МІНІСТЕРСТВО ЕКОЛОГІЇ ТА ПРИРОДНИХ РЕСУРСІВ УКРАЇНИ
(Мінприроди України)

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на № _____

Міністерство охорони навколишнього середовища, вод та лісів Румунії

На № Н-2-1/1993 від 25.05.2015
Про виконання міжнародних зобов'язань

Міністерство екології та природних ресурсів України надає інформацію на поставленні питання Міністерством охорони навколишнього середовища, вод та лісів Румунії щодо оцінки впливу на навколишнє середовище діяльності зі спорудження сховища для проміжного зберігання осклованих високоактивних відходів, які повертатимуться із Російської Федерації після переробки відпрацьованого ядерного палива українських АЕС.

Додаток: 1. Відповіді на пропозиції (питання) румунської сторони (українською мовою) на 10 арк.
2. Відповіді на пропозиції (питання) румунської сторони (англійською мовою) на 10 арк.

З*у***и** Мі**і***** з **и*******
Європейської інтеграції **Г.О. Вронська**

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206-2028

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Мінприроди
№5/25-13/8789-15 від 21.07.2015

Traducerea neoficială din limba ucraineană

MINISTERUL ECOLOGIEI ŞI RESURSELOR NATURALE AL UCRAINEI

Nr. 5/25-13/8789-15 din 21.07.2015

Către

Ministrul Mediului, Apelor şi Pădurilor al României

Răspuns la nr. H-2-1/1993 din 25.05.2015

Referitor la îndeplinirea obligațiilor internaționale

Ministerul Ecologiei şi Resurselor Naturale al Ucrainei ca răspuns la observațiile Ministerului Mediului, Apelor şi Pădurilor al României transmite informația referitor la evaluarea impactului asupra mediului a activității privind construcția unui depozit intermediar pentru deşeurile radioactive vitrificate de înaltă activitate care sunt returnate din Federația Rusă după procesarea combustibilului uzat de la centralele nuclear-electrice din Ucraina.

Anexă: 1. Răspuns la propunerile (observațiile) părții române (în limba ucraineană), 10 file.
2. Răspuns la propunerile (observațiile) părții române (în limba engleză), 10 file.

Ministrului Adjunct pentru Integrarea Europeană **/semnatura/** **Hanna Vronska**

-Attachment

to the letter № _____ dated _____

Answers to the questions (comments) of Romanian authorities on EIA documentation for the vit-HLW repository.

Questions of Romanian party on EIA documentation for the vit-HLW repository.	Answers to the questions of Romanian party on EIA documentation for the vit-HLW repository
The National Commission for Nuclear Activities Control	
1.Under what circumstances may a criticality accident take place and what would be the maximum emission of radioactivity.	The design of the repository is intended for controlled long-term storage of vitrified HLW in the dry condition. The main hazards during the storage of the packages are: - Excess of the heat generated by the vit-HLW; - Water. To enhance the safety of the storage system the measures are applied to protect insulating materials of the storage facility and packages from direct contact with atmospheric moisture, condensation and ground water. These factors, in particular, were the cause of several accidents with the release of significant amounts of radionuclides in the operation of the radiation-chemical plants. Also, in case of failure of the system of natural ventilation and drainage of condensation occurring in water radiolysis the hydrogen, accumulating in an enclosed space, may form an explosive mixture with air. The lower explosive limit of hydrogen is equal to 4.2% by volume. This makes a necessity in organization and maintenance of the forced mechanical ventilation systems of the repository, as well as ensuring its reservation in case of the periods of hot and rainy weather. Insulating shields of cans in one way or another can be corroded from the time of filling them by the glass mass and the temporary storage in the units of the storage facility at PA "Mayak" taking into account the high humidity environment and high levels of radiation fields. To prevent from such a scenario at the storage repository level during the operation relatively stable conditions for preservation of packages are to be provided and maintained a by controlling the temperature and pressure inside the insulation system at the level of the packaging case and remove of the excess heat through the natural ventilation (passive method) or inclusion of the system of forced ventilation (active mode), as well as condensate drain into the collection well with the further control. In the process of storage the significant impact and other mechanical effects on the insulating cases are practically eliminated. See the answer to the item 3.

2. What is the maximum temperature that can be reached during intermediate storage in an accident after which the ability ventilation is lost (e.g. an extreme earthquake) and what would be the radioactive emissions (mainly cesium)	According to the initial data of vit-HLW supplier (Federal State Unitary Enterprise "Production Association" Mayak" Plant 235) the maximum temperature inside the can, of the glass mass seasoned for 20 years, is no more than 60°C. Heat generation is no more than 2 kW for $1m^3$ of glass mass. The design decisions taken to implementation for ventilation system in units and storage modules provide for safe mode of removal of the excess waste heat generated by the decay of radionuclides during a long-term storage of vitrified HLW cases as part of the cases and packages (containers), both under normal conditions and possible accident-prone situations. The possibility of generation of explosive concentrations of combustible gases and vapors (radiolytic hydrogen, etc.) in the free volumes of storage facility sections, as well as inside the canisters is practically impossible. Meeting the requirements of the criteria for reception of packaging cases in the sections of the storage repository for controlled long-term storage also provides for the conditions of minimization of the possibility of leakage, corrosion hazardous processes inside the insulating systems, and other chemical reactions throughout the project period of storage.
3. If extreme temperatures in case of the accident referred to above lead to the melting of glass and leakages, criticality analysis should cover this situation a well.	The implementation of organizational, technical and design decisions will reduce to a minimum the likelihood of critical phenomena (explosive concentration of combustible gases in the free volume, achieving a temperature at which the explosion is possible, achieving the pressure at which the package can be broken, etc.) Accordingly, the occurrence of events of emergency nature (burning and explosion of gas mixtures with the release of contamination outside the main protective barriers) in the systems of protection and insulation of vit-HLW will also be on the practicable minimum. In this regard, the release of radioactive contamination of the glassy matrix and diffusion outside the packaging case (cans, foam) during the long-term storage is not provided for. According to the initial data of vit-HLW supplier (Federal State Unitary Enterprise "Production Association" Mayak" Plant 235) sodium aluminophosphate glass as amorphous material has no melting point. Thermal stability of the glass mass ensures no changes in the structure of glass and water resistance to temperature 450°C during the storage.
4. What are the consequences of aft airplane crash or an act of terrorism.	Consideration for this effect is provided as by the standard documents and the IAEA Safety Standards, Safety Guide. №50-SG-D5. At the same time, the probability of this influence is small enough. In this case, the account of the airplane crash is mandatory only for the projects of nuclear power plants located in close proximity to settlements. During the design of nuclear facilities for other purposes - NPP or NCP etc. - the consideration of this impact is made by the special requirement. Air Crash statistics shows that the most often they occur during takeoff or landing of the

	airplane on the routs. In accordance with the IAEA Safety Standards it is considered that the potential danger of the crash should be taken into account if we have one of the following circumstances: - the airways borders or routes for airplanes landing located within 4 km from the plant; - there are any airports within 10 km from the plant site; - there are any military facilities or airspace to be used as a testing ground for practical bombing located within 30 km from the site. All of these conditions for the site of the projected storage repository for vit-HLW are absent. The explosion associated with the terrorist attack near the repository. Explosion of hazardous facilities near the storage repository could potentially lead to partial destruction of the storage facility elements with some release of radionuclides into the environment. However, in the immediate vicinity, near the borders of the sanitary protection zone, there is no production of explosives, no gas pipelines and etc. So the release of radionuclides beyond the borders the blast in a radius of 1 km will not take place. See the answer to the item 7
5.There are not précised the design data related to external events corresponding to the chosen site (for example: the seismic data design)	Seismic and tectonic conditions of the area The area is located within the Dnieper-Donetsk Basin, with the north-eastern slope of the Ukrainian shield at the area of its junction. Within the neotectonic (Neogene-Quaternary) stage of development of the territory there is more shorter quaternary phase. By the nature of movements at the neotectonic stage (Neogene-Quaternary movements) territory is a regional Ivankov neoblok on Quaternary stage - the regional Quaternary Ivankov-Nezhin unit. Regional Quaternary Ivankov-Nezhin block experienced a lowering of 15 m as a whole during the Quaternary period. Analysis of tectonic movements, structural and tectonic plan of the territory and the nature of sediment deposition in the upper part of the sedimentary cover indicates that the projected area is located outside the zones of the latest faults. East-European platform refers to the low-level seismicity. The closest seismic stations to the study area are located in the Carpathians, the Crimea and Belarus at a distance of 350-550 km and can detect earthquakes of the area only to the intensity of ground motion (M) $\geq$ 4,0. Weaker earthquakes of this area are not registered. The fact that no records of local earthquakes by the distant stations is not an evidence of aseismatic state of the area. The most studied seismically active regions are neighboring Carpathian and Crimean. Repeatability of earthquakes, seismic regime, the level of seismic activity is studied, the zones of maximum possible earthquakes are determined, attenuation of seismic

	waves in different directions from the source is estimated. The intensity of the ground motion from strong Carpathian earthquakes extends far to the Russian platform, reaching 5 points near Kiev. From the strongest Crimean earthquake in 1927 the observed intensity in Kiev was 3.8-4 points. According to the results of a comprehensive assessment of geological conditions made by Seismology Department ofIG NASU for the north-west of Kiev region, a major seismic hazard are Vrancea zone earthquakes. The estimated intensity of the seismic action (projected earthquake - PE) can reach to 6 points. Crimean region of earthquakes intensity of the seismic action may reach 5 points. The intensity of the earthquakes at the site of Industrial Complex "Vector" is taken into account according to ChNPP site and it is the following: - Design earthquake - 5 points by MSK-64 scale. Project Earthquake corresponds the frequency of recurrence - once in 1000 years; - Maximum calculated earthquake (MCE) - 6 points by MSK-64 scale. MCE corresponds the frequency of recurrence - once in 5000 years. According to Appendix G DBN A.2.1-1-2008 (Engineering surveys for construction), survey site included: - to category I complexity by geomorphological conditions; - Geological factors to the II category of complexity; - to Category II by the hydrogeological factors; - According to modern geological processes and phenomena to the First category of complexity; - For soils with special properties to the Category II complexity. In general, the studied area belongs to II (middle) complexity. EIA of the project was designed to meet the requirements of legislative and normative documents on environmental safety and environmental protection
	National Environmental Protection Agency
6.The request concerning an evaluation of risks associated to natural disasters (earthquakes, flood, etc.) that occur during the deposit operation or post-closure.	The repository is designed in such a way as to ensure resistance to seismic loads resulting from earthquakes, combined with all the other additional loads, existing under normal operating conditions. The building is designed so as to withstand the maximum design earthquake (MDE), equivalent to the maximum earthquake intensity of 6 points by MSK-64 scale and recurrence with a period equal to 5 thousand years (building structures calculations are from archive of SE "STC KORO"). The system is designed so that the maximum rainfall with the frequency recurrence equal to

	one event per 10,000 years, do not lead to infiltration of water into the storage facility even in case of local flooding. Upper floor mark of the storage facility building is above the adjacent area. The building is designed taking into account of the normal regulatory wind loads of 0.45 kPa, therefore the wind loads will not have negative impact on the safety of the repository. The building is designing on the basis of storage capabilities with the regulatory load values of 1.8 kPa, therefore the snowfalls will not have negative impact on the safety of the repository. The maximum wind speed in the area of work implementation does not exceed 47.3 m/sec (provision 0.01%). Thus the expected damage (Fuji F-scale) is classified as medium: torn roofs, broken windows, displaced or overturned light trailers, cars are on the roadsides. This damage can not affect the systems and components important for repository safety. Vitrified HLW, which are at the store of packaging cases in isolated reinforced concrete sections of modules will not be moved outside the places of their location in the repository. Fragments of the structures, in case of falling into the storage facility space will not be able to ruin the concrete overlapping of sections with a thickness up to 1.1 m.
7.The request concerning an evaluation of risks associated to terrorist attacks that occur during the deposit operation or post-closure.	The current level of physical protection of the repository corresponds the degree of protection which is applied to such kind of facilities that provides for protection from terrorist attacks.
8. The request concerning the evaluation of measures intended to be taken on long term environmental and human health protection including the environmental and public health monitoring within the impact/influence area of the deposit site.	Transfer, handling and storage of the vit-HLW in the building is carried out in closed sealed cases made of steel and stainless steel. At the same time HLW are enclosed in a matrix of a special glass. Therefore, radiation impact on the air environment is not taking place during the operation of vit-HLW repository. Inside the repository all the equipment runs on electricity, so that's harmful emissions from the operation of machinery and equipment are excluded. Non-radioactive aerosol emissions during the operation are possible when welding for covering of the stainless steel cases (in radiation protection chamber). The calculation of dispersion of harmful substances in the air of the nearest villages from the work area - on the border of Radinka, Starye Sokoly, Dityatki, which are located at a distance of not less than 20 km from IC "Vector". The largest concentration of harmful substances are expected at a distance of 150 m from the release point and it do not exceed 7E-05 mg/m3 (1E-05 of maximum permissible concentration (MPC) for carbon monoxide, 3E-05 mg/m3 (2E-4 MPC) for nitrogen dioxide. For the rest pollutants the maximum concentrations are less than 4 E-07 shares of maximum permissible concentration for air at working area (MPCw.a.) Calculated surface concentrations of harmful pollutants in the air at the border of residential places does not exceed the value 0.0000001 shares of single maximum permissible concentration

	(MPCmax.s.) - are standardized within in accordance with DSP 201-97 (State Sanitary rules of air protection of populated areas (from pollution by chemical and biological agents). Storage repository will be fully released from the vit-HLW in 100 years maximum. At the end of 100 years of repository operation the vit-HLW should be transferred to the disposal facility, which will be equipped in a stable geological formations.
9.Implement and maintain a permanent exchange of information on radiological monitoring results carried out impact/influence area of the deposit, mentioned above between the competent authorities.	Information exchange and consultations are to be carried out in accordance with the Article 5 of Espoo Convention.
«Romanian Waters» National Administration	
10.Study transmitted is summary and rely solely on mathematical modeling without using data and measurements made by accredited laboratories for similar installations. Since, the transboundary impact of operating the interim waste storage radioactive vitrified can be assessed from the point of view of water management, still require completion of the EIA documentation to the following aspects: environmental impact assessments of proposed technical solutions in the next stage of design and results specific engineering and environmental studies, as well as transboundary impact of the operation.	Project for monitoring of surface and groundwater provides: - control of radiation, physical and chemical characteristics of groundwater; - control of radiation and physical and chemical characteristics of rainwater and wastewater. For monitoring of groundwater after the completion of construction and before the start of filling the repository observation wells are to be created on its territory to a depth of 28 m. The wells are located at the four sides of the repository. The groundwater is monitored prior to the filling of repository (for obtaining of background characteristics) and during operation of the repository. The selected water samples are analyzing to determine the overall chemical and radionuclide composition. Total chemical analysis includes the determination of the following components: pH, EH, Ca^{2+},Mg^{2+}, Na^{+}, K^{+}, Al^{3+}, NH_4^{+}, Fe^{2+}, Fe^{3+}, Cl^{-} ,F^{-}, NO_3^{-}, NO_2^{-}, SO_4^{2-}, CO_3^{2-}, HCO^{-}, SiO_2, SS (synthetic surfactants), dry residue. Radiometric, spectrometric and radiochemical analyzes should include a definition of the following radioactive elements: ^{90}Sr, ^{137}Cs, TUE. The volume of samples: the complete chemical analysis - 1 liter, the concentration of radionuclides – up to 100 liters. Observation wells during the operation of the repository are tested once per year for general chemical analysis and quarterly for content of radionuclides. Measurements of water levels and measurements of well depth are carried out quarterly. Monitoring of wastewater includes sampling and analysis. Collector sewage network is integrated into the corresponding network of IC "Vector" site, where the control of volume activity and radionuclide composition should be carried out. At the territory of proposed repository the periodic monitoring of special runoff is carried out in a collection well. The effluent contains β- (^{90}Sr), α- (TUE) and γ- (^{137}Cs) emitting radionuclides. Thus total alpha activity of water should be less than 0,7Bq/l, total beta activity - less than 7.0 Bq/l, total gamma activity – less than 70Bq/l - volume 6 (NRBU- 97 table P.2.2 and OSPU-2005

	(Basic sanitary rules of radiation safety of Ukraine) Table. P.15.1.7) Wastewater is subject to the control and monitoring according to their origin and characteristics. Residential and industrial sewage and related biological treatment plant of IC "Vector" site is removing and treating all wastewater generated. Discharge of wastewater after treatment is provided in to the river Maryanovka. In case of presence of radioactive contamination of rainwater in the total amount, which is not exceeding the PCingest standards for drinking water according to the Safety radiation norms for Ukraine (NRBU - 97): - Strontium 90 - 1 x 104 Bq / m3; - Cesium 137 - 1 x 105 Bq / m3; - Cesium 134 - 7 x 104 Bq / m3. The following treatment is envisaged: - Self-treatment by mechanical suspensions by the natural sedimentation. - Biological treatment of organic contaminants and radionuclides by using microorganisms. Treatment is carried out by supplying of active sludge from unit sewage treatment plants of biological treatment into the rainwater sedimentation ponds. In this case, sludge has a high sorption capacity and a low percentage of desorption to the majority of radionuclides, most freshwater organisms, plankton and periphyton especially have a high coefficient of accumulation, the majority of bio-organisms have high resistance to radiation (105 Bq /l). For a more complete extraction of 137Cs there is a necessity in adding clay and bottom sediments into the ponds.
Ministry of Health	
11. The EIA Study must be completed the transboundary impact with the excess health risk assessment in scenarios incidents/accidents nuclear and "worst case scenario".	Vit-HLW repository does not belong to nuclear facilities. Analysis of the possibility of occurrence and prognosis of emergencies in the operation shows that the planned operation can not have much of any significant effect on the environment. Radiation exposure of the population is not expected, because treatment of vit- HLW is carried out in the exclusion zone, guarded territory, where access is prohibited to unauthorized persons. During normal operation, at all stages of the process of vit-HLW management direct contact of personnel with radioactive substances, as well as adverse effects on the environment is practically eliminated. All work places are equipped with control radiometric and dosimetric devices, provided with alarm (threshold) signaling See also the answers to the item 8.
Ministry of Regional Administration and Public Administration	
12. The document sent to us not treat the issues required	The repository is designed in such a way as to ensure resistance to seismic loads resulting from earthquakes, combined with all the other additional loads, existing under normal operating

by this authority (by the. 739/GLG/05.02.2015); Warehouse building design: design and execution of construction with consideration of natural hazard seismogenic sources depth / area of Romania (Vrancea and Maramues) given also the European objective of increasing insurance building earthquake action provided for in seismic design standards EN 1998-1 ... 6 Seria (Eurocodes). Using the design year of technical regulations / national standards in force, and their proper notification in the procedure for environmental impact assessment (e.g. correct version Ukrainian DBN norm A.2.1-1 statement in pt. 1 lit. ii)	conditions. The building is designed so as to withstand the maximum design earthquake (MDE), equivalent to the maximum earthquake intensity of 6 points by MSK-64 scale and recurrence with a period equal to 5 thousand years (building structures calculations are from archive of SE "STC KORO") The EIA of this project was developed taking into account the requirements of legislative and regulatory documents on environmental safety and environmental protection.
13. Environmental monitoring / objective: permanent tracking (daily) meteorological parameters (wind speed and direction, temperature maximum / minimum amounts of rainfall recorded, etc.), as well as seismic activities the construction site.	For continuous monitoring of meteorological parameters as the basic meteorological station for characterization of the climatic conditions of the region was identified the weather station Chernobyl, the most closely placed from the site in similar geographical conditions. The closest seismic stations to the study area are located in the Carpathians, the Crimea and Belarus at a distance of 350-550 km and can detect an earthquake with an intensity of the area of ground motion (M) $\geq$ 4,0.
14. Preventing, reducing and / or mitigating the negative effects: developing a guide for monitoring transboundary population of the states involved in cases of accidental radioactive pollution, including the assessment of medium and long-term effects on health.	During normal operation, at all stages of the process of vit-HLW management direct contact of personnel with radioactive substances, as well as adverse effects on the environment is practically eliminated. All work places are equipped with control radiometric and dosimetric devices, provided with alarm (threshold) signaling
15. Information periodica institutions of the States concerned: the provision under the Espoo Convention, information on, inter alia, meteorologic parameters and seismic events recorded at site.	Decisions will be made by the competent authorities: DAZV Ukraine and the Ministry of Ecology and Natural Resources of Ukraine.
National Administration of Radioactive Waste	
16. Taking into account that the selected site for the construction of vit-HLW storage facility is located inside the complex "Vector", which host several nuclear facilities, including Chernobyl NPP, we consider that the environmental impact assessment should also presents the cumulative impact of all the existing nuclear facilities inside the Exclusion	On the territory of the Industrial Complex "Vector" there are no facilities with nuclear materials. The Chernobyl nuclear power plant is located at a distance of 11km from the IC"Vector site.

ZoneTaking into account that the selected site for the construction of vit-HLW storage facility is located inside the complex "Vector", which host several nuclear facilities, including Chernobyl NPP, we consider that the environmental impact assessment should also presents the cumulative impact of all the existing nuclear facilities inside the Exclusion Zone.	
17. The current EIA documentation refers mainly to construction and normal operation of vit-HLW storage. We consider that it is also necessary to evaluate and describe the impact of accidents which could occur during the operation life of the facility (such as fire in the installations, drop of a radioactive waste package or failure of the electrical supply, especially in the line for loading the cases, the so-called "hot cell") as well as those occurring following external events such as: flooding, earthquakes, hurricanes, crashing aircraft or external fire	The issue will be considered at the next stages during the revision the Safety Analysis Report.
18. It is useful to evaluate periodically the safety level of the storage facilities; how frequent are this assessments foreseen?	According to the order SNRCU dated 07.12.2007 No168, requirements for structure and content of the Safety Analysis Report (hereinafter SAR) registered by the Ministry of Justice dated 19.02.2008 N134/14825, states that the SAR is submitted as part of the application documents to obtain the license for the processing, storage and disposal of radioactive waste, during the justification of the work performance safety of the following: - construction of the repository; - operation of the repository; - decommissioning of the repository. At the stage of operation the safety reassessment for the repository is to be done periodically on the basis of: • Uncertainty and sensitivity analysis on the parameters, patterns and scenarios; • Investigations on vit-HLW location site; • real characteristics of received packages of vit-HLW;
19. Are there any measures taken to mitigate the corrosion between the cans with vit-HLW and the steel cases in which the waste are hermetically sealed?	The service life of the case is at least 100 years. In the development of design documentation for the case the justification of service life of the case no less than 100 years will be provided by calculations as well as its resistance to external influences.

20. Ventilation and air purification systems are important elements in ensuring the operational safety of the hot cell and the storage; which are the measures taken into account for a possible failure of these systems?	For repository modules there are two types of ventilation system provided: primary natural and forced reserve system. Forced system activates in case of fail of the natural draft in the ventilation pipe. Besides the ventilation system is equipped with a filters that clean the air and make impossible the release of radionuclides to the environment.
21. What are the financing resources and mechanisms used to ensure the money needed for construction, operation, monitoring and decommissioning of vit-HLW storage?	The source of financing of the construction, operation, monitoring and decommissioning is the state budget of Ukraine, the State Fund of Radioactive Waste Management, producers of radioactive waste. The basis for the project "Construction of repository for interim storage of HLW returning from Russian Federation after reprocessing of spent nuclear fuel of Ukrainian NPPs" is: • the Law of Ukraine "On the State Environmental Program of Radioactive Waste Management"; • Order of the Cabinet of Ministers of Ukraine dated 23.12.2009. №1605-r "On approval of the feasibility study of investments of the second stage of the Industrial Complex "Vector".
22. Supposing that after 100 years (at the end of storage life-time), the final repository for HLW is not yet available, what scenarios do you have in plan?	Research implementation on further operation of the repository in case of impossibility of repository operation - construction of a new storage facility.
23. Please provide us a brief presentation of the emergency programmes related to the operation vit-HLW storage.	The emergency programs will be developed at the further stages of emergency plans development.
24. Please describe the measures for promptly and efficient information of the Romanian population and authorities regarding the results of radiological monitoring in the bordering area, during normal and abnormal vit-HLW storage operation.	Well-timed and efficient informing of Romanian public and authorities will be provided by the competent authorities according to the Article 5 of Espoo Convention.