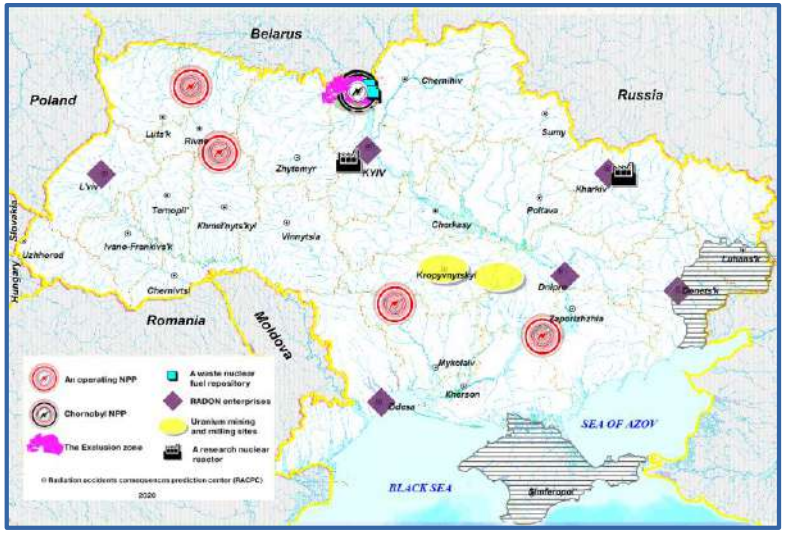
Ukrainian Hydrometeorological Center
State Service on Emergency of Ukraine

Ukrainian Radiation Monitoring System and Interaction with International Information Systems

Radiation Accidents Consequences Prediction Center
(RACPC)

IEC IAEA Workshop September, 2020

The main sources of radioactive and nuclear threats in Ukraine



1. Radioactively contaminated territories (the Exclusion zone) as result of the Chornobyl accident (1986);
2. Chornobyl NPP that is in a state of decommissioning;
3. Spent nuclear fuel repositories in the Exclusion zone;
4. Four operating nuclear power plants (15 power units and 2 units that are planned to be completed);
5. Three research nuclear reactors (Kyiv, Kharkiv and Crimea);
6. Uranium mining and milling sites (including conventional and legacy sites);
7. Radioactive waste repositories (State specialized enterprise "Radon Association" that includes 6 branches);
8. Numerous radioactive sources that are used in medicine and industry;
9. Other sources located outside of Ukrainian state border, which potentially having trans-boundary pollution effects at the territory of Ukraine.

Main Legal and Regulatory Documents.

1. Code of Civil Protection of Ukraine 2013 , Revision on July 3, 2020
2. Decree of the Cabinet of Ministers of Ukraine “On approval of the Regulations on the unified state system of civil protection” 2014, Revision on December 24, 2019
3. The law of Ukraine “On Protection of People against Ionizing Radiation” 1998, Revision on February 24, 2020
4. The law of Ukraine “On Use of Nuclear Power and Radiation Safety” 1995, Revision on July 3, 2020
5. The law of Ukraine “On Hydrometeorological Activity” 1999, Revision on March 7, 2018
6. The Degree of the Cabinet of Ministers № 391(1998) "Order on the state system of environmental monitoring" (with amendments 2018 and 2019)

The existing radiation control systems in Ukraine

Main Radiation Monitoring Programs

- Source monitoring and radiation control system around nuclear installations, U-Mining, Milling and NORM Industry facilities
- Special observational networks
- Country wide Environment monitoring network (atmosphere, water bodies/surface and groundwater, marine) including background observation and trans-boundary observational programs.

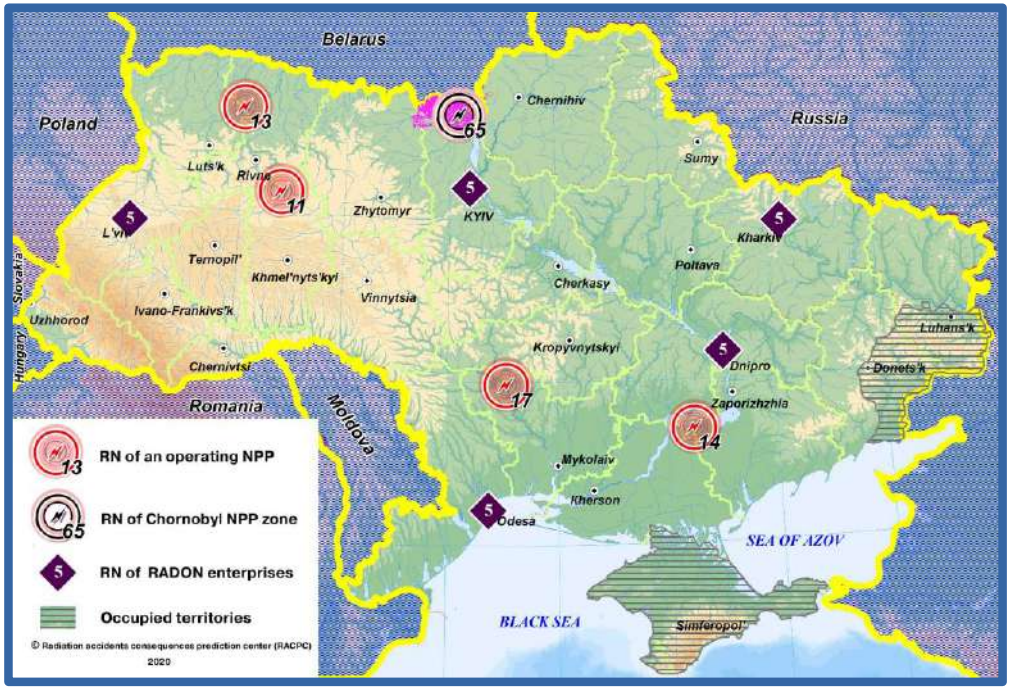
Main Environmental Radiation Monitoring Networks are functioning under operation:

- Nuclear facility Operator (NPPs) - State Enterprise "National Nuclear Energy Generating Company"ENERGOATOM"
- Chornobyl Exclusion Zone and RADON (State Agency of Ukraine on Exclusion Zone Management)
- Hydrometeorological Service (country wide network) -

State Service on Emergency of Ukraine

Main Automated Radiation Monitoring Systems in Ukraine

ARMS encompass only 2.5 % of Ukraine's territory



1. RMS of SE “ENERGOATOM” includes networks of 4 operating NPPs. The RN of each NPP encompasses only the area of responsibility of the NPP - 30 km. The total number of observation points at which ambient dose rate is continuously measured -54. Data from RNs of all NPPs are sent to the headquarters(Kyiv).

2. RMS in the Chornobyl Exclusion Zone encompasses the area of the exclusion zone and the zone of obligatory unconditional resettlement - 90 km. The total number of observation points at which ambient dose rate is continuously measured -65. This is an area of responsibility State Agency of Ukraine on Exclusion Zone Management. Data from all observation points sent to SE “ECOCENTER” (Chernobyl -city).

3. At the end of 2019, with the financial support of the European Commission, ARMS was put into operation at State specialized enterprise "Radon Association". RNs were installed in 5 branches out of 6. In Donetsk - city, RN was not installed due to the military aggression of the Russian Federation in eastern Ukraine. RN of each branch encompasses only the area of responsibility - 300 m. The total number of observation points at which ambient dose rate is continuously measured -25(5 on each site).Data from RNs of all branches are sent to the headquarters(Kyiv).

Radiation monitoring of the environment carried out by operating NPPs (licensee)

Objects to be controlled:

- Water
- Air
- Ground
- Foodstuff (milk, meat, fish, fruits, vegetables, cereals)
- Bottom sediments
- Integral dose
- Dust fall

Types of measurements:

- Dose rate measuring;
- Measuring concentration iodine and aerosols in the atmospheric air under emergency radiation condition;
- Sampling atmospheric air aerosols and precipitation for laboratory testing.

Radiation monitoring of the environment carried out by operating NPPs (licensee)

Equipment measuring iodine and aerosols in the atmospheric air

GammaTracer Dosimeter (Genitron, Germany)

- Measurement of equivalent dose rate in the range of 20 nSv/h – 10 Sv/h;
- Basic measurement error is 10%;
- Communication interface – RS-485;
- Working temperature span - -40°C – +60 °C;

PIM-201

I-131concentration in the range of $3.7 \div 3.7 \cdot 10^6$ Bq/m^3;

ABPM-201

α aerosols concentration in the range of $0.01 \div 1.0 \cdot 10^4$ Bq/m^3 in the energy range of 4.2 MeV – 5.5 MeV;

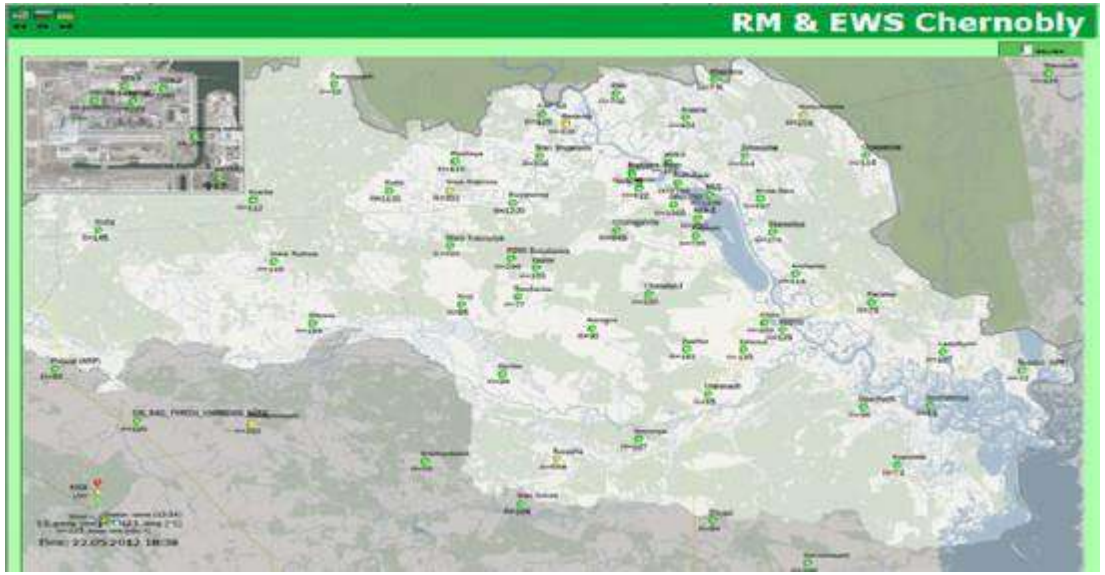
β aerosols concentration in the range of $1 \div 1.0 \cdot 10^7$ Bq/m^3 in the energy range of 80keV – 2 MeV;

Radiometric Network in the Chornobyl Exclusion zone

Automated Gamma dose rate control network in Chornobyl Exclusion Zone and the adjacent area (65 stations)

Gamma Tracer Dosimeter
(Genitron Instruments, 2006)

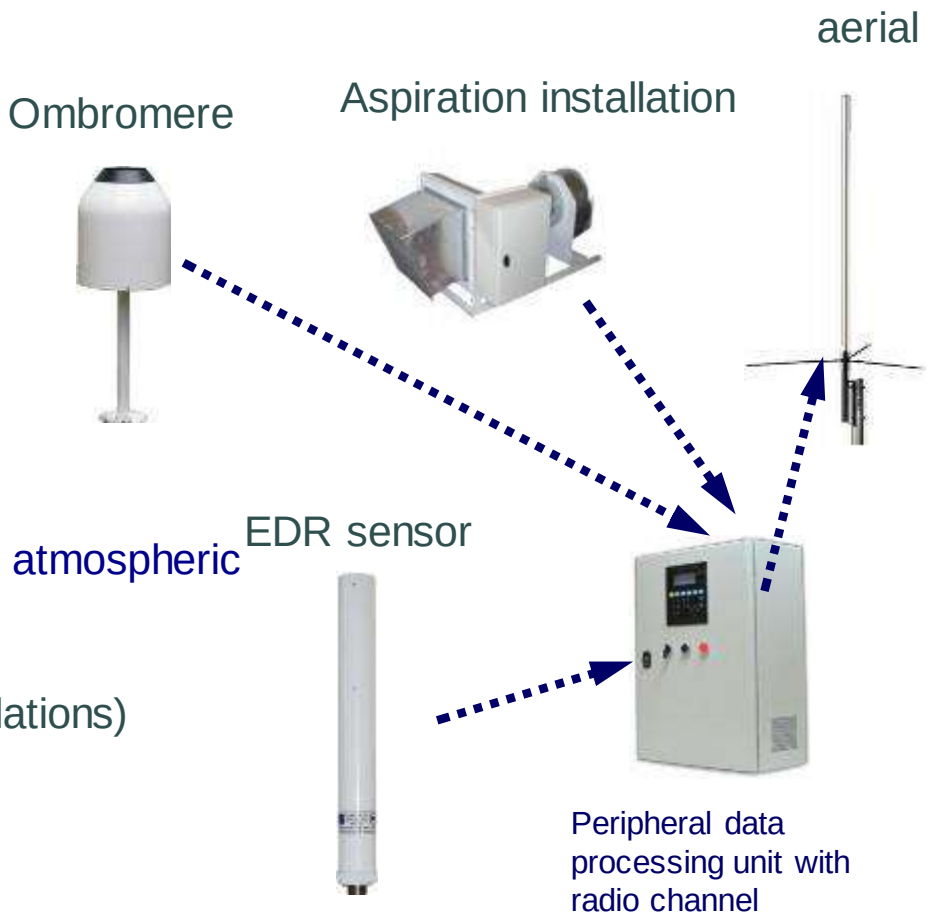
Measurement of equivalent dose rate in the range of 20 nSv/h – 10 Sv/h;
Basic measurement error is 10%;
Working temperature span - -40°C – +70 °C;



Measurement results from automatic sensors are sent to the operational control center once an hour in routine mode and every 2 minutes if the control level is exceeded. Radio channel is used for transmitting data

Radiometric Network in the Chornobyl Exclusion zone

Automated control point



Measuring concentration aerosols in the atmospheric air

Equipment for sampling

Aspiration installation AURA-02 (18 installations)

Productivity : 1200 - 1500 м^3 / h.

Working temperature span : -40 - +50 C.

Aerosol fallout collectors (wet, dry) – 25 installations

Working size of a metal cuvette - 540x630x200 мм.

Integrated automated system of environment radiation monitoring(IASERM) of SSE "Radon Association". Developed and installed by the company NUVIA.

Type of real-time measurements :

Dose rate measuring

Gamma sensor KF-01 (G-M) – 5 sensors on each site

Measurement of equivalent dose rate in the range of 50 nSv/h – 2 Sv/h;

Basic measurement error is 20%;

Working temperature span - -35°C – +50 °C;

Gross alpha and beta activity in air

Stand-by mode (is switched on automatically after receipt from gamma sensors of the notification on the excess of the level of a radiation background established for the system)— 3 aspiration installations on each site

Routine mode - 3 aspiration installations on each site

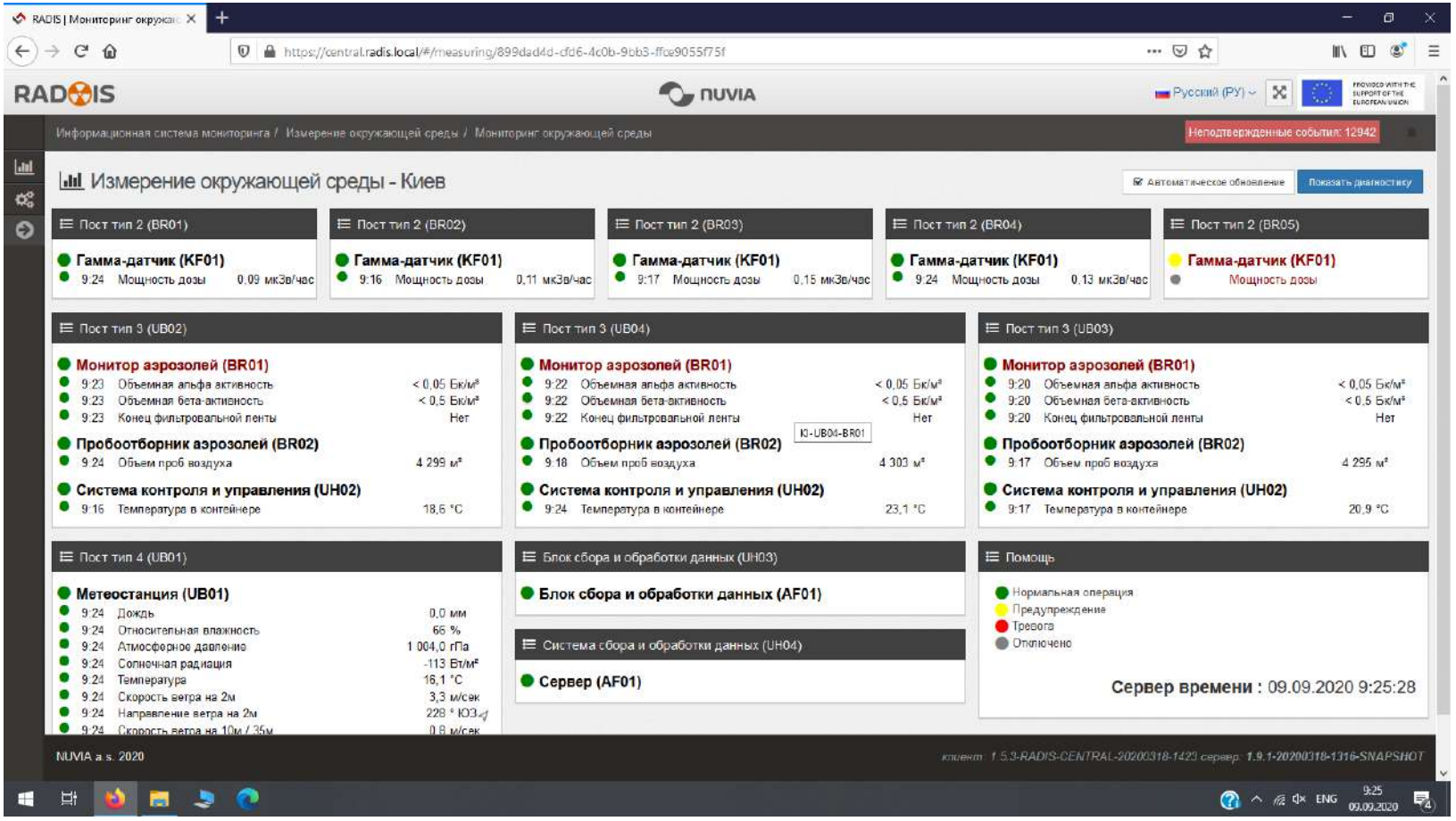
α aerosols concentration in the range of $0.01 \div 1.0 \cdot 10^6$ Bq/m^3 ;

β aerosols concentration in the range of $0.2 \div 1.0 \cdot 10^5$ Bq/m^3 ;

Basic measurement error is 30%;

Working temperature span - -10°C – +40 °C;

Interface of IASERM in the automated control point at the site of the branch of SSE "RADON Association" .



Radiometric Network of National Hydrometeorological Service

The equipment of the radiometric network of the National Hydrometeorological Service

Dosimeter DRG-01 produced in 1990 (319 dv)

Dosimeter-radiometer produced in 2004-2018 (97 dv)

Measurement of equivalent dose rate (by hand) in the range of :
(produced in 1990)
10,0 μR/h – 10 R/h; 0,01 mR/h –10mR/h;
10,0 μR/h – 100 R/h;
Basic measurement error is 15%;
Working temperature span - -10° – +40°C;
(produced in 2004-2018)
0,1 – 999,9 μS/h;
Basic measurement error is 25%;
Working temperature span - -20° – +50°C

Large air sampling stations (1000-6000 m3 / h) - 7 installation

MKS-05 Terra

RKS-01 Stora-TU

Devices for water sampling - 8 installation

Devices for fallout sampling -56 installation

The capacity of analytical laboratories of the National Hydrometeorological Service. (CGO)

Laboratory of gamma-spectrometric analysis CGO

Gamma- spectrometer:
- Canberra (produced in 2020)
- Ge-1k (produced in 1999)
- SEG-40 (produced in 1991)

Gamma-spectrometer Seg-001 " AKP-S"-63 produced in 2017(1dv)

Decade-counting installation produced in 1963 (4dv)

Methods used:
-Gamma-spectrometry
-Beta-radiometry
(Gross beta- activity in air, water and soil samples)

Beta- radiometer RUB-01 produced in 1991 (5 dv)

Analytical capacity of the Reference laboratory UHMI includes

High efficient gamma, alpha and LLC spectrometry devices as well as basic radiochemical and environment sample preparation facilities

Environmental samples

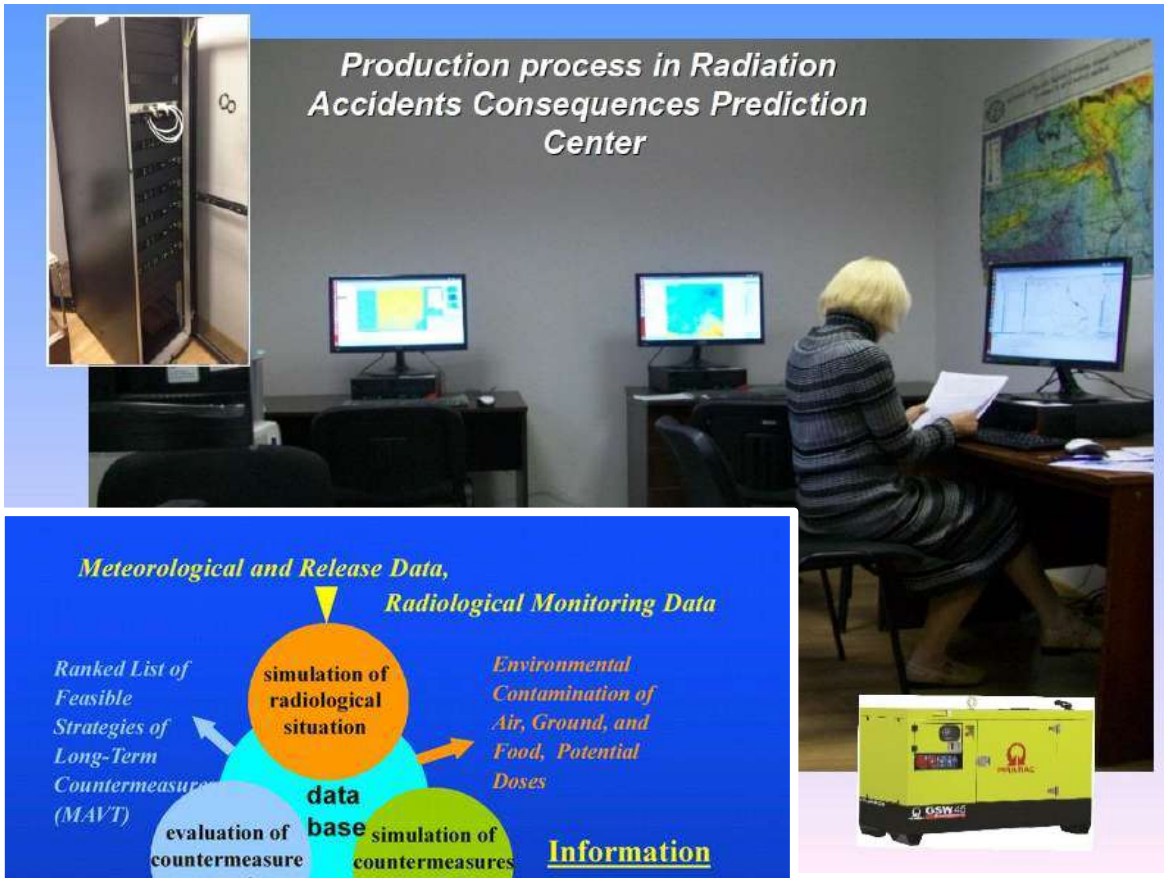
Chornobyl and Global fallout areas Cs-137, Sr-90, Am-241, Pu aerosol, water, soil, bottom sediment, vegetation
Uranium production legacy sites U- (238,234), Th-230, Ra-226, Pb-210, Po-210, Th-(232,238), Ra-228, K-40, B-7(for aerosols)

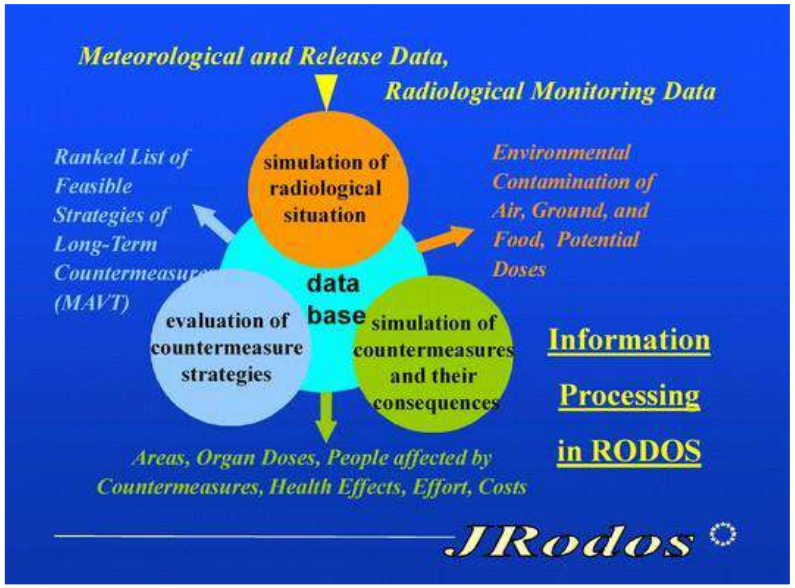
Methods used:

- Gamma-spectrometry using High- Purity Germanium detector HPGe
- Alpha-spectrometry with radiochemistry treatment (in water, soil aerosol samples)
- Liquid Scinsillation Counting LSD (Gross alpha-beta- activity in water samples)
- Alpha- , beta- radiometry(Gross alpha-beta- activity in water and soil samples)

Radiation Accidents Consequences Prediction Center

The center was established with the financial and organizational support of the European Commission in 2015.

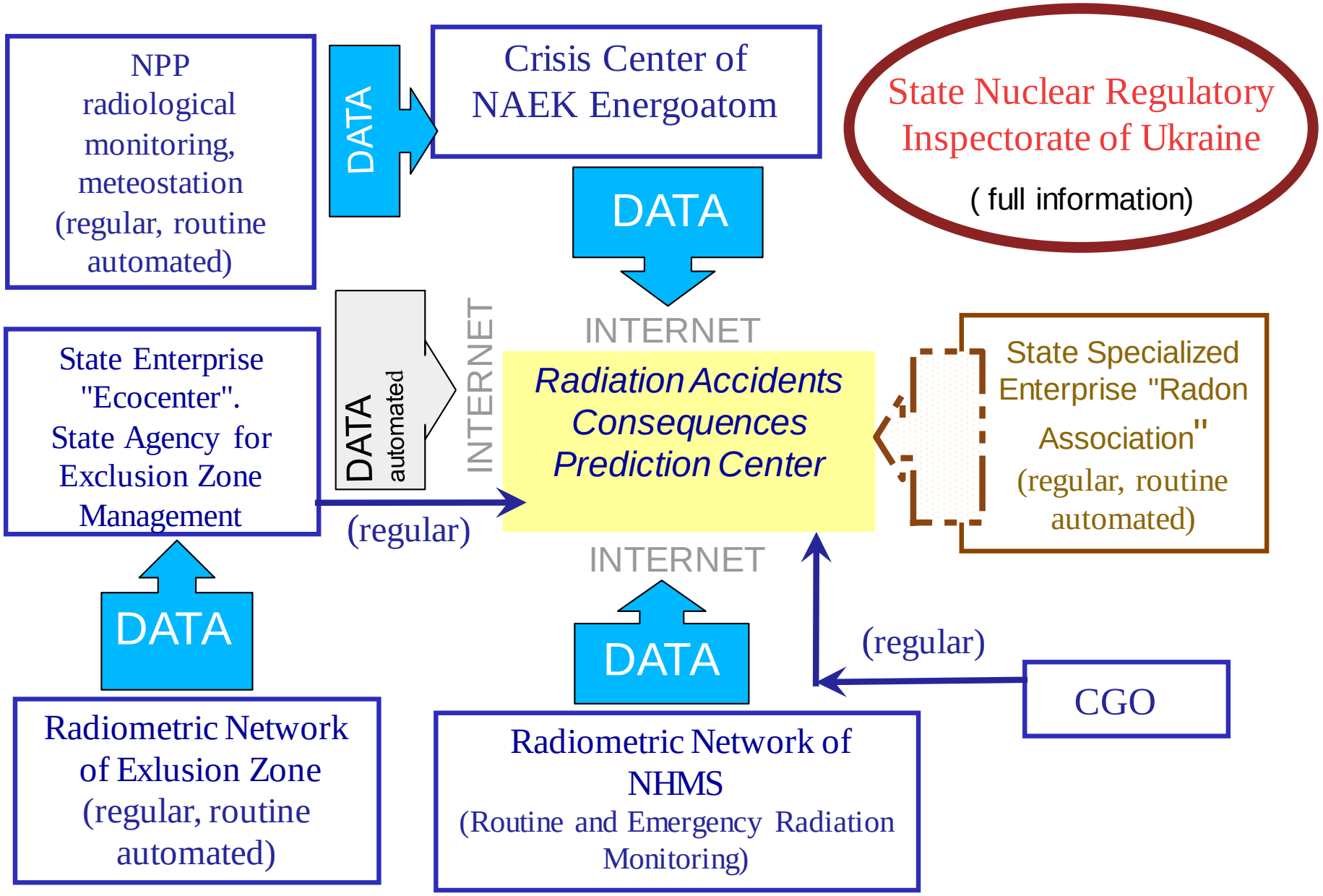




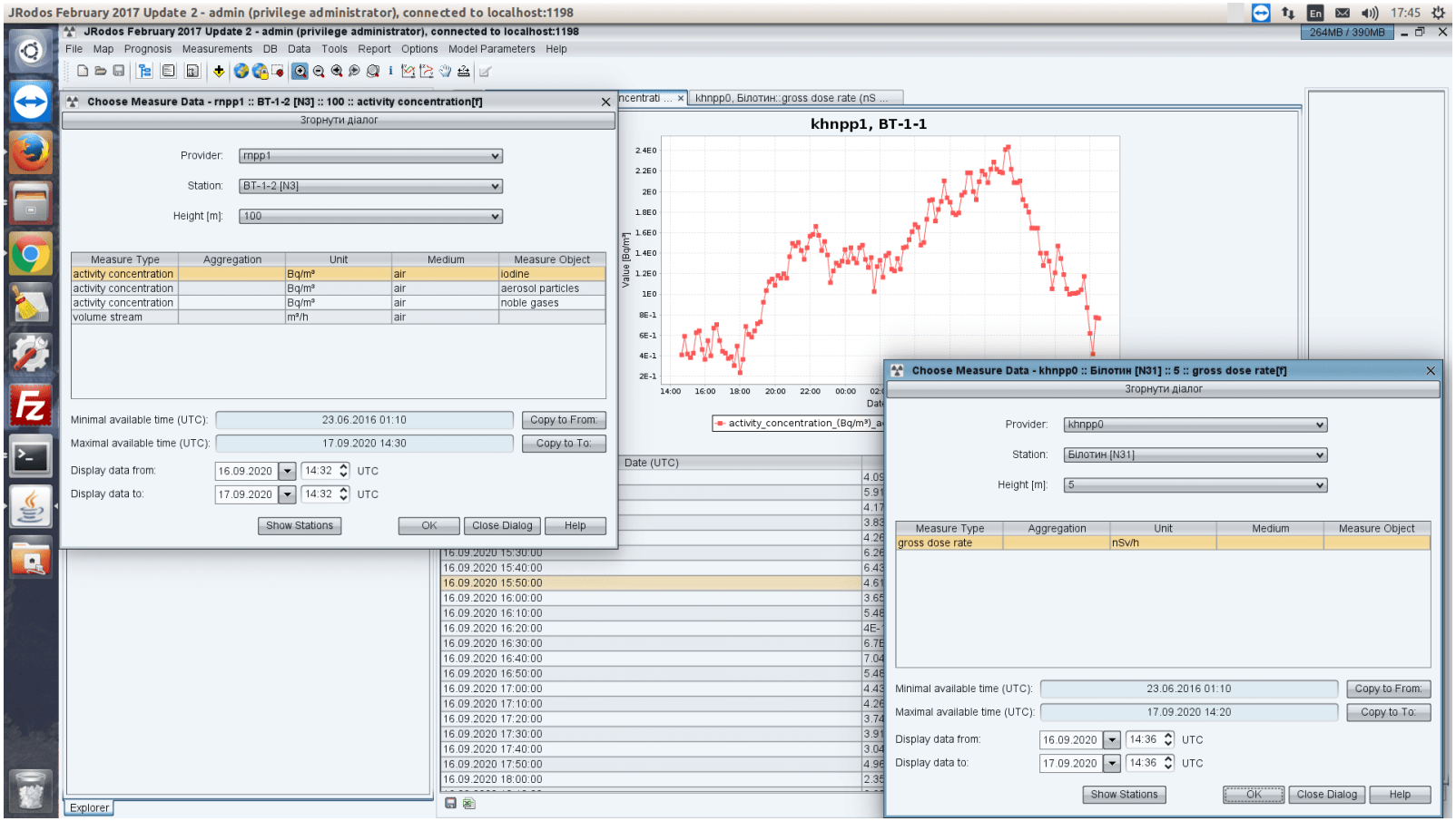
RACPC acting as a structural unit of Ukrainian Hydrometeorological Center and is an integral part of the
Emergency Response System of the State Service on Emergency of Ukraine.
The center operates with JRODOS and is the main information support center for decision-making in cases of Emergency.

The center is in charge to collect, collate, analysis and exchange information on the actual and expected radiation situation on the territory of Ukraine in cooperation with Hydrometeorological institutions.

Exchange of the monitoring data



Monitoring DATA of SE "NAEK" ENERGOATOM " through interface of decision support system JRODOS



Interaction with International Information Systems

UkrGMC is defined as the national provider of radiological data in routine mode for Exchange of the monitoring data .

Ukrainian Data regularly transmitting to EURDEP(since 2016) and IRMIS (since 2020) directly from sftp-server of UkrGMC .

Interaction with IRMIS actual nowadays

•Data of NHMS - measurement results of gamma-dose rate carried out on observation points of NHMS. Data refresh rate is 1 time per day. Number of observation points 165. This is the countrywide environmental radiation monitoring data

•Data of State Enterprise "NAEK"ENERGOATOM" – Data from Automated Gamma - dose rate control networks of operating NPPs. The data are updated every hour and are the average of the measurement results for each minute of the previous hour. Total number of observation points – 54. This is the data from the areas around operating NPPs.

•Download data to IRMIS during international training ConvEx

Interaction with IRMIS in future

Organize to transmit data Automated Gamma -dose rate control network in Chernobyl Exclusion Zone to IRMIS in regular bases after the resumption of data to RACPC

Interaction with International Information Systems

Interaction with Unified System for Information Exchange in Incidents and Emergencies (USIE)

- Publication of reports on the radiological situation in Ukraine in cooperation with colleagues from State Service on Emergency and State Nuclear Regulatory Inspectorate
- Acquaintance with reports on the radiological situation in other countries

Interaction with EURDEP

- Data of NHMS - measurement results of gamma-dose rate carried out on observation points of NHMS. Data refresh rate is 1 time per day. Number of observation points 163. This is the countrywide environmental radiation monitoring data
- Information about the radioactive situation in Ukraine in case of Emergency

Ukrainian Hydrometeorological Center
State Service on Emergency of Ukraine

Thank you for listening

For further information, please contact us
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