of nuclear weapons testing (this is confirmed by analysis of the isotope ratio of Cs-134 and Cs-137 in 1986).

Summary

The results of the monitoring programs conducted in 2020 in Poland show that the environment, food and drinking water are safe for the general population.

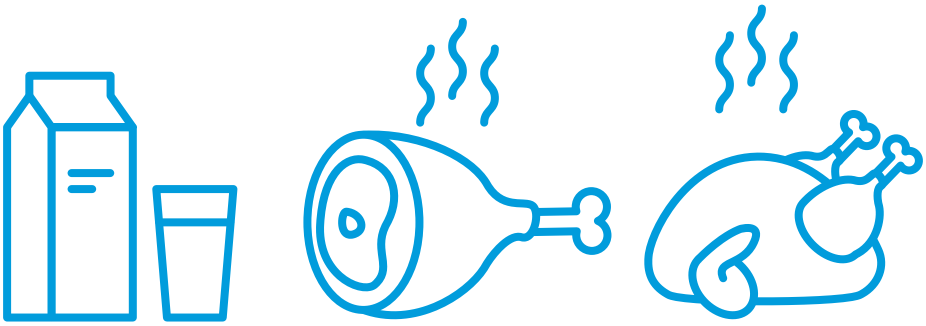
Cs-137 contamination from the Chernobyl accident mostly remains at a very low level with no significant impact on human health. Higher concentrations of Cs-137 can be observed in forest products, which also do not have a significant impact on human health, and the results of the sampled food from forest areas did not exceed the limits for consumption in 2020.

FOOD RADIOACTIVITY

Radioisotope activities in foods and food products should be compared to the values laid down in Council Regulation (EC) No 733/2008.

370 Bq/kg

maximum total allowable dose of isotope concentrations of Cs-137 and Cs-134 in milk, milk products and infant formulae.



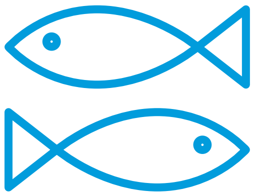
medium concentration Cs-137	**MILK**	**MEAT**	**POULTRY**
2020	**0.63 Bq/dm³**	**0.87 Bq/kg**	**0.50 Bq/kg**
2019	0.41	1.11	0.52
2018	0.52	1.09	0.47
2017	0.46	0.89	0.50
2016	0.40	0.63	0.54
2015	0.50	0.77	0.60
2014	0.50	0.83	0.73
2013	0.60	0.95	0.90
2012	0.60	0.90	0.70
2011	0.49	0.64	0.60
2010	0.48	0.83	0.58
2008	0.60	0.85	0.52
2009	0.60	0.70	0.52
2007	0.70	0.64	0.67

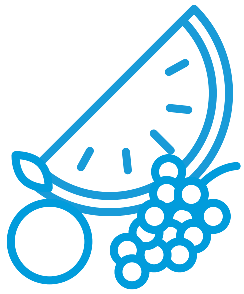
600 Bq/kg

the maximum total allowable dose of isotope concentrations of Cs-137 and Cs-134 in all other foodstuffs and food products.

Cs-137

only the concentration of Cs-137 is taken into account in the measurement results given, since the concentration of Cs-134 is less than 1‰ of their total activity.



EGGS	FISH	VEGETABLES	FRUIT
0.55 Bq/kg	**0.77 Bq/kg**	**0.93 Bq/kg**	**1.69 Bq/kg**
0.56	0.67	0.48	0.31
0.57	0.85	0.40	0.75
0.49	0.61	0.42	0.38
0.42	0.77	0.39	0.33
0.40	0.77	0.41	0.27
0.45	0.86	0.46	0.50
0.60	1.10	0.50	0.60
0.50	1.00	0.50	0.40
0.45	1.00	0.49	0.40
0.43	1.00	0.47	0.35
0.42	0.70	0.45	0.37
0.39	0.84	0.54	0.28
0.43	0.96	0.46	0.25

Data source: sanitary and epidemiological stations

11 International cooperation

Fot. IAEA

International cooperation concerning nuclear safety and radiation protection on behalf of Poland is a statutory duty of the President of the PAA. This duty is carried out in close cooperation with the Minister of Foreign Affairs, the Minister of Energy and Environment and other ministers (heads of central offices), in accordance with their respective competences.

The purpose of conducting international cooperation by the PAA is to support the implementation of the nuclear supervision mission, i.e. ensuring the nuclear safety and radiological protection of the country. The objective is achieved through the PAA's participation in the development of international legislation and international standards, through the exchange of information on nuclear safety with neighbouring countries and through increasing its own competence and implementing good practices as a result of sharing experience and knowledge with foreign partners. International cooperation is carried out through the participation of the PAA representatives in the work of international organisations and associations as well as bilateral cooperation.

Multilateral cooperation

In 2020, the President of the PAA was involved in the implementation of tasks resulting from Poland's multilateral cooperation under the framework of:

- European Atomic Energy Community (Euratom Community),
- International Atomic Energy Agency (IAEA),
- Organisation for Economic Co-operation and Development Nuclear Energy Agency (OECD NEA),
- Western European Nuclear Regulators' Association (WENRA),
- Heads of the European Radiological Protection Competent Authorities (HERCA) meetings,
- Council of the Baltic Sea States (CBSS),
- European Nuclear Security Regulators Association (ENSRA),
- European Safeguards Research and Development Association (ESARDA).

Cooperation with international organisations

European Atomic Energy Community (EURATOM)

PAA's involvement resulting from Poland's membership in the Euratom Community and in 2020 focussed mainly on the work conducted in two groups in the European Nuclear Safety Regulators Group (ENSREG). The Group includes senior management representatives from the national nuclear regulatory authorities of each Member State, a representative from the European Commission who holds advisory powers of the European Commission.

At the plenary meeting of ENSREG in November 2020, Poland was represented by the President of the PAA, Dr. Łukasz Młynarkiewicz, and Vice-President of the PAA, Andrzej Głowacki. During the meeting, issues related to the planned Second Topical Peer Review were discussed. The meeting was also devoted to conducting safety analyses of nuclear power plants, so-called stress tests, in countries outside the European Union.

The PAA is a key institution in cooperation with the IAEA, alongside the Ministry of Foreign Affairs. Another important national institution involved in cooperation with IAEA is the Ministry of Climate and Environment, which is responsible for nuclear energy development in Poland.

International Atomic Energy Agency (IAEA)

PAA's main activities related to Poland's membership in the IAEA include:

- coordination of national institutions' cooperation with the IAEA,
- participation in the development of IAEA international safety standards,
- participation in the work of the annual IAEA General Conference, the most important statutory body of the IAEA,
- payment of Poland's membership fee to the IAEA from the PAA's budget (in 2020 the fee was: EUR 2,497,140 and USD 361,519 to the regular budget of the IAEA, and EUR 679,831 to the IAEA Technical Cooperation Fund),
- implementation of own projects in cooperation with the IAEA.

Cooperation in setting IAEA safety standards

One of the important elements of cooperation within the IAEA is the establishment of the IAEA Safety Standards for the peaceful uses of nuclear energy. The work on these standards is carried out with the participation of the PAA experts within the following six committees:

- Nuclear Safety Standards Committee (NUSSC);
- Radiation Safety Standards Committee (RASSC);
- Waste Safety Standards Committee (WASSC);
- Transport Safety Standards Committee (TRANSSC);
- Nuclear Security Guidelines Committee (NSGC);
- Emergency Preparedness and Response Standards Committee (EPRESC).

IAEA General Conference

The General Conference is the highest statutory body of the IAEA. It is composed of representatives of the 172 (as of 1 March 2021) Member States of the Agency. The General Conference is held annually to consider and approve the Agency's programme and budget, and to make decisions and resolutions on matters brought before it by the Board of Governors, Director General or Member States.

The 64th IAEA General Conference was held from 21 to 25 September 2020.

In line with security requirements due to the COVID-19 pandemic, the number of participants in national delegations was limited. The Polish delegation was headed by Mr. Michał Kurtyka, Minister for Climate and Environment, while the Polish Atomic Energy Agency was represented by its President, Dr. Łukasz Młynarkiewicz. They both attended the Conference online. Poland was represented by Ambassador Dominika Krois, Permanent Representative of the Republic of Poland to the United Nations Office and the International Organisations in Vienna[5].

The Polish delegation voted in favour of the resolution setting the membership fee for the regular budget of the IAEA in 2021 (Poland's contribution: EUR 2,497,542 and USD 402,854).

The General Conference approved the election of Poland as a member of the IAEA Board of Governors for the 2020–2022 term. Ambassador Dominika Krois, Permanent Representative of the Republic of Poland to the United Nations Office and the International Organisations in Vienna, represents Poland on the IAEA Board of Governors for the 2020–2022 term. Her first deputy is Dr. Łukasz Młynarkiewicz, President of the PAA, the second deputy is Adam Guibourgé-Czetwertyński, Undersecretary of State in the Ministry of Climate and Environment, and the third deputy is Arkadiusz Michoński, Deputy Permanent Representative of the Republic of Poland to the Office of the United Nations and the International Organisations in Vienna.

Through membership in the Board, Poland will have a direct influence on the IAEA's operation, including the IAEA's recommendations on the safe use of nuclear energy and the Agency's nonproliferation and nuclear safeguards activities.

The Board of Governors includes 35 Member States. In addition to the annual General Conference, it is one of the two bodies of the International Atomic Energy Agency responsible for the direction of its activities. The Board reviews the financial statements, programme tasks and budget of the IAEA and makes recommendations to the General Conference. It considers applications for membership in the Agency, and approves IAEA Safety Standards and nuclear material safeguards agreements.

Poland was last represented on the IAEA Board of Governors in 2012–2014.

5. Speech by Head of the Polish Delegation, Michał Kurtyka
https://www.iaea.org/sites/default/files/20/09/poland-gc64.pdf

During the General Conference, as part of its efforts to strengthen nuclear safety in the global dimension, the PAA held a number of consultations with international partners:

- at the 64th Senior Safety and Security Regulators' Meeting, which addressed topics related to competency management for building effective nuclear oversight and a phased approach in nuclear regulatory activities;
- at a meeting of the Regulatory Cooperation Forum (RCF). The Forum was established on the initiative of the IAEA to support countries planning or developing nuclear power by countries with advanced nuclear power technologies;
- at a meeting of National Liaison Officers with the IAEA on the Technical Cooperation Programme. The National Atomic Energy Agency, as the leading institution in terms of Poland's cooperation with the IAEA, coordinates the participation of national institutions in the Technical Cooperation Programme.

Expert cooperation under the auspices of the IAEA

The Technical Cooperation Programme is an important instrument of the IAEA, and Poland has for many years participated in the Programme with a dual role: as a net contributor to the Programme and as a beneficiary of expert cooperation with the IAEA and its Member States. For many years, Polish institutions have participated in national and regional IAEA technical cooperation projects.

In 2020, the PAA coordinated the participation of national expert and research organisations in 200 meetings, training courses and conferences organised by the IAEA. Due to the pandemic, much of the training was cancelled or postponed. Only selected were organised remotely.

Polish institutions actively use expert support and the Technical Cooperation Programme to implement projects that are important for the development of Polish science, medicine, and energy sectors, and for ensuring nuclear safety and radiological protection in the country. The IAEA offers support in developing competencies, advice from international experts and assistance in purchasing the necessary equipment. From 4 to 6 March 2020, the PAA hosted a representative of the IAEA, Mr. Jing Zhang, coordinating the participation of Polish institutions in the Technical Cooperation Programme on behalf of the IAEA. He had a meeting with representatives of four national organisations that are implementing cooperation projects in the 2020–2021 cycle. The National Centre for Radiological Protection in Health Care (KCOR) in the medical field intends to compare the quality of iodine (I-131) activity measurements on a national scale. As far as science is concerned, the National Centre for Nuclear Research (NCBJ) intends to strengthen competencies in the safe and efficient operation of the MARIA research nuclear reactor in Otwock-Świerk. The Ministry of Climate and Environment has continued its project aimed at expanding the nuclear power infrastructure, while the PAA has focussed on further developing its competences, which are necessary for the effective performance of its nuclear regulatory role.

In February 2020, the Polish delegation headed by the President of the PAA, Dr. Łukasz Młynarkiewicz, took part in the International Conference on Nuclear Security ICONS 2020. During his speech at the conference, the President of the PAA stressed that Poland is a party to international legal instruments aimed at ensuring physical protection of nuclear facilities, materials and radioactive sources. In 2016, Poland hosted an International Physical Protection Advisory Service Mission, and in December 2019, the International Physical Protection Advisory Service Mission came to an end.

IAEA's COVID-19 operations

At the request of the PAA, the IAEA donated equipment to the Polish health services to support the fight against COVID-19. The kits were delivered to the National Institute of Public Health – National Institute of Hygiene in Warsaw and the Provincial Sanitary and Epidemiological Station in Katowice.

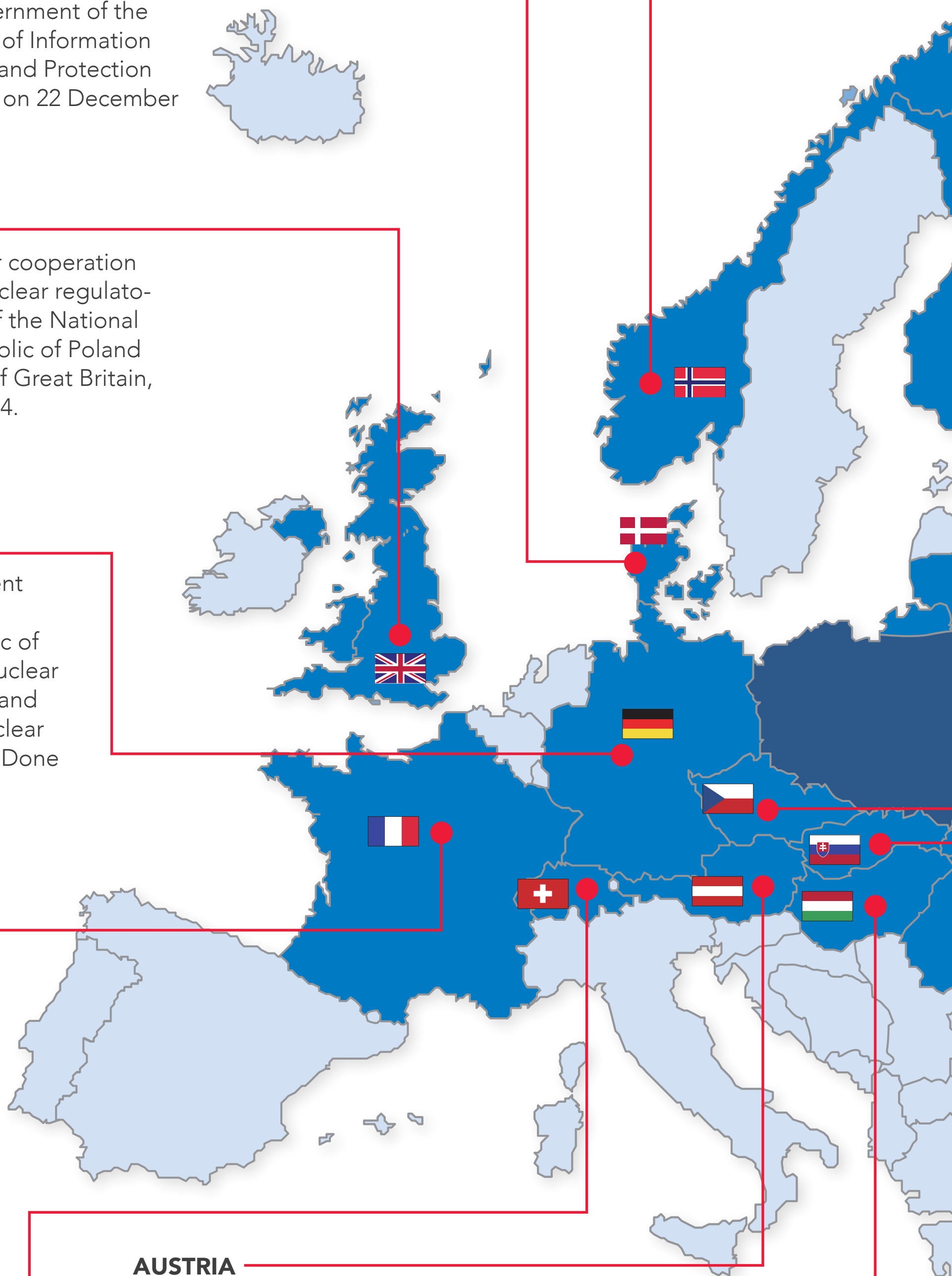
As part of the kits, Poland received thermocyclers for SARS-CoV-2 molecular diagnostics. The apparatus is used to detect coronavirus infection. It increases the number of diagnostic tests performed to detect COVID-19 disease. The IAEA, as part of its assistance to Member States, has provided diagnostic equipment to more than 40 countries, including two diagnostic kits to Poland valued at approx. EUR 187.000.

Bilateral agreements concluded by Poland within the areas of activity of the National Atomic Energy Agency in Europe

NORWAY
Agreement between the Government of the People's Polish Republic and the Government of the Kingdom of Norway on Early Notification of Nuclear Accident and on Cooperation in Nuclear Safety and Protection Against Radiation. Done at Oslo on 15 November 1989.

DENMARK
Agreement between the Government of the People's Polish Republic and the Government of the Kingdom of Denmark on Exchange of Information and Cooperation in Nuclear Safety and Protection Against Radiation. Done at Warsaw on 22 December 1987.

UNITED KINGDOM
Memorandum of Understanding for cooperation and exchange of information for nuclear regulatory matters between the President of the National Atomic Energy Agency of the Republic of Poland and Office for Nuclear Regulation of Great Britain, signed at Vienna 24 September 2014.



GERMANY
Agreement between the Government of the Republic of Poland and the Government of the Federal Republic of Germany on Early Notification of Nuclear Accident, Exchange of Information and Experience and Cooperation in Nuclear Safety and Radiological Protection. Done at Warsaw on 30 July 2009.

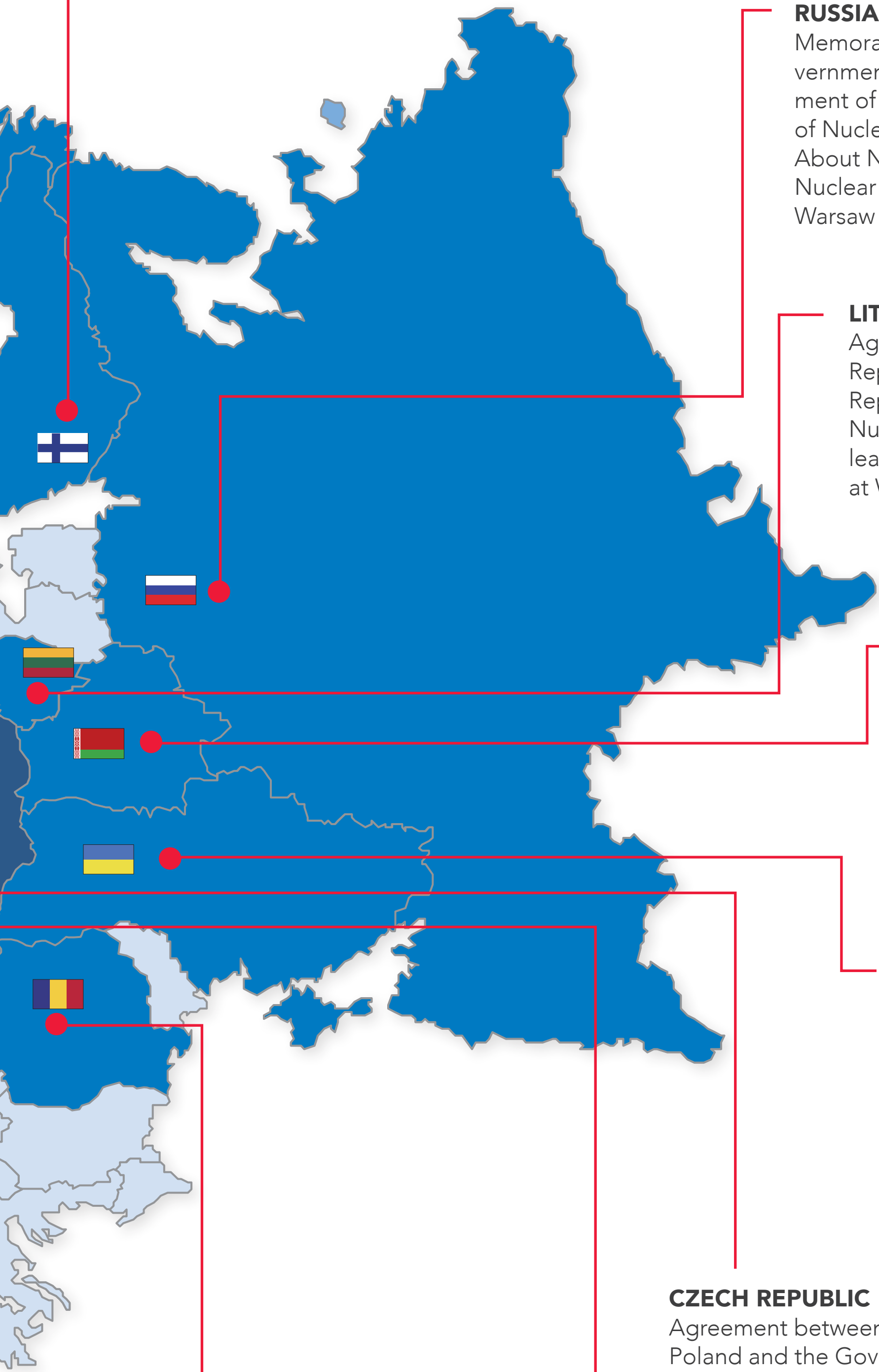
FRANCE
PreAgreement concluded between the President of the National Atomic Energy Agency in the Republic of Poland and the Office of the Nuclear Safety (l`Autorité de sûreté nucléaire) of the French Republic on the exchange of technical information and cooperation in the field of nuclear safety. Done at Warsaw on 14 June 2012 and Paris 26 June 2012.

SWITZERLAND
Memorandum of Understanding for cooperation and exchange of information for nuclear regulatory matters between the President of the National Atomic Energy Agency of the Republic of Poland and the Swiss Federal Nuclear Safety Inspectorate ENSI, signed in Vienna on 26 September 2016.

AUSTRIA
Agreement between the Government of the People's Polish Republic and the Government of the Republic of Austria on Exchange of Information and Cooperation in Nuclear Safety and Protection Against Radiation. Done at Vienna on 15 December 1989.

HUNGARY
Memorandum of Understanding for cooperation and exchange of information for nuclear regulatory matters between the President of the National Atomic Energy Agency of the Republic of Poland and the Radiation and the Hungarian Atomic Energy Authority, signed at Vienna 19 September 2017.

FINLAND
Memorandum of Understanding for cooperation and exchange of information for nuclear regulatory matters between the President of the National Atomic Energy Agency of the Republic of Poland and the Radiation and Nuclear Safety Authority of Finland, signed in Vienna on 19 September 2017.



RUSSIA
Memorandum of Understanding between the Government of the Republic of Poland and the Government of the Russian Federation on Early Notification of Nuclear Accident, on Exchange of Information About Nuclear Installations and on Cooperation in Nuclear Safety and Radiological Protection. Done at Warsaw on 18 February 1995.

LITHUANIA
Agreement between the Government of the Republic of Poland and the Government of the Republic of Lithuania on Early Notification of Nuclear Accident and on Cooperation in Nuclear Safety and Radiological Protection. Done at Warsaw on 2 June 1995.

BELARUS
Agreement between the Government of the Republic of Poland and the Government of the Republic of Belarus on Early Notification of Nuclear Accident and on Cooperation in Radiation Safety. Done at Minsk on 26 October 1994.

UKRAINE
Agreement between the Government of the Republic of Poland and the Government of Ukraine on Early Notification of Nuclear Accident, on Exchange of Information and on Cooperation in Nuclear Safety and Radiological Protection. Done at Kiev on 24 May 1993.

CZECH REPUBLIC
Agreement between the Government of the Republic of Poland and the Government of the Czech Republic on Early Notification of Nuclear Accident and on Exchange of Information About Peaceful Use of Nuclear Energy, Nuclear Safety and Radiological Protection. Done at Vienna on 27 September 2005.

ROMANIA
Memorandum of Understanding for cooperation and exchange of information for nuclear regulatory matters between the President of the National Atomic Energy Agency of the Republic of Poland and the National Commission for Nuclear Activities Control of Romania, signed at Vienna 25 September 2014.

SLOVAKIA
Agreement between the Government of the Republic of Poland and the Government of the Republic of Slovakia on early warning of nuclear accidents, on sharing information and on cooperation in the field of nuclear safety and radiation protection. Concluded in Bratislava on 17 September 1996.

Cooperation with the Regulatory Cooperation Forum (RCF)

The Regulatory Cooperation Forum was established to ensure that countries with developed nuclear power programs support countries planning or developing nuclear power.

The PAA's cooperation with the RCF has resulted in projects that significantly contribute to the efforts made in preparation for the implementation of the Polish Nuclear Power Programme. With the support of the Forum, the PAA is implementing an OJT (On-the-Job Training) project directed at providing direct experience in nuclear regulation in terms of siting, construction, commissioning and operating nuclear power plants. Under the project, PAA employees completed internships in various foreign nuclear supervision offices.

On 17 and 18 November 2020, the President of the PAA, Dr. Łukasz Młynarkiewicz, and Vice President of the PAA, Andrzej Głowacki attended a meeting of the international Regulatory Cooperation Forum. Due to the COVID-19 pandemic, the two-day meeting was held remotely. During the first day of the meeting, the recipient members of the RCF presented the current state of preparations for nuclear regulatory tasks in relation to nuclear power plants under construction or planned. The President of the PAA spoke about the tasks resulting from the Polish Nuclear Power Programme, the update of which was published in October this year, and the state of preparations of the PAA to carry out the tasks resulting from the Programme. On the second day, the member countries with developed nuclear infrastructure (provider members) presented activities implemented in the area of experience sharing, good practices and expert support.

Organisation for Economic Co-operation and Development Nuclear Energy Agency (OECD NEA)

The activities of the NEA are based on the cooperation of national experts in 7 committees and in subordinate working groups. Poland became a member of the NEA in 2010 and has since actively participated in the working groups. The leading national institution for the NEA is the Ministry of Climate and Environment. The PAA is involved in the work of NEA committees and working groups in the area of nuclear safety, nuclear regulation, nuclear law and new reactors.

In June and November 2020, the President of the PAA, Dr. Łukasz Młynarkiewicz, took part in the meetings of the Committee on Nuclear Regulatory Activities (CNRA). Due to the COVID-19 pandemic, the two-day meetings were held remotely. The meetings were devoted to updating the strategy of the Committee and analysing its structure and operations to enable effective performance. The discussion also focussed on budgetary priorities for 2020 and 2021 and the programme of activities for the various working groups operating within the Committee.

Cooperation within associations and other forms of multilateral cooperation

Western European Nuclear Regulators' Association (WENRA)

In 2020, WENRA work areas included activities within working groups dedicated to the harmonisation of reference levels for nuclear power plants and research reactors and a working group dedicated to radioactive waste.

In April 2020, a WENRA working group meeting was held for the first time in Poland. The seventh meeting of the Reference Level for Research Reactor Working Group concerned the creation of reference levels for research reactors on the basis of already existing requirements for nuclear power plants.

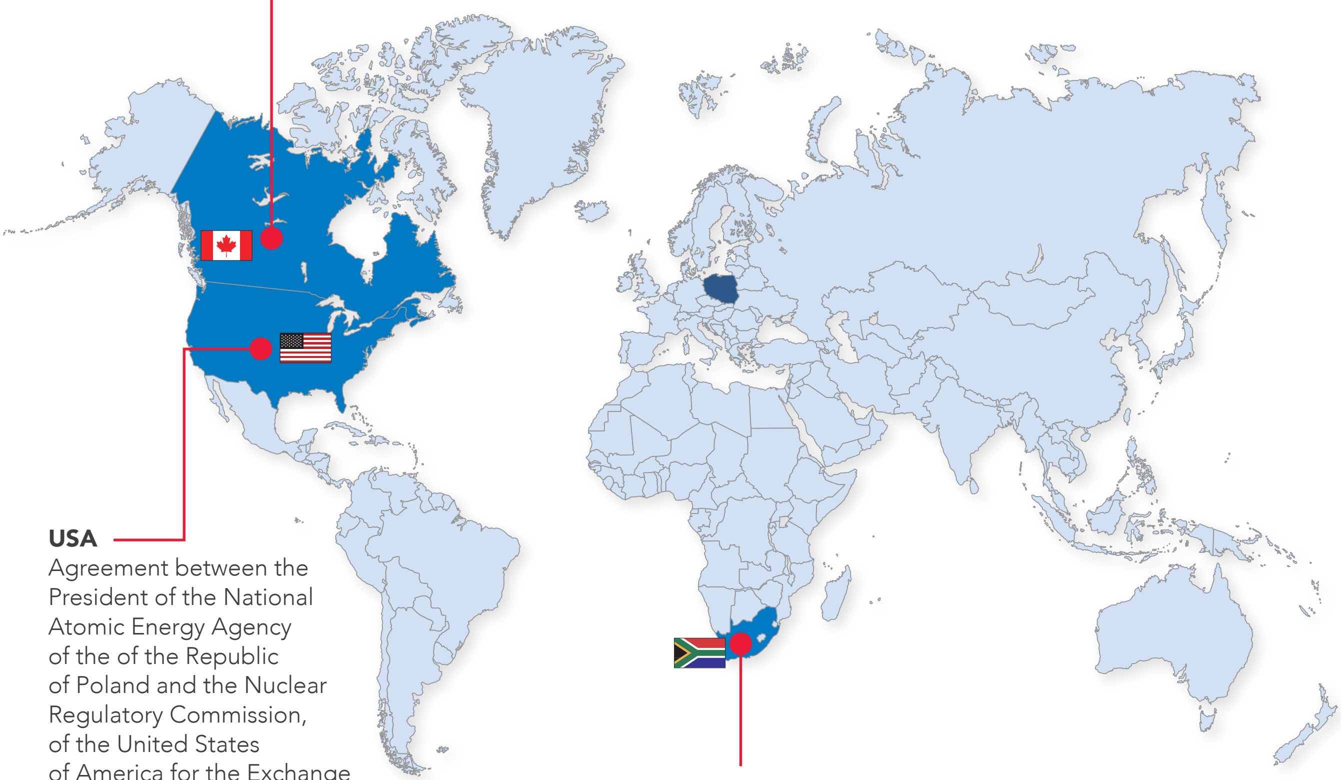
On 4 and 5 November 2020, the President of the PAA, Dr. Łukasz Młynarkiewicz, attended the WENRA plenary meeting. Due to the COVID-19 pandemic, the two-day meeting was held remotely. A discussion was held on issues related to the current work of the Association, as well as the strategy for its future activities. The meeting also addressed the relationship between nuclear safety and the physical protection of nuclear facilities and materials.

Heads of the European Radiological Protection Competent Authorities (HERCA)
Representatives of Poland participate in plenary works of heads of regulatory authorities and in HERCA working groups dealing with such issues as radiological protection in medicine, veterinary medicine, industry, and preparation for radiological emergencies.
In June and November 2020, the President of the PAA, Dr. Łukasz Młynarkiewicz, took part in the meetings of the Heads of the European Radiological Protection Competent Authorities (HERCA). Due to the COVID-19 pandemic, the meetings were held remotely. During the meetings, the heads of radiation protection authorities from 32 European countries discussed the organisation's current and planned activities. The tasks carried out by the individual working groups were discussed.

Council of the Baltic Sea States (RPMB)
The CBSS functions as a political forum for intergovernmental cooperation among the countries of the Baltic Sea Region. The aim of the Council is to build cooperation and trust among Member States. The Presidency of the Council is held by successive member states. Lithuania assumed the Presidency of the Council in 2020.

As part of the Council's work, a seminar entitled 'Baltic Sea Region: acting together against nuclear risks', involving Polish representatives of the PAA and the National Fire Service, was held on 26 November 2020. During the seminar, issues related to preparing for a major accident requiring intervention, international cooperation in the context of a nuclear facility accident, and coordination of communication with the public were raised.

Bilateral agreements concluded by Poland within the areas of activity of the National Atomic Energy Agency outside Europe



Continued cooperation within the framework of the Council of Baltic Sea States, including the resumption of work in the area of nuclear safety and radiological protection, is an important aspect of developing relations between the Baltic Sea states.

The problems of the region are discussed in working groups. The PAA represents Poland in the Council's Expert Group on Nuclear and Radiation Safety (EGN-RS). The operation of the Group has been temporarily suspended.

European Nuclear Security Regulators Association (ENSRA)

Authorities from 16 EU countries are currently participating in ENSRA, including, since 2012, the PAA. The main objectives of the Association are to exchange information on matters relating to the physical protection of nuclear materials and facilities, and to promote a unified approach to physical protection in the EU countries.

European Safeguards Research And Development Association (ESARDA)

The PAA has been a member of the European Safeguards Research and Development Association (ESARDA) since 2009. It is an organisation providing a forum for the exchange of information, knowledge and experience, dissemination of continuous development and improvement in the field of nuclear material safeguards, related to the fulfilment of obligations under the Nuclear Non-Proliferation Treaty and related international agreements. The organisation cooperates with the IAEA, the US Institute of Nuclear Materials Management (INMM) and the laboratories of the Joint Research Centre (JRC) of the European Commission. It brings together scientific institutes, universities, industrial companies, specialists and state administration bodies responsible for nuclear safeguards in the European Union countries. The organisation has a steering committee whose meetings are attended by representatives of all member organisations.

Bilateral cooperation

Poland has signed agreements on cooperation and exchange of information with regard to nuclear safety, radiation protection and nuclear accidents with all of its neighbouring countries.

The PAA President is responsible for the implementation of these agreements. In 2020, the PAA continued cooperation with foreign partners experienced in the supervision of large nuclear facilities. The PAA implemented a bilateral cooperation program:

- on 3 February 2020, a meeting was held in Warsaw with Bernard Doroszczuk, Chairman of the Commission of the French Nuclear Safety Authority – ASN. The meeting, part of the official visit of French President Emmanuel Macron to Poland, was held at the PAA headquarters;
- on 17–18 February 2020, a meeting was held in Warsaw with a delegation of the Slovak nuclear regulator – ÚJD SR, headed by Marta Žiakova, President of the ÚJD SR;
- a remote meeting was held with Kristine L. Svinicki, Chair of the US Nuclear Regulatory Commission (US NRC) on 16 December 2020.

Bilateral cooperation with the US NRC also enabled remote consultation meetings with US NRC experts in 2020. The consultations revolved around the following issues:

- the PAA's planned needs in connection with works on updating the PPEJ,
- planned staff development (employment) in the PAA resulting from the tasks envisaged under the PPEJ,
- PAA's demand for external analyses related to safety assessment of nuclear facilities,
- exchange of US NRC's experience in conducting the licensing and nuclear construction processes based on the examples of Watts Bar NPP, V.C. Summer NPP and Vogtle NPP.

As part of the bilateral cooperation with the US, experts from the US National Nuclear Security Administration (NNSA) from the Department of Energy (DOE) and Sandia National Laboratories came to Poland for a meeting devoted to cooperation with Polish institutions with respect to physical protection of nuclear facilities, materials and radioactive sources.

The meeting took place on 3 February 2020 at the PAA headquarters. Poland was represented by Dr. Łukasz Młynarkiewicz, President of the PAA, Andrzej Cholerzyński, Director of the ZUOP, Grzegorz Krzysztoszek, Deputy Nuclear Safety and Radiation Protection Director of the National Centre for Nuclear Research, and staff from these institutions. During the meeting, the possible scope of cooperation between Polish institutions, including the PAA, and the NNSA, in strengthening physical protection competence was discussed. The participants of the meeting discussed areas of possible cooperation in such fields as: transport safety, creation of legal regulations, protection against sabotage and cyber security.

NNSA is a United States agency specialising in the safety and physical security of nuclear facilities and nuclear materials. One of its tasks is to reduce international threats from the use of nuclear weapons. Poland has cooperated extensively with NNSA in connection with the implementation of the Global Threat Reduction Initiative (GTRI) through the export of spent nuclear fuel from the EWA and MARIA research reactors between 2009 and 2016.

Conclusions:

- The biggest international success is the approval by the General Conference of Poland's election as a member of the IAEA Board of Governors for the 2021–2020 term. Ambassador Dominika Krois, Permanent Representative of the Republic of Poland to the United Nations Office and the International Organisations in Vienna, represents Poland on the IAEA Board of Governors for the 2020–2022 term. Her first deputy is Dr. Łukasz Młynarkiewicz, President of the PAA, the second deputy is Adam Guibourgé-Czetwertyński, Undersecretary of State in the Ministry of Climate and Environment, and the third deputy is Arkadiusz Michoński, Deputy Permanent Representative of the Republic of Poland to the Office of the United Nations and the International Organisations in Vienna.
- The PAA participates in all remote meetings organised by associations and in other forms of multilateral cooperation. PAA representatives actively participated in working and expert groups focussing on nuclear safety, nuclear regulatory competence building, nuclear law and new reactors.
- The COVID-19 virus pandemic significantly reduced the possibility of holding bilateral meetings, but this did not affect the excellent relations with partner nuclear regulators. Continuous exchange of information is one of the main tenets of the bilateral relations.
- The exchange of experience and good practices in the field of safe conduct of the licensing process by the US NRC allowed the PAA to prepare more effectively for tasks resulting from the implementation of tasks provided for in the Polish Nuclear Power Programme.

.

List of abbreviations

- **ADN** – European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways
- **ADR** – L'Accord européen relatif au transport international des marchandises dangereuses par route – European Agreement concerning the International Carriage of Dangerous Goods by Road
- **ASN** – Autorité de sûreté nucléaire – the French Nuclear Safety Authority
- **ASS-500** – Aerosol Sampling Station
- **BSS** – Basic Safety Standards
- **CEZAR PAA** – the PAA Radiation Emergency Centre
- **CLOR** – Centralne Laboratorium Ochrony Radiologicznej – Central Laboratory for Radiological Protection
- **COAS** – Centralny Ośrodek Analizy Skażeń – Central Contamination Analysis Center
- **DBJ PAA** – Departament Bezpieczeństwa Jądrowego Państwowej Agencji Atomistyki – Department of Nuclear Safety of the National Atomic Energy Agency
- **DoE** – US Department of Energy
- **DOR PAA** – Departament Ochrony Radiologicznej Państwowej Agencji Atomistyki – Radiological Protection Department of the National Atomic Energy Agency
- **ECURIE** – European Community Urgent Radiological Information Exchange
- **ENSRA** – European Nuclear Security Regulators Association
- **ENSREG** – European Nuclear Safety Regulators' Group
- **ESARDA** – European Safeguards Research and Development Association
- **EURATOM** – European Atomic Energy Community
- **EURDEP** – European Radiological Data Exchange Platform
- **GIG** – Główny Instytut Górnictwa – Central Mining Institute
- **GIOŚ** – Główny Inspektorat Ochrony Środowiska – Chief Inspectorate of Environmental Protection
- **GTRI** – Global Threat Reduction Initiative
- **HERCA** – Heads of the European Radiological Protection Competent Authorities
- **HEU** – Highly Enriched Uranium
- **IAEA** – International Atomic Energy Agency
- **IAEA** Safety Standards
- **IATA – DGR** International Air Transport Association Dangerous Goods Regulation
- **ICAO** – International Civil Aviation Organization
- **IChTJ** – Instytut Chemii i Techniki Jądrowej – Institute of Nuclear Chemistry and Technology
- **IMDG Code** – International Maritime Dangerous Goods Code
- **IMiGW** – Instytut Meteorologii i Gospodarki Wodnej – Institute of Meteorology and Water Management
- **INES** – International Nuclear and Radiological Event Scale
- **IOR** – inspektor ochrony radiologicznej – Radiological Protection Officer
- **IRSN** – L'Institut de Radioprotection et de Sûreté Nucléaire – French Institute for Radiological Protection and Nuclear Safety
- **JRC** – European Comission's Joint Research Centre
- **KG** – IAEA General Conference
- **KPK** – National Contact Point
- **KSOP** – Krajowe Składowisko Odpadów Promieniotwórczych – National Radioactive Waste Repository
- **LEU** – Low Enriched Uranium
- **MON** – Ministerstwo Obrony Narodowej – Ministry of National Defence
- **NCBJ** – Narodowe Centrum Badań Jądrowych – National Centre for Nuclear Research
- **NEA OECD** – Nuclear Energy Agency of the Organisation for Economic Co-operation and Development
- **NIK** – Najwyższa Izba Kontroli – Supreme Audit Office
- **NUSSC** – Nuclear Safety Standards Committee
- **PAA** – Państwowa Agencja Atomistyki – National Atomic Energy Agency
- **PMS** – Permanent Monitoring Station
- **POLATOM** – Ośrodek Radioizotopów POLATOM – POLATOM Radioisotope Centre
- **PPEJ** – Program Polskiej Energetyki Jądrowej – Polish Nuclear Power Programme
- **RASSC** – Radiation Safety Standards Committee
- **RCF** – Regulatory Cooperation Forum

- **RID** – Réglement concernant le transport international ferroviaire des marchandises dangereuses – Regulations concerning the International Carriage of Dangerous Goods by Rail
- **CBSS** – Council of the Baltic Sea States
- **TLD** – thermoluminescent dosimeters
- **TRANSSC** – Transport Safety Standards Committee
- **UDT** – Urząd Dozoru Technicznego – Office of Technical Inspection
- **USIE** – Unified System for Information Exchange in Incidents and Emergencies
- **WASSC** – Waste Safety Standards Committee
- **WENRA** – Western European Nuclear Regulators Association
- **WHO** – World Health Organization
- **ZUOP** – Zakład Unieszkodliwiania Odpadów Promieniotwórczych – Radioactive Waste Management Plant

Cover photo:
NCBJ

DTP, printing and binding:
Grafpol Agnieszka Blicharz-Krupińska

PAA
NATIONAL
ATOMIC ENERGY
AGENCY

ul. Bonifraterska 17
00-203 Warszawa
Poland
www.gov.pl/paa/