

STATE COMMISSION OF UKRAINE ON MINERAL RESOURCES

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The results of application, adapted to the UNFC,
Classification of mineral reserves and resources in Ukraine

In Ukraine, the activities on transferring the reports of mineral reserves and resources according to the UNFC-adapted Classification are performed in the following directions:

- applying the classification during the calculation and economic-geological evaluation of the newly found, explored or producing of deposits;
- transferring mineral reserves taken into account by the State Reserve Register into the taxa of the new classification;
- using the classification when forming the Annual Report of the reserves base state submitted by subsoil-using enterprises.

Calculation and economical-geological evaluation of the mineral reserves in ukraine is performed in the following cases:

- for technical and economic assessment of advisability of starting the exploration at the discovered potential deposits;
- for technical and economic assessment of advisability of starting the commercial development of the proven and thoroughly evaluated deposits;
- for technical and economic assessment of advisability of continuing the commercial development of a producing deposits.

According to the legislation of Ukraine materials of economic-geological evaluation of mineral reserves of all the explored and thoroughly evaluated deposits, as well as the reserves additionally explored in the process of the deposits development and the reserves remaining in the situ in case of liquidation of a mining enterprise are subject to a compulsory state expert examination.

Materials of the economic-geological evaluations of deposits submitted for the state expert examination include:

- characteristics of the geology aspects of mineral deposits, their technological properties, mining and geological conditions as well as other relations in the volume necessary for making design solutions in relation to production techniques and production systems as well as the schemes for processing of mineral reserves;
- technical and economic assessment of conditions for calculation of mineral reserves, providing for the most complete extraction of mineral reserves from the situ with the help of the modern commercial production and processing technologies under condition of observing the requirements of mineral reserves conservation and preservation of the environment;
- characteristic for methods and results of mineral products and testing and calculation of their mineral reserves;
- predictive economic evaluation of the total effect from deposit's exploitation after one or several variants with determining the predictive results of the entrepre-

neurial activities of a mining enterprise in the volume necessary for making an investment solution.

The experts of the State Commission of Ukraine on mineral resources conduct investigations, examination and analysis of the submitted materials of economic-geological evaluations of the mineral deposits and prepare conclusions according to completeness and quality of the exploration conducted, reliability of the discovered mineral resources/reserves, their readiness for commercial development according to the Classification of the mineral resources/reserves approved by the Government of Ukraine.

The decisions of the State Commission of Ukraine on mineral resources will be taken based on the expert conclusion and will be officially registered in the form of protocols.

In order to demonstrate the application of the Classification of 1997 in Ukraine standard contents of a State Commission of Ukraine on mineral resources protocol for approving reserves of gas and condensate deposits are given below.

Board of the State Commission of Ukraine on mineral reserves decrees:

Set the following conditions for calculation of hydrocarbon reserves deposits:

- lower limit of the collector's open porosity – 6,5 %;
- lower limit of the collector's gas saturation – 65 %;
- lower limit of the collector's permeability – $0.7 \cdot 10^{-15} \text{ m}^2$.

Approve the gas and condensate extraction factors according to the table:

Field	Gas extraction factor	Condensate extraction factor
B-166 ₂ , B-19	0.860	0.712
B-16B ₃₊₄ ; B-17a+б	0.585	0.347
B-17B; B-18	0.598	0.487

Approve the proven and prospected hydrocarbon reserves deposits (excluding production as of 01.01.01), which can be used for projection of commercial production:

Free gas reserves according to Table 1.

Table 1.

Field (block)	Reserves category		Current gas reserves by 01.01.01, mln. m ³					
	Present Classifica- tion of 1997	Classifica- tion of 1983	Total	Gas extrac- tion fac- tor	Economic (Recoverable) [ukr. Balance (extractive)]		Potentially economic [ukr. Conditionally balance and out balance]	
					Class code			
					111	122	221	222
B-16 б ₂ -1	C ₁	C ₁	599.0	0.860	508.9	—	90.1	—
B-17 а ₁ -1	C ₂	C ₁	96.9	0.585	—	56.7	—	40.2
B-17 а ₂ -1	C ₂	C ₁	272.0	0.585	—	159.1	—	112.9
B-17 б ₁ -1	C ₂	C ₁	1656.3	0.585	—	968.9	—	687.4
B-17 б ₂ -1	C ₂	C ₁	253.3	0.585	—	148.1	—	105.2
B-17 В ₁ -1	C ₂	C ₁	1939.3	0.598	—	1 159.7	—	779.6
B-17 В ₂ -1	C ₂	C ₁	780.0	0.598	—	466.4	—	313.6
B-18-1	C ₂	C ₁	229.2	0.598	—	137.1	—	92.1
B-19-1	C ₁	C ₁	2705.1	0.860	2291.7	—	413.4	—
Total	C₁	C₁	3304.1	—	2800.6	—	503.5	—
	C₂	C₁	5227.0	—	—	3096.0	—	2131.0
	C₁+C₂	C₁	8531.1	—	—	—	—	—

Condensate reserves according to Table 2.

Table 2.

Field (block)	Reserves category		Current condensate reserves by 01.01.01, thousand tons					
	Present Classifica- tion of 1997	Classifica- tion of 1983	Total	Condensate extrac- tion fac- tor	Economic (Recoverable) [ukr. Balance (extractive)]		Potentially economic [ukr. Conditionally balance and out balance]	
					Class code			
					111	122	221	222
B-16 б ₂ -1	C ₁	C ₁	74.9	0.712	50.5	—	24.4	—
B-17 а ₁ -1	C ₂	C ₁	24.6	0.347	—	8.5	—	16.1
B-17 а ₂ -1	C ₂	C ₁	69.2	0.347	—	24.0	—	45.2
B-17 б ₁ -1	C ₂	C ₁	307.4	0.347	—	106.7	—	200.7
B-17 б ₂ -1	C ₂	C ₁	47.0	0.347	—	16.3	—	30.7
B-17 В ₁ -1	C ₂	C ₁	246.3	0.487	—	120.0	—	126.3
B-17 В ₂ -1	C ₂	C ₁	99.0	0.487	—	48.2	—	50.8
B-18-1	C ₂	C ₁	29.1	0.487	—	14.2	—	14.9
B-19-1	C ₁	C ₁	73.5	0.712	50.2	—	23.3	—
Total	C₁	C₁	148.4	—	100.7	—	47.7	—
	C₂	C₁	822.6	—	—	337.9	—	484.7
	C₁+C₂	C₁	971.0	—	—	—	—	—

Reserves of concomitant useful components in free gas according to Table 3.

Table 3.

Field (block)	Reserves category		Concomitant useful components	Potential contents in gas, t/mln. m ³	Current reserves as of 01.01.01, thousand tons				
	Present Classification of 1997	Classification of 1983			Total	Economic (Recoverable) [ukr. Balance (extractive)]		Potentially economic [ukr. Conditionally balance and out balance]	
						Class code			
						111	122	221	222
B-16 б ₂ -1	C ₁	C ₁	ethane	91	55.0	46.0	-	9.0	-
			propane	59	35.0	30.0	-	5.0	-
			butanes	31	19.0	16.0	-	3.0	-
B-17a ₁ -1	C ₂	C ₁	ethane	67	6.0	—	4.0	-	2.0
			propane	31	3.0	—	2.0	-	1.0
			butanes	21	2.0	—	2.0	-	-
B-17a ₂ -1	C ₂	C ₁	ethane	67	18.0	—	11.0	-	7.0
			propane	31	8.0	—	5.0	-	3.0
			butanes	21	6.0	—	3.0	-	3.0
B-17б ₁ -1	C ₂	C ₁	ethane	125	207.0	—	121.0	-	86.0
			propane	70	116.0	—	68.0	-	48.0
			butanes	34	56.0	—	33.0	-	23.0
B-17б ₂ -1	C ₂	C ₁	ethane	125	32.0	—	19.0	-	13.0
			propane	70	18.0	—	10.0	-	8.0
			butanes	34	9.0	—	5.0	-	4.0
B-17B ₁ -1	C ₂	C ₁	ethane	78	151.0	—	90.0	-	61.0
			propane	44	85.0	—	51.0	-	34.0
			butanes	20	39.0	—	23.0	-	16.0
B-17B ₂ -1	C ₂	C ₁	ethane	78	61.0	—	36.0	-	25.0
			propane	44	34.0	—	21.0	-	13.0
			butanes	20	16.0	—	9.0	-	7.0
B-18-1	C ₂	C ₁	ethane	78	18.0	—	11.0	-	7.0
			propane	44	10.0	—	6.0	-	4.0
			butanes	20	5.0	—	3.0	-	2.0
B-19-1	C ₁	C ₁	ethane	81	219.0	186.0	-	33.0	-
			propane	23	62.0	53.0	-	9.0	-
			butanes	10	27.0	23.0	-	4.0	-
Total			ethane		767.0	232.0	292.0	42.0	201.0
			propane		371.0	83.0	163.0	14.0	111.0
			butanes		179.0	39.0	78.0	7.0	55.0

Approve:

Current (by 01.01.01) prospected free gas reserves and deposit's condensate, which can be used for projecting the further exploration and research and commercial production according to Table 4.

Table 4.

Field (block)	Reserves category		Current gas reserves by 01.01.01, mln. m ³				Current condensate reserves by 01.01.01, thousand tons			
	Present Classification of 1997	Classification of 1983	Total	gas extraction factor	Economic (Recoverable) [ukr. Balance (extractive)]	Potentially economic [ukr. Conditionally balance and out balance]	Total	condensate extraction factor	Economic (Recoverable) [ukr. Balance (extractive)]	Potentially economic [ukr. Conditionally balance and out balance]
					Class code				Class code	
					122	222			122	222
B-16 б ₂ -2	C ₂	C ₂	1834.2	0.860	1577.4	256.8	241.4	0.712	171.9	69.5
B-16 B ₃ -1	C ₂	C ₂	87.2	0.598	52.1	35.1	22.2	0.487	10.8	11.4
B-16 B ₄ -1	C ₂	C ₂	74.0	0.598	44.3	29.7	18.8	0.487	9.2	9.6
B-17 a ₁ -2	C ₂	C ₂	192.2	0.585	112.4	79.8	48.8	0.347	16.9	31.9
B-17 a ₂ -2	C ₂	C ₂	159.9	0.585	93.5	66.4	40.6	0.347	14.1	26.5
B-17 б ₁ -2	C ₂	C ₂	476.6	0.585	278.8	197.8	88.5	0.347	30.7	57.8
B-17 б ₂ -2	C ₂	C ₂	107.6	0.585	62.9	44.7	20.0	0.347	6.9	13.1
B-17 B ₁ -2	C ₂	C ₂	526.3	0.598	314.7	211.6	66.8	0.487	32.5	34.3
B-17 B ₂ -2	C ₂	C ₂	157.1	0.598	93.9	63.2	20.0	0.487	9.7	10.3
B-18-2	C ₂	C ₂	469.9	0.598	281.0	188.9	59.7	0.487	29.1	30.6
B-19-2+3	C ₂	C ₂	2869.3	0.860	2467.6	401.7	78.7	0.712	56.1	22.6
Total	C₂	C₂	6954.3	—	5378.6	1575.7	705.5	—	387.9	317.6

Based on the abovementioned tables we can see, that the estimation of hydrocarbon reserves after the new classification during the calculations and re-calculations of the hydrocarbon reserves provided for by the legislation of Ukraine in the process of their geological analysis and commercial production does not cause significant complications and allows to define the reserves of every deposit not only by sufficiency of geological information, but also by the level of preparedness for commercial development.

Report of changes in state of reserves and resources during their use will also be simplified, since the information on the level of preparedness for commercial development will be determined by the reserves class code.

Transferring the reserves of mineral resources taken into account by the state reserve register into the taxa of the new classification.

Activities on re-evaluation of reserves of hydrocarbon deposits being on balance sheets of state enterprises (SE) were started in 1999 by groups of experts of the state geological survey enterprises.

The same activities are performed by producing organizations and enterprises: 'Ukrnafta' LLC, SC 'Ukrgezvydobuvannia', SPE 'Chornomornaftogaz' and others.

The main principles of the hydrocarbon reserves and resources re-evaluation are the following:

1. Main contours of hydrocarbon saturation, positions of the gas-water contact, the oil-water contact, the gas-oil contact, the values of the oil recovery ratio, the condensate recovery ratio are not considered.

2. The calculation parameters previously accepted for the evaluation objects (fields) are not considered.

3. Previously approved estimations of reserves (figures) are not rounded off and are not defined without absolute necessity, in case the calculation parameters do not change.

4. The total oil-bearing capacity of the re-evaluation object does not change. The sum of reserves and resources or the fields' area in ordinary cases should remain constant.

5. Will be revised according to the requirements of the Instruction:

5.1. Categories of the extent of exploration and reliability of reserves and resources.

5.2. Position of limits between the categories.

5.3. The number of reserves and resources of different categories.

5.4. New category reserves and resources will be assigned the codes of the International codification UNFC.

5.5. Free gas extraction coefficients are not used.

6. Commercial significance of total hydrocarbon reserves does not change. In case they were not related to as economic, it is necessary to consider them as such. At the same time it is necessary to consider the balance reserves only those reserves, which are being extracted (recoverable).

7. According to the new Instruction, the hydrocarbon reserves are considered as such reserves, the commercial significance of which has not been defined since the reliability (exactness) of defining them does not allow making a more precise economic-geological evaluation of them. Accordingly, the prospected reserves cannot undergo a detailed technical and economic assessment.

8. In case the graphic data (area, capacity etc.) as of 01.01.1999 does not coincide with the table data, preference will be given to the table data.

9. In case the research and commercial production of the field has been performed, first it is necessary to contour the B or C₁ category reserves (according to the Instruction) and the recoverable reserves will be related to class 111.

10. In case the research and commercial production of the field has not been performed, all the C₁ category reserves will be transferred to the C₂ category and contoured according to the Instruction. The 'remainder' of the reserves area of the 'old' C₁ category can also be included into the new C₂ category, in case it is small. Significant 'remainder' of the reserves area of the C₁ category relates to the prospective resources.

11. The calculation block of the 'old' C₂ category can be partially or fully transferred to the new C₂ category in case they meet the new requirements, otherwise they will be transferred to the prospective resources.

12. Prospective resources previously related to C_1 or C_2 or C_3 categories, but transferred to the resources category in the result of the re-evaluation will all be related to the class under the code 333.

13. The class 332 reserves can be distinguished at the fields where no preliminary assessment has been performed.

14. The unrecoverable reserves equal to the difference between the total and recoverable reserves will be related to the out-balance reserves. At that the residual reserves of the C_1 category block will be related to the code 221 class, and the residual reserves of the C_2 category will be related to the code 222 class.

15. Research and commercial production will be considered performed in case more than 5% of the field's recoverable reserves have been extracted, or in case the formation pressure decrease of more than 5-10% has been determined at the field.

16. Collector efficiency level may be determined as according to the formation testing data so according to the bore geophysical survey data.

After the reserves quantity the total and balance (recoverable) reserves have insignificant discrepancies according to the Classifications of 1983 and 1997.

Integral indices of the oil reserves in oil-and-gas region in the State Reserve Register according to the classification of 1983 and the results of the expert re-evaluation according to the Classification of 1997.

SN	Indices	Total	OIL-AND-GAS REGION		
			Eastern	Western	Southern
1.	Data according to the Classification of 1983				
1.1.	Fields with oil reserves	26	10	9	7
1.2.	Number of evaluation objects	45	17	13	15
RESERVES					
1.3.	Total reserves of the C_1+C_2 categories (1983), thousand tons, including:	107881	18539	60699	28643
	extractive (recoverable)	26290	4616	15667	6007
	out-balance	609	—	—	609
1.4.	Total reserves of the C_1 category (1983), thousand tons, including:	63442	8067	44457	10918
	extractive (recoverable)	16079	2470	11606	2003
	out-balance	609	—	—	609
1.5.	Total reserves of the C_2 category (1983), thousand tons, including:	44439	10472	16242	17725
	extractive (recoverable)	10341	2146	4061	4134
	out-balance	—	—	—	—
PRODUCTION					

1.6.	Cumulative, thousand tons	811	155	639	17
	including: in 2000, thousand tons	62	8	50	4
2.	Re-evaluation data (Classification of 1997)				
2.1.	Fields at which the oil reserves re-evaluation has been performed	24	8	9	7
2.2.	Number of objects, the reserves of which have been re-evaluated	42	14	13	15
RESERVES					
2.3.	Total reserves, thousand tons	107543	18200	60699	28644
	including: out-balance	1828	—	—	1828
2.4.	Balance (recoverable) reserves, thousand tons	25997	4516	15667	5814
	including: after the class 111 code	34	34	—	—
	after the class 121 code	3699	1157	2542	—
	after the class 122 code	22264	3325	13125	5814

Integral indices of the condensate reserves on the oil-and-gas region according to the State Reserve Register and the results of the expert re-evaluation according to the Classification of 1997.

SN	Indices	Total	OIL-AND-GAS REGION		
			Eastern	Western	Southern
1.	State Reserve Register data according to the Classification of 1983				
1.1.	Fields with condensate reserves	27	23	1	3
1.2.	Number of evaluation objects	81	76	1	4
RESERVES					
1.3.	Total reserves of the C ₂ category (1983), thousand tons, including:	28375	19510	1	8864
	out-balance	47	—	—	47
	extractive (recoverable)	14313	8865	1	5447
1.4.	Total reserves of the C ₁ category (1983), thousand tons, including:	14681	12444	1	2236
	out-balance	47	-	—	47
	extractive (recoverable)	7239	5776	1	1462
1.5.	Total reserves of the C ₂ category (1983), thousand tons, including:	13694	7066		6628
	out-balance	—	—	—	—
	extractive (recoverable)	7074	3089	—	3985
PRODUCTION					
1.6.	Cumulative, thousand tons	643	621	—	22
	including: in 2000	65	65	—	—
2.	Re-evaluation data (Classification of 1997)				
2.1.	Fields at which condensate reserves re-evaluation has been performed	23	19	1	3

2.2.	Number of objects, the reserves of which have been re-evaluated	59	54	1	4
RESERVES					
2.3.	Total reserves, thousand tons	29466	20601	1	8864
	including: out-balance	—	—	—	—
2.4.	Balance (recoverable) reserves, thousand tons	14867	9392	1	5474
	including: after the class 111 code	246	84	—	162
	after the class 121 code	1101	1101	—	—
	after the class 122 code	13520	8207	1	5312

Integral indices of the gas reserves on the oil-and-gas region according to the State Reserve Register and the results of the expert re-evaluation according to the Classification of 1997.

SN	Indices	Total	OIL-AND-GAS REGION		
			Eastern	Western	Southern
1.	State Reserve Register data according to the Classification of 1983				
1.1.	Fields with gas reserves	66	33	18	15
1.2.	Number of evaluation objects	195	132	43	20
RESERVES					
1.3.	Total reserves of the C ₁ +C ₂ category (1983), mln. m ³ , including:	147987	103448	22494	22045
	out-balance	530	432	—	98
	extractive (recoverable)	147457	103016	22494	21947
1.4.	Total reserves of the C ₁ category (1983), mln. m ³ , including:	81646	59210	13555	8881
	out -balance	495	397	—	98
	extractive (recoverable)	81351	59013	13555	8783
1.5.	Total reserves of the C ₂ category (1983), mln. m ³ , including:	66341	44238	8939	13164
	out-balance	35	35	—	—
	extractive (recoverable)	66306	44203	8939	13164
PRODUCTION					
1.6.	Cumulative, mln. m ³	7522	7062	369	91
	including: in 2000, mln. m ³	830	777	53	-
2.	Re-evaluation data (Classification of 1997)				
2.1.	Fields at which the gas reserves re-evaluation has been performed	62	29	18	15
2.2.	Number of objects, the reserves of which have been re-evaluated	162	99	43	20
RESERVES					
2.3.	Cumulative reserves, mln. m ³	154028	103603	27213	23212
	including: out-balance	7415	1514	4720	1181

2.4.	Balance (recoverable) reserves, mln. m ³	146613	102089	22493	22031
	including: after the class 111 code	1478	1478	—	—
	after the class 121 code	19789	15114	1591	3084
	after the class 122 code	125225	85376	20902	18947

On the whole the results of the reserves re-evaluation show the insignificant change of the reserves sums:

— total oil reserves according to the Classification of 1983 amounted 107.9 mln. tons, an 107.5 mln. tons after the re-evaluation, gas reserves - 148 bln. m³ and 154.0 bln. m³, condensate reserves – 28.4 bln. tons and 29.5 bln. tons correspondingly.

At the same time the correlation between the proven and prospected reserves has changed.

For oil — the proved recoverable reserves after the Classification of 1983 amounted to 16.1 mln. tons, and 3.7 mln. tons after the re-evaluation, 81.4 and 21.3 bln. m³ for gas, correspondingly, and 7.2 mln. tons and 1.3 mln. tons for condensate. The greater part of the reserves was moved to the prospected category and cannot be considered as production-ready.

The above-mentioned data shows that the application, adapted to the UNFC, Classification of mineral reserves and resources in Ukraine will not cause any complications. At the same time, the simultaneous introduction of the gas extraction factors defined in the result of technological and economic surveys together with the new classification, will lead to noticeable decrease of the gas and condensate recoverable reserves of the 111 and 122 classes. Just as introduction of the requirement in the new classification, according to which the prospected reserves should be proven by their research and commercial production data, will lead to decrease of the prospected reserves of the 111 and 121 classes.

As a result of transferring the hydrocarbon reserves taken into account by the State Reserve Register into the taxa of the new classification, significant adjustment of the information on the quantity of the class 111 reserves ready for commercial development was performed and, correspondingly, the information on the possibility of increasing the oil and gas production at the enterprises the reserves of which have been re-evaluated.