National Classification of Ukraine as a Tool for Commercial Evaluation of Mineral Deposits according to International Standards

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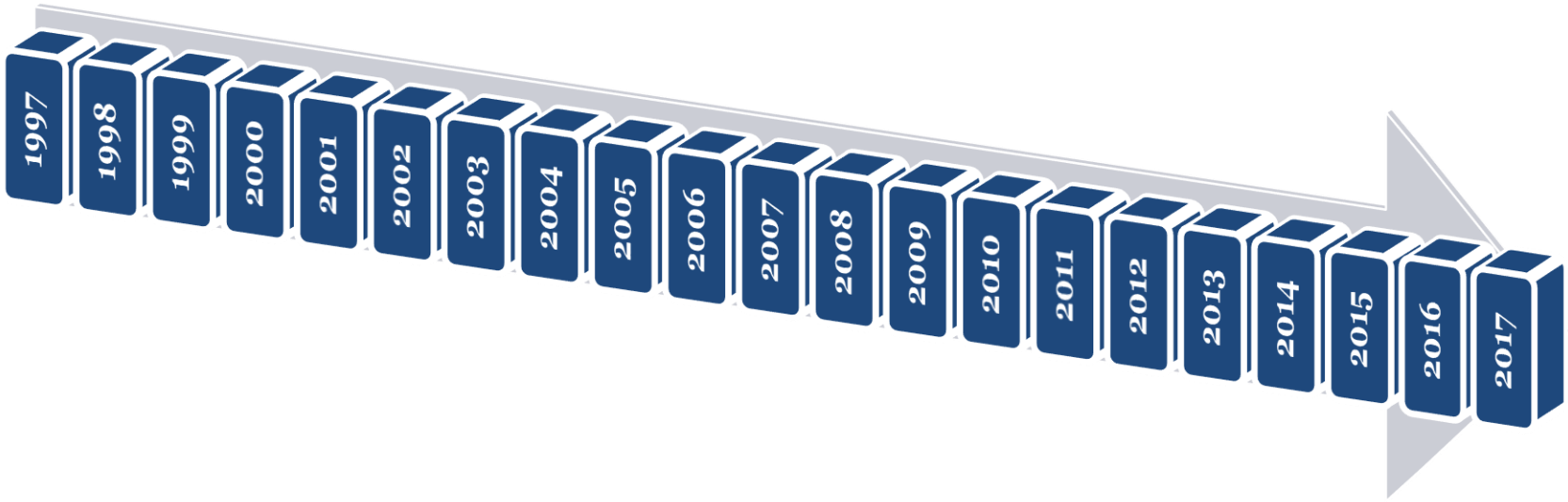
MINERAL RESERVES AND RESOURCES CLASSIFICATION OF THE STATE SUBSOIL FUND OF UKRAINE

Since 1997 Ukraine applies Mineral Resources Classification, which is adapted to all types of mineral resources (coal, oil, gas, non-metallic and ore minerals, and groundwater). The Classification was developed following the UNECOSOC Resolution No 227/1997 and approved by the Decision of Ukrainian Government of 05.05.1997 No 432. The classification is constantly being improved.

During 2012–2017 State Commission of Ukraine on Mineral Resources continued case studies on adaptation of National Classification to the UNFC-2009, and their comparison at the level of Categories and Sub-Categories. As a result Expanded Classification for Mineral Reserves and Resources of Ukraine was developed, which is fully adapted to the UNFC-2009 at the level of Categories and Sub-Categories.



EXPANDED CLASSIFICATION FOR MINERAL RESERVES AND RESOURCES OF UKRAINE

<table>
<tr><th>Socio-economic viability (E)</th><th colspan="2">Project feasibility (F)</th><th>Geological knowledge (G)</th><th>Class code</th><th></th></tr>
<tr><td rowspan="3">1. Balance reserves (1..)
E1
E1.1; E1.2</td><td rowspan="1">Producible and approved for develop-ment</td><td>EGE -1 (.1.)
F1
F1.1; F1.2; F1.3</td><td>Explored reserves (..1)
G1</td><td>111
(Proved)</td><td rowspan="3">Commercial</td></tr>
<tr><td rowspan="2">Proved for development</td><td rowspan="2">EGE -2 (.2.)
F2
F2.1; F2.2</td><td>Explored reserves (..1)
G1</td><td>121
(Probable)</td></tr>
<tr><td>Prospected reserves (..2)
G2</td><td>122
(Probable)</td></tr>
<tr><td rowspan="3">2. Conditionally balance and out-balance reserves (2..)
E2</td><td rowspan="3">Pending development</td><td rowspan="2">EGE -1 (.1.)
F1 (F1.3)</td><td rowspan="2">Explored reserves (..1)
G1</td><td>211</td><td rowspan="3">Potentially Commercial</td></tr>
<tr><td>221</td></tr>
<tr><td>EGE -2 (.2.)
F2
(F2.1; F2.2)</td><td>Prospected reserves (..2)
G2</td><td>222</td></tr>
</table>

EXPANDED CLASSIFICATION FOR MINERAL RESERVES AND RESOURCES OF UKRAINE

Socio-economic viability (E)	Project feasibility (F)		Geological knowledge (G)	Class code	
3. Commercial value is not defined (3..) E3 E3.1; E3.2 E3 (E3.3)	Development not clarified	EGE -3 (.3.) F3	Explored reserves (..1) G1	331	Non-Commercial
			Prospected reserves (..2) G2	332	
			Prospective resources (..3) G3	333	Geologically explored
			Inferred resources (..4) G4	334	
		EGE -4 (.4.) F4	Explored reserves (..1) G1	341	Residual quantities (additional)
			Prospected reserves (..2) G2	342	
			Prospective resources (..3) G3	343	
			Inferred resources (..4) G4	344	

…ALL UNFC-2009 CLASSES AND SUB-CLASSES HAVE THEIR ANALOGS IN TAXA OF THE EXPANDED CLASSIFICATION OF UKRAINE

ECONOMIC-GEOLOGICAL EVALUATION OF MINERAL DEPOSITS IN UKRAINE

In accordance with Ukrainian Classification, the categorization of mineral reserves and resources is conducted with reference to the results of the economic-geological evaluation (EGE)

Phases of geological, technical and economic assessment

EGE -1 Initial economic-geological evaluation	EGE-2 Preliminary economic-geological evaluation	EGE-1 Detailed economic-geological evaluation
SCOPING STUDY	PRE-FEASIBILITY STUDY	FEASIBILITY STUDY

ECONOMIC-GEOLOGICAL EVALUATION OF MINERAL DEPOSITS IN UKRAINE

- **In accordance with Ukrainian Minerals and Mining law (subsoil legislation), economic-geological evaluation of the industrial development efficiency is performed for each subsoil area, which is contemplated for development by a certain mining enterprise. Meanwhile, the utilization of all minerals and minor components lying within its boundaries is taken into account.**

- **Economic-geological evaluation of subsoil assets can be conducted directly by subsoil users, or on their behalf by other organizations that can ensure the qualified performance.**

- **Exploration maturity of the mineral deposits being under evaluation should meet the requirements of National Classification of Ukraine.**

ECONOMIC-GEOLOGICAL EVALUATION OF MINERAL DEPOSITS IN UKRAINE

involves:

- Analysis and generalization of the results of geological exploration including the definition of the geological model of the subsoil area
- Marketing research of market capacity for final products, the level of prices, taxes, terms of remuneration, ensuring energy and labor resources of potential mining enterprise, environmental and social conditions for the performance of mining operations
- Justification of the requirements for mineral raw materials, including the utmost permissible conditions for the deposits bedding, the quantity and quality of raw materials
- Delineation and calculation of balance, recoverable and proved reserves of mineral deposits and commercial components, which are the subject to sale
- Development of geological model for the mineral deposit

ECONOMIC-GEOLOGICAL EVALUATION OF MINERAL DEPOSITS IN UKRAINE

involves:

Justification of mining & operating conditions and exploitation indexes

- *Mining methods and schemes of mineral deposits production*
- *Annual capacity of the enterprise*
- *Loss and dilution*
- *The output of saleable product types*

Justification of economic conditions and financial indicators of field exploitation

- *Capital investment*
- *Operating expenses*
- *Cashflow*
- *Mineral Owner's or Lessee's Income*
- *Net Present Value (NPV) of mineral reserves*

Justification of optimum field exploitation project, technical and economic indicators of its effectiveness (the profitability ratio of the enterprise)

THE PRINCIPLES OF ECONOMIC-GEOLOGICAL EVALUATION

correspond to the generally accepted principles of developing investment projects in the world practice, including :

- **The effectiveness of commercial field development (object) is specified for the whole period of productive activity of extractive enterprise – from the moment of evaluation till dissolution**
- **The modeling of cash flows includes all cash inflows and cash outflows (costs) associated with industrial activity over the years of the production cycle, including remediation of the environment**
- **Calculations are performed for the date of Economic-Geological Evaluation using the procedure of discounting of future money flows**
- **Only FORTHCOMING (relatively to the time of evaluation) expenses and revenues of real money are included**
- **Technical-and-economic calculations should be performed with reference to the FINAL SALEABLE PRODUCTION of the mining enterprise that meets the requirements of the relevant standards and is sold by the subsoil user**

COMMERCIAL EFFICIENCY EVALUATION

The financial indicators of economic-geological evaluation define by means of **technical-and-economic calculations (feasibility study)** in accordance with the **Manual for the Preparation of Industrial Feasibility Studies** by W. Behrens and P.M.Hawranek, published by **UNIDO** (Vienna, 1991).

THE NET PRESENT VALUE of a project is defined as the value obtained by discounting, at a constant interest rate and separately for each year, the differences of all annual cash outflows and inflows accruing throughout the life of a project. This difference is discounted to the point at which the implementation of the project is supposed to start.

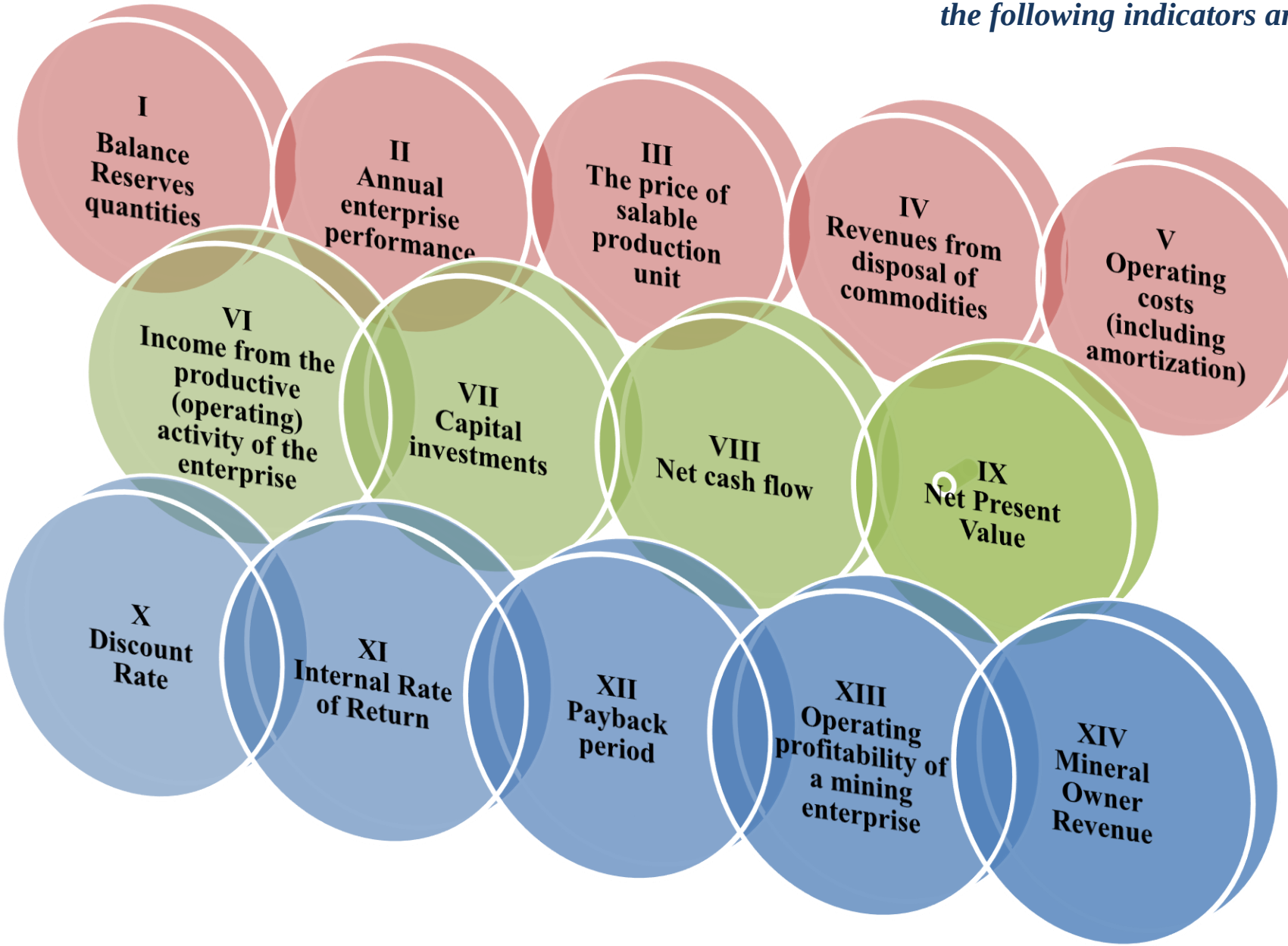
$$NPV = \sum_{t=0}^{T} \frac{[(Дt - Bt) - Пt] + At]}{(1+E)^t} - \sum_{t=0}^{T} \frac{Kt}{(1+E)^t},$$

NPV	Net Present Value, which is accumulated during the entire period of future production activities on an estimated geologic feature;
E	discount rate;
$Д_t$	annual income (revenue) from realization of salable production during t-year;
Bt	maintenance cost, including amortization during t-year;
Пt	tax and compulsory payment rate in t-year, which are not included to the amount of maintenance expenditure;
At	amortization in t-year;
Кt	capital investments into the industrial construction in t-year, including further geological exploration;
T	period of project life in years, starting from the zero-year
t	the number of the accounting year starting with the zero number

…The discount rate for the calculation is assumed to be equal to the rate of the National Bank of Ukraine (as the minimum rate of return). But it can also be a given specification of the investor in other sizes..

THE INDICATORS OF ECONOMIC-GEOLOGICAL EVALUATION

To substantiate the optimal approach for mineral reserves calculation and field industrial exploitation, the following indicators are used:



At determining the optimal way of deposit exploitation THE ADVANTAGE IS GIVEN TO THE APPROACH, which provides with the MAXIMUM RATE of cumulated NET CASH FLOW and THE INCOME OF THE STATE BUDGET with a POSITIVE NET PRESENT VALUE…

CONCLUSIONS

- **The above information on the practically applicable method of economic-geological evaluation (EGE) of mineral deposits in Ukraine demonstrates that the National Mineral Reserves and Resources Classification is fully adapted to UNFC-2009. The Classification and its application specifications meet the international standards recommended by UNIDO for commercial assessment of mineral reserves and resources.**

- **In the meantime, the outcome of mineral deposits economic-geological evaluation (mineral reserves and resources quantity, quality and preparedness for the industrial development, as well as the level of economic efficiency of capital and operating costs), which have been verified and confirmed by audit (expertise), so far can not be used to enter the public stock market and attract investment for the development of the mining industry.**

- **Stock exchanges, banks, and other financial institutions do not work with reporting on mineral reserves compiled in accordance with the classifications adapted to UNFC-2009.**

- **The prompt actions should be applied to resolve the issue..**

Thank you for your attention!