

# SESSION OF EGRM NUCLEAR FUELS RESOURCES WORKING GROUP

“Focus on application of UNFC to nuclear fuel resources for sustainable development and integrated life cycle management of nuclear fuel resources for sustainable energy”

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## Nuclear Energy As a Dominant Pathway to Energy Efficiency for Sustainable Development of Ukraine



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## **Basic provisions on the use of nuclear energy**

- 1. Uranium is the most effective fossil energy carrier of our planet, in case of full burn-up, 1 kilogram of uranium with isotopic enrichment of up to 4%, used in nuclear fuel, releases energy, which is equivalent to that obtained through burning of about 100 tons of high quality coal.**
- 2. For the countries that have to import energy raw materials it is the most acceptable commodity energy carrier, which is the most suitable for creation of strategic reserves for energy security.**
- 3. A real situation in the power system of most countries using nuclear energy makes a refusal of it impossible as this increases their dependence on energy resource exporters.**
- 4. Further development of nuclear energy is determined by its provision with the real resources of uranium raw materials.**

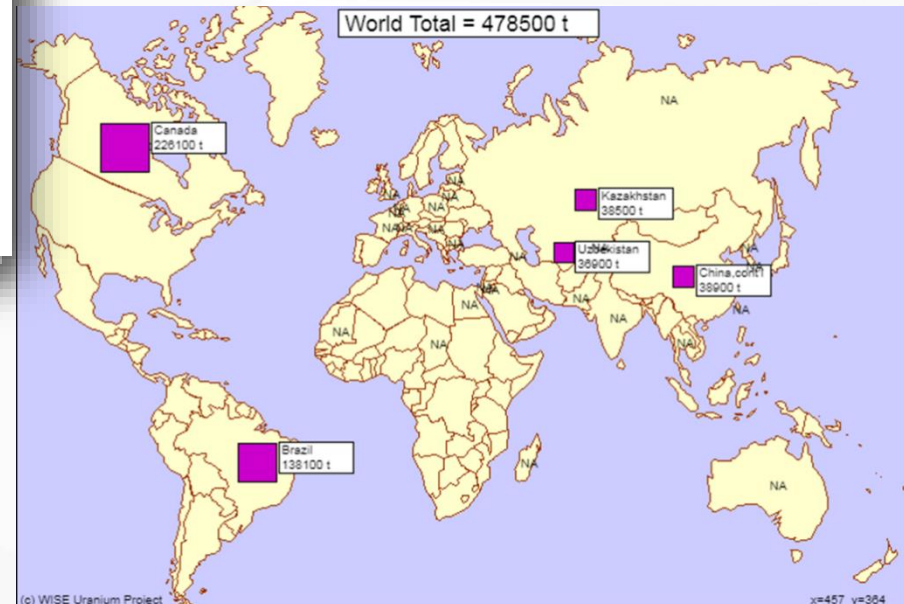
# Global distribution of identified uranium resources

(<USD 130/kgU as of 1 January 2015)

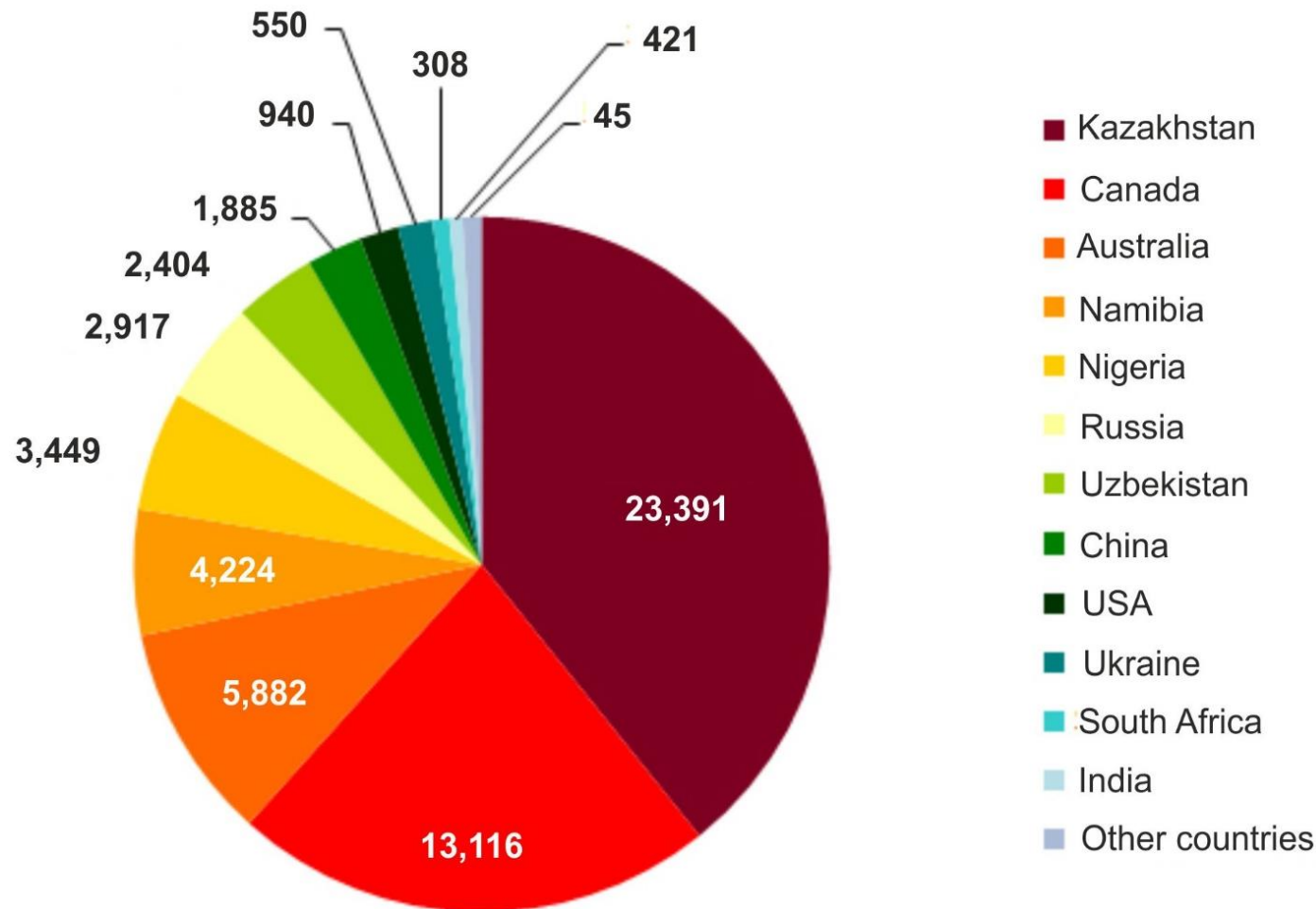


## Uranium Resources (RAR - \$40/kg U)

[t U] Reasonably Assured Resources (recoverable),  
1/1/2015, Cost range < US\$40/Kg U (OECD 2016)



## World Uranium Production (t) in 2019



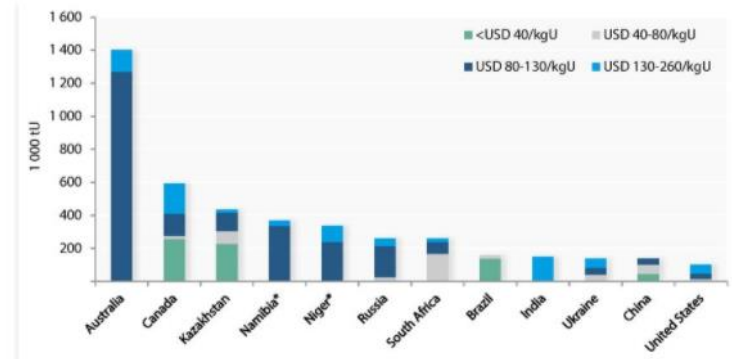
Source: World Nuclear Association



# CURRENT AND PROSPECTIVE URANIUM DEPOSITS IN UKRAINE



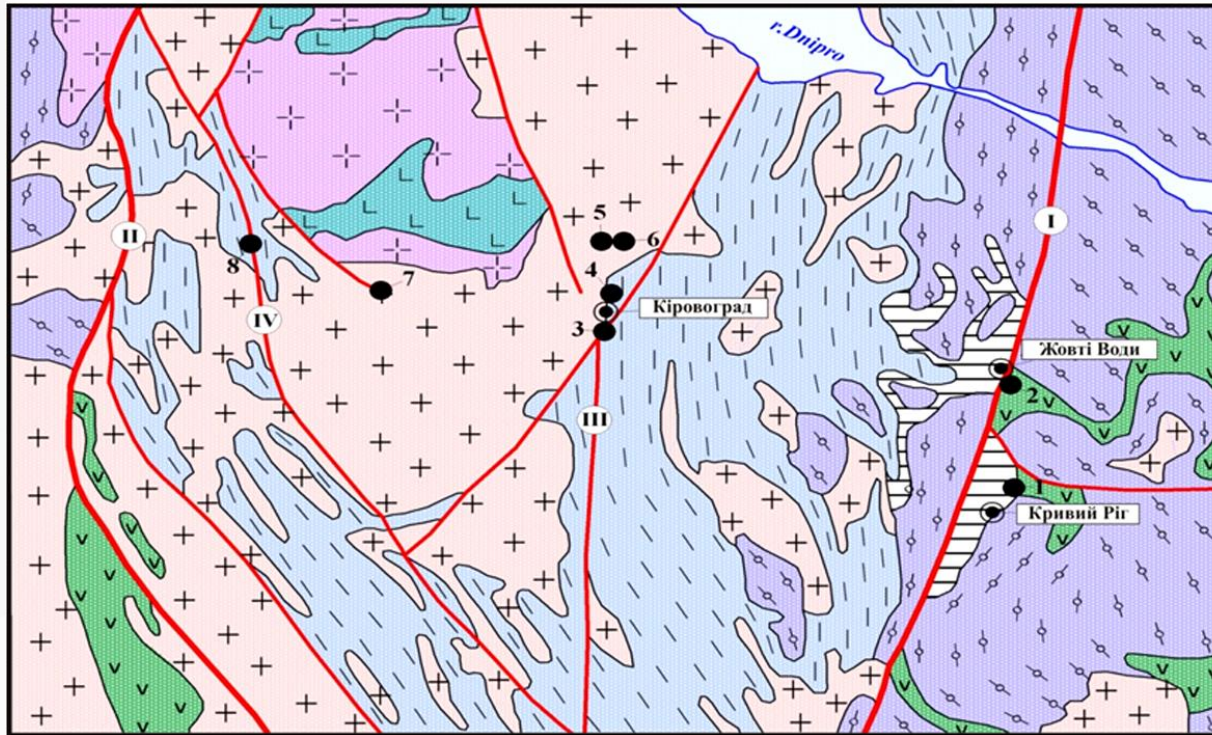
Distribution of reasonably assured resources among countries with a significant share of resources



As of 01.01.2017, explored and previously explored uranium reserves in the subsoil of Ukraine according to the RAR category of the IAEA Classification amounted to 157.2 thousand tons at uranium production cost less than 260 USD/kg, including those with the cost of less than 80 USD/kg – 48 100 tons.

## Need of Ukraine for Uranium in the Future According to IAEA

Prognostic year									
2015		2020		2025		2030		2035	
Variant									
(1 – pessimistic, 2 – optimistic)									
1	2	1	2	1	2	1	2	1	2
2,840	3,230	3,020	3,600	3,020	3,600	3,600	4,800	4,800	5,300



**Geological map  
of the central part  
of the Ukrainian  
Shield**

In Ukraine there are three geological-industrial types of the discovered uranium deposits.

**Metasomatic deposits** are located in the areas of tectono-magmatic activation of the Precambrian shields and connected with the fault alkaline sodium metasomatites.

In the Central Ukrainian ore area the metasomatic deposits are located in the sodium metasomatites (**Vatutinske, Michurinske, Novokostiantynivske etc.**).

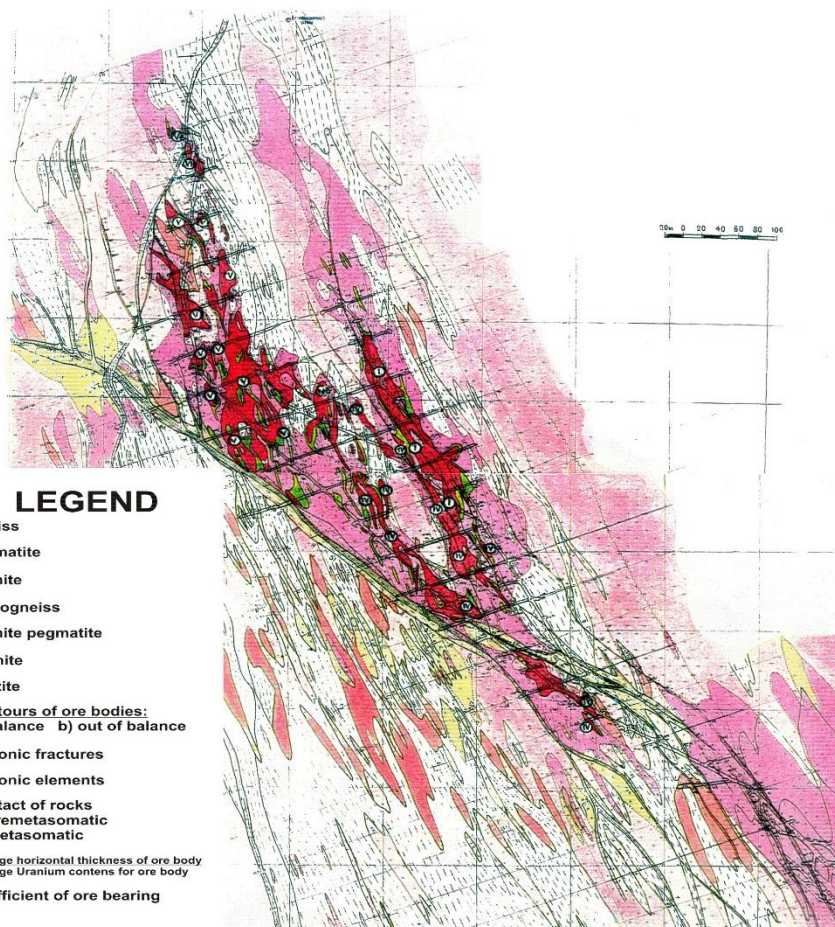
**Sandstone deposits.** Uranium deposits in the palaeovalley sediments of the platform stage of development of stabilized areas connected with the zones of sheet and formation oxidation (**Devladivske, Saphonivske, Bratske**) belong to a sandstone type.

**Intrusive deposits.** This type covers deposits in the post-granitized pegmatoids and silica-potassium metasomatites (**Pivdenne, Kalynivske, Lozuvatske**).

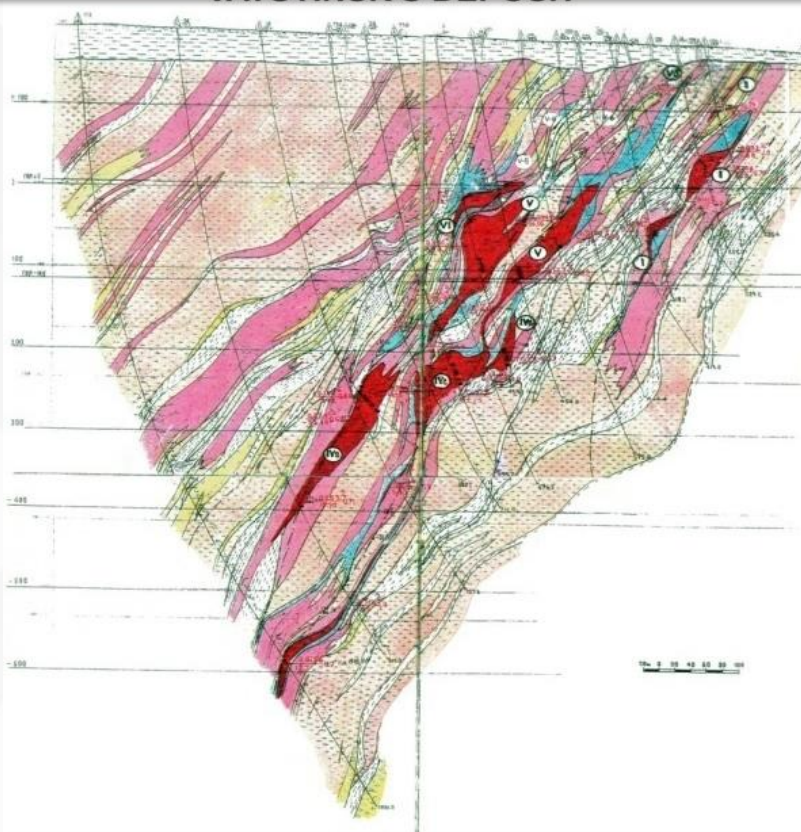


The **Vatutinske uranium deposit** is located in the central part of the Ukrainian crystalline shield formed by palaeogenic and ultrametamorphic granitoids of the Lower Proterozoic age.

According to the list of main geological types of economic uranium deposits given in the IAEA Red Book and accepted in Ukraine, the **Vatutinske deposit** belongs to a metasomatite type.



### Geological cross section of the Vatutinske deposit

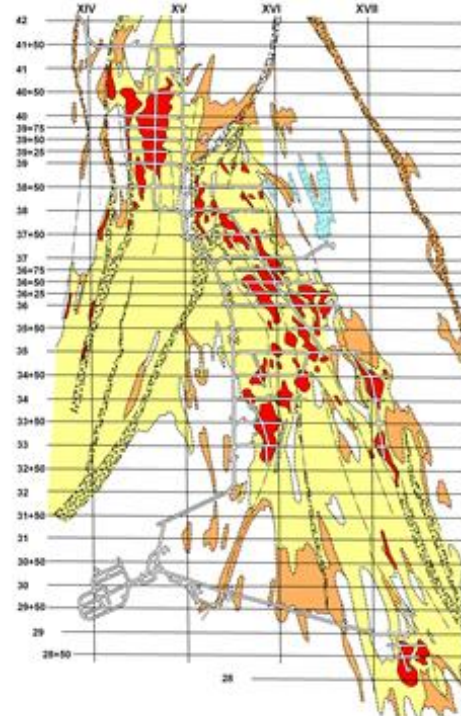


As of 01.01.2019 the uranium ore reserves of the Vatutinske deposit make by classes:







Class code of reserves	Ore reserves quantity, ths. t
111	1,456.58
211	171.36
221	642.67

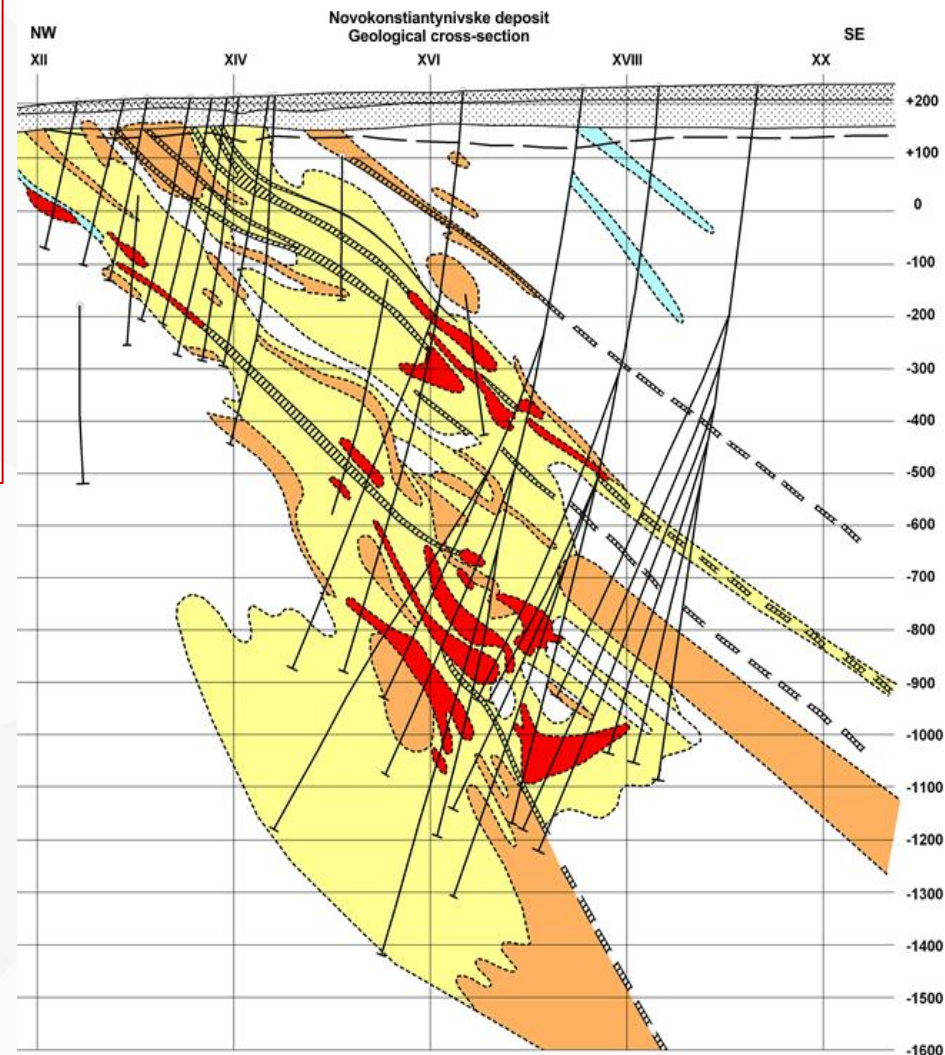


**Novokonstantynivske uranium deposit** is located 45 km to the west from the city Kropyvnytskyi. The deposit is directly related to the node of the northeast section fault and fractures of the submeridional north-western direction. Bodies of metasomatic albitites, where uranium ores are localized, are formed in tectonically processed granites of the Novoukrainskyi massif. Albitites form large bodies of complex morphology with a thickness of tens to hundreds of meters and a length of up to 1700 meters.



Novokonstantynivske deposit  
Geological plan  
of the horizon - 300

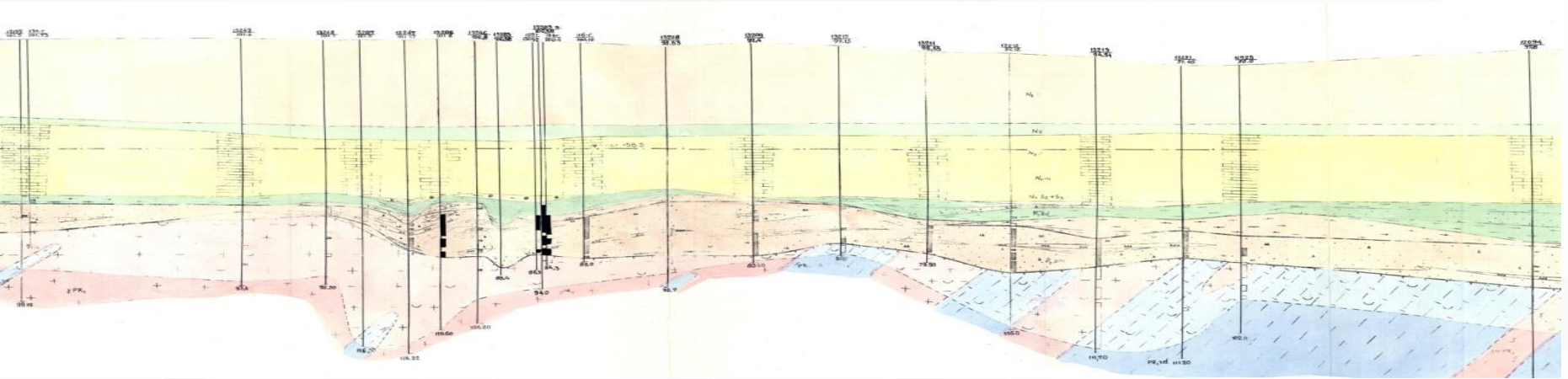
-  gneiss
-  granites
-  albitites
-  syenites
-  tectonic disturbances
-  contours of ore bodies





**The Safonivske deposit of uranium ores** is located in the Kazankivka District in the Mykolaiv Region at a distance of 120 km from the town of Zhovti Vody.

**Geological cross-section of the Safonivske deposit**



Report is used by Date	Block	Horizon	Class	U t
CSA Global en ERM Group company30 June 2020	Total Safonivske deposit	Main	Measured	1 315
			Indicated	1 659
			Inferred	524
			Total	3 498
		Lower	Inferred	1 217
		Total	122	4 715

**Main characteristics:**

**deposit type:** sand-carbon-clay sediments of the Middle-Upper Paleogene.

**geology:** morphology of ore deposits is mainly band-like, in some places isometric. Ore distribution in the deposit profile is one-layered, and it oftener has a form of ore-saturated zones, or lens-like morphology. Average thickness of the producing horizon makes 13.0 m, and average total thickness of ore bodies makes 7.2 m. The interval of ore bedding depth makes 50-70m.

**main minerals:** sorbed uranium in the carbon-clay minerals, uranium blacks. The content of uranium in ores makes 0.018%

## CONCLUSIONS

**The nuclear power system in Ukraine is provided with natural uranium reserves and resources in subsoil for nuclear fuel production during the long period for sustainable development of Ukraine.**

**According to the International Atomic Energy Agency (IAEA), nuclear energy of the world is only provided with uranium explored reserves for more than one century. The same quantity of uranium prospective and prognostic resources should be added to the explored ones.**

**Nuclear energy carriers are also secondary uranium resources including thorium, the quantity of which is almost three times bigger than the quantity of uranium in the bowels of the Earth .**

**The use of nuclear energy will further enable to create a base for acceleration of the sustainable development process of the mankind.**





***THANK YOU FOR ATTENTION!***

