SAVING SOLUTIONS FOR MINING IN JIU VALLEY

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Abstract: *This paper analyzes the situation of mining in the Jiu Valley mining basin in 2015 without taking account of measures taken subsequently, measures that led to upheaval in the entire mining Romania's mining area. Feasibility studies completed in 2015 by the University of Petrosani and S.C. Universal Cerc Proiect SRL for four viable mines at the time, resulted solutions continued acceptance of mining activities with appropriate investments. In the second part of the paper summarizes these solutions and political, legislative and governmental decisions to continue mining in the Jiu Valley.*
Keywords: *Jiu Valley, techno-economic solutions, political, legislative, governmental decisions*

1. General information on the Jiu Valley mining basin

Currently, the mining basin Jiu Valley remains the only national mining area able to achieve production of pit coal with geological reserves of about 450 million tons in leased perimeters, of which exploitable (for which exist license) 50 million tons.

Jiu Valley mining basin, located in south-western Romania, constitute the morphological point of view, a narrow and deep depression, one of the few that are in Southern Carpathians.

Is shaped like a triangle synclinal, asymmetric, oriented ENE-WSW direction, with a length of 46km and a width of between 2-9km, with a maximum at the confluence of East Jiu with West Jiu, covering 137.6 km².

Jiu Valley is a micro-region consists of three municipalities: Petrosani, Vulcan, Lupeni and three cities: Petrila, Aninoasa Uricani with a total population of 120734 inhabitants (census 2011) (fig. 1).

Link to Transylvania is secured by railway lines Petrosani-Simeria and DN 66A and with Oltenia by rail Petrosani - Tg-Jiu and DN 67A.

Fig.1 ***Positioning and towns in the mining basin Jiu Valley [3]***

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2. General information on geology of Jiu Valley mining basin

Works geological prospecting, exploration and exploitation have revealed the existence of 22 coal seams, numbered 0-21, characterized by areas of distribution, thickness and quality variables (from area to area and from seam to seam). Economic importance presents coal seams 3, 4, 5, 7, 8, 9, 13, 14, 15, 17, 18 (fig. 2).

Since currently only viable mines operating the coal seams 3, 5 and 13 in the below will only make a brief presentation of them.

The coal seam 3 is the main seam of the coal pit deposit from Jiu Valley basin, being settled in all mining fields. It is located about 25-50 meters away from rupelian-chattian limit. Coal presents highly variable thickness from 0.5m to 34m, with large differences in the direction and especially the tilt. In mining fields located in the eastern half of the basin the coal seam 3 shows thicknesses greater, exceeding 10m (average 18m), while the western side is smaller thicknesses, which drops to an average of 5.5 - 6 m. The roof coal bed 3 is made up of sandstone or limestone clay, well cemented, with alternating sandstone and clay with traces of plants. Bedding consists of sandstone concretions frequent sideritice.

The coal bed 5 is considered the second main coal seam. It is located at 35-75m in the roof coal seam 3 being formed from 1-4 banks in the eastern part of the basin and 4-8 banks in the western area. The thickness is quite uneven, pointing out areas thicker than mine fields Dâlja, Iscroni, Petrila, sometimes in Lupeni, Vulcan, Aninoasa, and in west thickness from 1-3m. On the southe-eastern flank of basin is a tendency for die out of coal seam. The first banks of coal seam 5, located at its upper part, is called "paprika" and is spontaneous inflammable, which pose exploitation.

The coal bed 13 shows expansion uniform in perimeter. It consists of 1- 2 coal banks. The roof is made of clay sandstone and marl with calcareous concretions and the remains fauna and the roof from clays and argillaceous sandstones with fossil sideritic concretions.

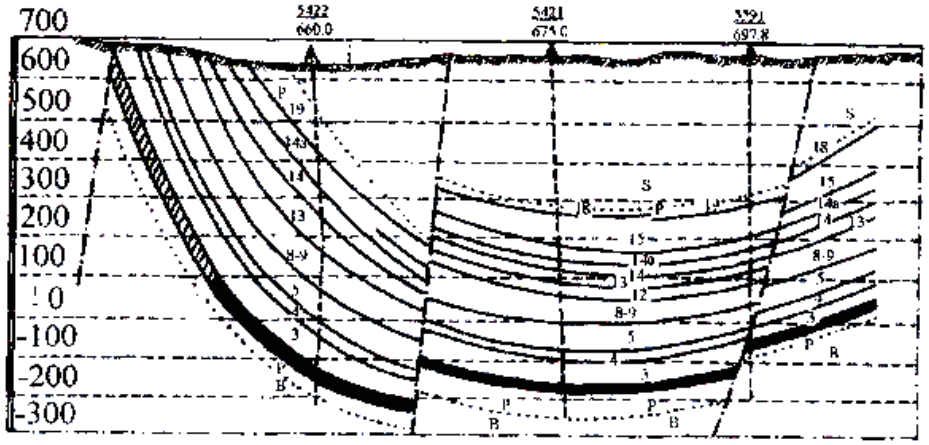


Fig 2. ***Structure of coal seams from Jiu Valley mining basin [3]***

Peculiarities of the basin are:

• *The large number of coal seams*. From among the 21 existing coal seams, have exploitable thickness only coal seams 3,4,5,6,7,8 / 9,12,13,14,15 and 17/18, having thicknesses greater than 1 m. These layers vary in thickness, have an inclination of 32º average in the northern flank of the western, eastern and 68º in the 10-15º in the center Paroşeni, the distance between them averaging 40m;

• *The intense tectonic,* effect of the evolution of tectonic basin which took place in a long time, causing besides main faults, an entire transverse, longitudinal and diagonal further system faults with expansions and amplitudes varied compartmented such basin below different shapes and sizes;

• *Strong accumulation of pit gas*, both in the coal deposit and the surrounding rocks, and release it within 10 to 15 m^3/t of coal creates problems for coal exploitation in terms of safety at work;

• *Self-igniting coal,* being determined by petrography and mineral content components: vitrite with a high capacity for absorbing oxygen and generating high speed oxidation temperature rise and the emergence of underground fires and pyrite, which stimulates the oxidation process.

Basin hydrographic network represented mainly by two rivers, *East* and *West Jiu*, is highly developed in the crossing mountainous area in the upper reaches of the Jiu. Density hydrographic network is 1.2 km/km^2, it is considered very dense.

Underground waters in the Jiu Valley, respectively water-bearing formation, is characterized by analogue hydrogeologic and lithofacies qualitative peculiarities and span large distances within High Jiu basin, a certain length of hydrogeological profile. Underground waters acidic pH.

The climate is temperate continental, with slight influences of Mediterranean currents, the average annual temperature being 6º-8°C. The climate is harsh, but not excessive, winters are not cold, summers are generally cool. The annual number of days with temperatures above 0°C is 193 and below 0°C is 172, representing the average of the values recorded at stations Parang and Petrosani.

Rainfall is the main source of provide rivers in the basin. Producing flash floods caused by heavy flooding are exceeding 40-50mm at short intervals of time (three to four per year).

The wind regimen is characterized by a period of calm (38%) and one wind (62%). According to the Beaufort scale of wind strength from this basin has the following distribution: strength 1: 43%, 2,3,4 strengths: 17% and 5,6,7 strengths: 3%.

Jiu Valley flora and fauna represent the elements which make it a center of tourist attraction. Coniferous forests predominate in the mountains, among which the most common are spruce and pine, zambra (pinus cembra), juniper, yew, etc. Oak and beech forests are common, sheltering numerous birds find their abode is the place where many animals like hare, wolf, fox, wild boar, deer, bear, chamois, bearded vulture species is found only in the Retezat Mountains.

3. Mining existing potential and its present situation

Of the 1.5 billion tons of coal reserves representing the Jiu Valley mining basin (after prof. Ludovik Mrazek) coal seam 3 holds 48%, coal seam 5 -16%, coal seam 13 -10%, the coal seams 4, 6, 7, 8, 9, 12, 14, 15, 17, 18 by 1.3% each. The coal seams 1, 2, 10, 11, 19, 20 are not included in the calculation of reserve balance.

After investigations petrographic and physico-chemical and industrial characteristics of coal from Jiu Valley, the specialists have concluded that we deal with coal pit and brown coal (coking and energy). The criterion of separation is to limit the calorific power of 5700 kcal/kg.

For all perimeters in operation, Hunedoara Energy Complex (CEH- SA) by Branch Mining Division (SDM) holds the operating license until 2024.

Coal pit extracted is subjected to a screening process after which the quantity that meets the quality parameters is delivered two power plants (Deva-Mintia Electrocentrale Branch and Paroseni Electrocentrale Branch, components of CEH), for the combined production of electricity and heat. This production is expected to be delivered in the form of coal pit sorted.

For four viable mines in the Jiu Valley mining basin, centralized, economically exploitable reserves (proven and probable) as of 01.01.2015 are shown in table 1. To this we can add the identified resources that reach approx. 400 million tons.

Table 1. ***Exploitable reserves from perimeters viable of Jiu Valley [1], [4]***

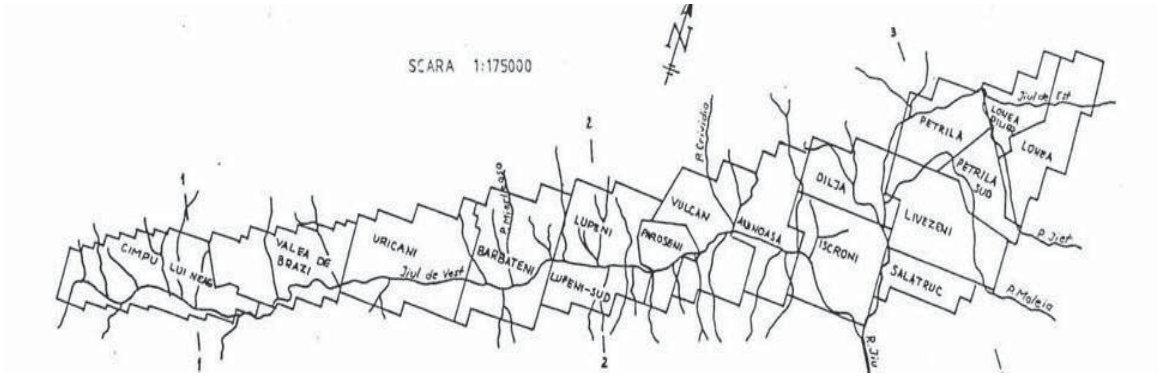
Mine	Mining production delivered in 2015, thousand tons /year	Economically exploitable reserves, thousand tons		Calorific power Q_{med}, kcal/kg
		Proven	Probable	
Lonea	200	1035.2	6055.3	4168
Livezeni	400	2045.4	15688.1	3432
Vulcan	250	957.3	6178.4	4129
Lupeni	440	2352.0	13341.3	3954
Total	1290	6389.9	41263.1	3921
General total		47653		

Total industrial reserves (capitalized) in the concession perimeters taken CEH- SA in 2015 is 47.653 million tons. This reserve can ensure continuity of operation over a period of 36.9 years at current production level of 1.290 million tons/year.

4. Mining perimeters and processing plants in Jiu Valley mining basin

In the Jiu Valley mining basin were delimited 14 mining areas (Fig. 3). Currently (2016), four are in operation (viabile mines - Lonea, Livezeni, Vulcan and Lupeni), three being closed (nonviabile mines – Uricani, Paroşeni and Petrila), and seven are closed already (Campu lui Neag, Valley Brazi, Barbateni, Aninoasa, Dâlja, Iscroni, Salatruc).

In 1989 and even in the 90s in the Jiu Valley mining basin there were five processing plants: Petrila, Livezeni, Coroesti, Lupeni and Uricani. Currently, coal preparation process, is concentrated in a single plant unit Coroesti, refurbished and modernized by Integrated Project Itochu-Kopex, dropping the other processing plants.



Fig, 3. ***Perimeters of the Jiu Valley mining basin [3]***

5. Business development for Jiu Valley mines after 1989

Following the work of mines in the Jiu Valley is noted the existence of several key moments in the evolution of the main indicators related to restructuring programs, as follows:

- *1998* was the year in which massive lay-offs in the fourth quarter of 1997 began to take effect, as demonstrated by significant productivity gains (about 28%) and lower total costs relative to 1000 lei production commodity 25.2%;
- for *the period 1999 - 2001* there was a steady increase in production based on significant increases in labor productivity and a significant increase in total costs, on the one hand, increases employment costs and, on the other hand, significant decrease in labor productivity in the workings front complex mechanized decline unmatched by productivity gains achieved with methods for operating the stopes front bench coal undermined in stopes with SCRI, while the share of production methods of operation remained constant;

- *2003* shows a dramatic increase in production costs due to rising mining costs achieved five of the ten units existing at that date, respectively Aninoasa mine with 5256 lei/1000 lei ware, Vulcan mine, 3204 lei/1000 lei ware, Paroşeni mine with 3854 lei/1000 lei ware, Barbateni mine with 3658 lei/1000 lei ware, and Brazi Valley with 5377 lei/1000 lei ware. If in Vulcan mine costs were caused by low production while restructuring the mine due to the explosion of the previous year, and if Paroşeni mine low production due to delays in the execution of preparatory work on shaping a new capacity for other units lack of reserves made it impossible to open by outlining and putting new production capacities;
- *Period 2004 - 2008* is characterized by a positive trend in all indicators primarily due to the effects of refurbishment projects, Itochu - Kopex and introducing new mechanized complex at Lupeni mine and secondarily due to increased mechanization of exploitation;
- *After 2008* there was a sharp drop in investments that will ensure only from its own sources and grants, indeed, from 2011 are granted. They will have repercussions on production extracts (decreased by 41%), number of employees (60% decrease), with fluctuations in production costs.

6. Workforce existing at CEH S.A. in 2015

In mid-2015 Branch Mining Division (SDM) of the Hunedoara Energy Complex were a number of 4659 employees: working staff (4137), overmen (197) and TESA (325). Of which 3433 were working underground, and the surface 1226.

An alarming finding is that the average age of employees at the four viable mines in the Jiu Valley is about 42, very close to retirement age. 25% of employees aged over 46 years and only 3% are young people aged between 18 and 25 years. Employees aged between 26 and 35 years, the most favorable period for solid training and experience, is only 9%.

7. Solutions for maintenance / development of mines' sustainable production capacity

7.1. Lonea mine

Taking into account the geo-mining conditions of the deposit from Lonea mine for general operation of the coal seams 3 and 5 in order to achieve production capacity of over 380000t/year and recovery of coal reserves in coal seam 5 (now abandoned), mode of operation most realistic is ***the operation coal seam 3 and the opening, preparation and partial exploitation simultaneous coal seam 5*** by applying the following scenario [4]:

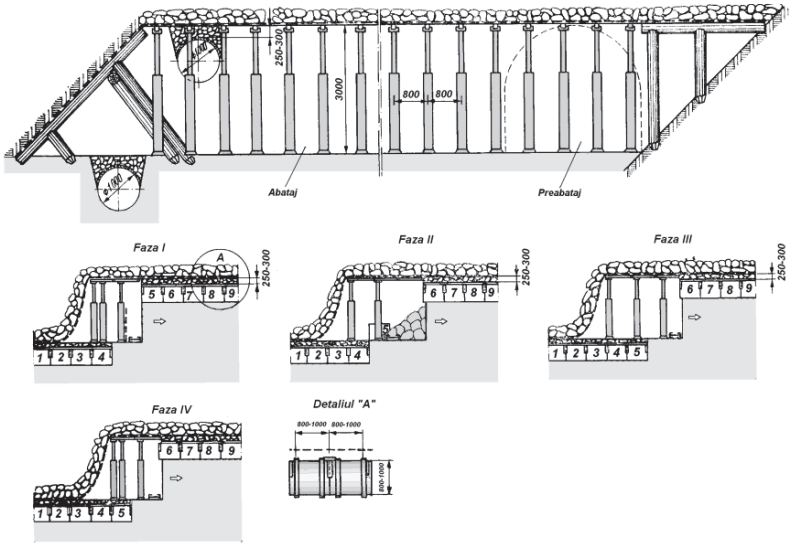
For coal seam 3:

• *Blocks IIB and IIIA* (from coal seam 3), to extract the full collapse horizontal slices of surrounding rocks, the ceiling of resistance, through stope technology with individual support (3,15m hydraulic props and hinged metal beams) and cutting combine with one drum (fig.4);

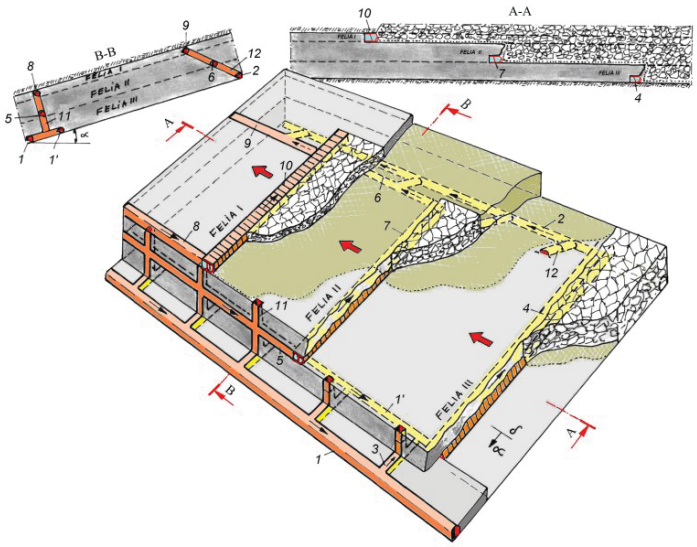
• *Blocks IIA and III B* (from coal seam 3), extract whit undermined banks in sublevels to 7.5m height (2.5m stope and undermined bank 5m) and stope technology with individual support (hydraulic props 2.5m and articulated spacers metal beams) and cutting coal by drilling-blasting. (fig.5).

For coal seam 5:

• Operating with long poles on direction, whit long stope fronts, using technology stope classic, represented by individual metal supporting of stope fronts (3,15m height props and beams hydraulic articulated length 1250mm) and cutting coal by drilling-blasting (fig.6).



Fig, 4. ***Mining technology with individual support under the ceiling of resistance and cutting by drilling-blasting [5]***



Fig, 5. ***Method whit undermined banks in directional sublevels [5]***
1,1'-directional conjugated roadways with floor transport; 2-directional air gate on the floor; 3-runs connecting; 4-stope front whit undermined bank in III slice; 5-directional path in II slice; 6-directional air gate in II slice; 7-directional frontal stope whit undermined bank in II slice; 8-directional path under the roof; 9-directional air gate under the roof; 10- mounting frontal stope in I slice; 11- transport raise, linking slices; 12 ventilation run, linking slices

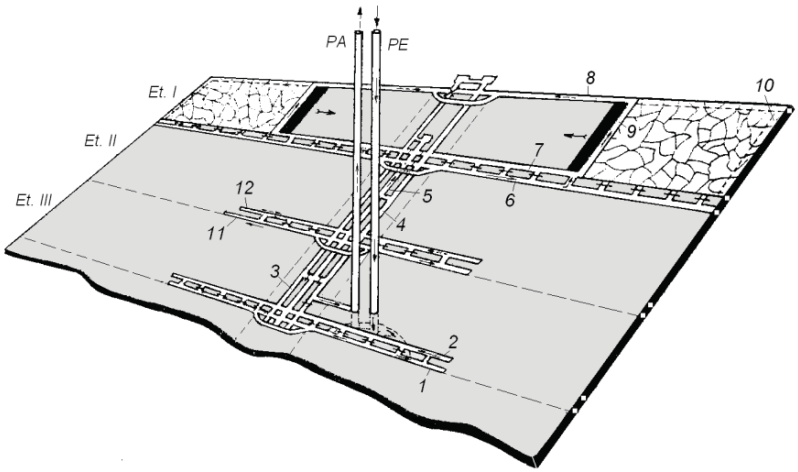


Fig.6. ***Mining method with long poles on direction, with long stope front [5]***
1, 2 – main directional conjugated roadways with floor transport; 3, 4, 5 - main run for transport, ventilation and circulation; 6, 7 – level directional conjugated roadways for transport; 8 – level directional air gate; 9 - directional longwall; 10 - run attack; 11, 12 – level directional roadways in cutting

Opening and preparatory workings to Lonea mine are developed on the framework of current opening and preparatory workings.

For the exploitation of the coal seams 3 and 5, in order to ensure achievement of and increasing economic efficiency, it is necessary to develop mining opening works in period 2015-2024, which are intended to be executed in two main stages, corresponding levels + 200m and + 250m.

Network workings opening take account of the general order of exploitation of the coal seams 3 and 5 and is optimized in terms of technical and economic, in accordance with the requirements of the ventilation system, general transport of coal and run of tailings, electric supply, materials supply, pit drainage and other utilities.

Preparatory workings required in period 2015-2024, for the exploitation of the coal seams 3 and 5, corresponding preparatory system of exploitation imposed by each method chosen.

For production capacity development priority attention should be given to **technical and technological equipment** on the surface activities, but especially those from underground. For all equipment are prepared, at present, the main technical data sheets required to purchase at

auctions, estimated cost values and their introduction is achieved staggering.

To establish the necessary utilities and technical solutions to ensure their promotion to the proposed variant, volumes are calculated networks (silting, firedamp detector, electrical, compressed air, water) and their purchase is made as to their timing.

For determining the duration of realization of the investment and main steps to be taken is achieved staggering, for the period 2016-2024, a ***total investment of 49967.614 thousand euros*** in Lonea mine and are prepared expense estimates of the costs necessary to achieve the objective.

7.2. Livezeni mine

Taking into account the degree of knowledge of the deposit, both in the areas of operating current and the adjacent, result with certainty the possibility of ***continuing exploitation coal seam 13 (blocks VII, VIIa, IX and X,) coal seam 5 (block VIII) and coal seam 3 (block VI, slices II and III)***, according to choose the best options for connection to existing mine workings framework [1].

From network analysis general opening of mining field Livezeni and the concrete conditions of deposit and technical-economic recovery, it can be concluded that there is no question of design other methods of opening, only extending and connecting them with new ones designed.

Opening the general concept is well defined and can be observed further, so to achieve production capacity and degree of reserves opened, will run complementary to existing mine workings.

The analysis of ***production*** levels can reach ***a maximum of 636100 t/year*** with a mitigation towards the end.

After analyzing the capacity of current technical and operational status of equipment of mine, the degree of wear and technical performance relative to forecast the development of new capacity in the analyzed period 2016 - 2024 resulting list of machinery and equipment required respectively underground utilities providing network list, their value and the phasing of the year in terms of quantity and value.

Project duration is 9 years resulting investment value as works of ***28409.033 thousand euros.***

7.3. Vulcan mine

Based on the analysis performed on the interpretation of the elements of knowledge of the deposit both in the areas of operating current and the adjacent resulted with certainty the possibility of ***continuing exploitation coal seam 3 in blocks VI, VII and part VIII, respective coal seam 5 in block VI to level 200m*** [1].

Evaluation of technical and economic opening, preparation and exploitation of coal seam 3, blocks VI, VII and VIII and coal seam 5 of block VI below level 310m was achieved in terms of choosing the best options for connection to existing mine workings framework.

From network analysis general opening of mining field Vulcan and the concrete conditions of deposit and technical-economic recovery, it can be concluded that there is no question of design other methods of opening, only extending and connecting them with new ones designed.

Opening the general concept is well defined and will be observed further, so to achieve production capacity and degree of assurance opened, will run complementary to existing mine workings.

Opening works designed to conduct the following steps:

Phase I is to open coal seam 3, blocks VI, VII, VIII between level 250m and 310m and the coal seam.5, block VI between level 310m and 255m.

Phase II is to open coal seam 3, blocks VI, VII, VIII between level 250m and 200m, and coal seam 5, block VI between level 250m and 200m.

Analysis of current technical capacity and operational status of equipment of mine, the degree of wear and technical performance relative to forecast the development of new capacity in the analyzed period 2016 - 2028 (***up to 400.000t/year***) allowed the establishment of the list machinery and equipment required to ensure that underground utility networks list, their value and the phasing of the year in terms of quantity and value.

Project duration is 13 years of investment resulting value as works of ***24670.082 thousand euros.***

7.4. Lupeni mine

Based on the knowledge of the deposit both current mining areas and the adjacent resulted with certainty the possibility of continuing exploitation coal seam 3, blocks II-IV-V-V South and coal seam 5 blocks IV-V South [1].

Evaluation of technical and economic opening, preparation and exploitation of coal seam 3, blocks II-IV-V-V South and coal seam 5 blocks IV-V South was achieved in terms of choosing the best options for connection to existing mine workings framework.

From network analysis general opening of mining field Lupeni and the concrete conditions of deposit and technical-economic recovery, it can be concluded that there is no question of design other methods of opening, only extending and connecting them with new ones designed

Opening the general concept is well defined and will be observed further, so to achieve production

capacity and degree of assurance opened, will run complementary to existing mine workings.

The analysis of ***production*** levels can reach a ***maximum of 639050 t/year***, which will be reached in 2018, after which it will drop gradually until the end.

After analyzing the current technical capacity and operational status of equipment of mine, the degree of wear and technical performance relative to forecast the development of new capacity in the analyzed period 2016 - 2031 resulting list of machinery and equipment required.

For your optimal work processes was provided underground with separate equipment list, that list to ensure underground utility networks, their value and the phasing of the year in terms of quantity and value.

Project duration is 16 years of investment resulting value as works of ***38.326.965 thousand euros.***

General comments for all four mines:

- from four viable mines, where you will be in the next 10-15 years made investments mentioned above, it can provide an annual production capacity of 2.05515 million tons;
- the two power plants which are part of CEH, CTE Paroşeni and CTE Mintia-Deva consume each year 0,7millions tons, respectively 1,5-1,8millions tons coal, so the annual demand of energy coal for these two power plants will be maximum 2,5millions tons, exceeding the possibilities of delivery of the four mines approx. 0,5millions tons. In the short term this deficiency can be assured of unviable mines, which are in the process of closing;
- if the analysis of possible options to the development of production capacities, are considered two possible options: the version without investment (zero option) and investment variant ("to do something"), then *zero option* void extracting coal under health and safety with negative consequences on the stability and safety of the national energy system and social effects and *investment variant* leads to the development of production capacities, resulting in a price of gcal acceptable;
- the sensitivity analysis it is noticed that the biggest fluctuations which could affect performance indicators, by varying the 1% are revenues. Failure to achieve projected in this regard may lead to unstreamline manufacturing activity implicitly to financial losses, outlining the possible risks that can modify the variables that are part of the revenue;
- it is proposed to finance the investment from its own sources by supplier credit or other sources in accordance with law.

8. Environmental protection in the area

Environmental impact assessment findings are based on study of the impact of human activities performed at each mine viable on environmental. Comparing results obtained by several methods can draw a final conclusion that **these mines the environment, although is subject to the effects of human activities within reasonable limits can occur at average risk acceptability and therefore the health of the environment must be constantly monitored**. Therefore it is considered that the *Compliance Program* from each mine, which is part of the *environmental Permit*, except for works to be performed and other works such as: filing avoid uncontrolled dumps; executing the fastening consolidation dumps in areas in an uncertain state of stability; for all dumps final solution must be reconstruction (repopulation vegetable or other uses); ongoing monitoring of surface areas under the influence of groundwater exploitation (subsidence areas) taking appropriate measures to avoid accidents and feed; refurbishment / efficiency of existing wastewater treatment plants as found in the outfall discharges pollutants exceeding maximum permissible concentrations; installation of effective filters for dust retention and disposal of pollutants emitted by fans and central heating stations; execution channels and riverbeds guard on the perimeter cones collapsing to reduce storm water quantity. All mines will have to implement an effective system of continuous monitoring of the environmental components under the ***Mining Industry Strategy for the period 2012-2035,*** which states that by 2020 to create basic infrastructure for the national integrated system for monitoring environmental impacts will develop and will operate as an effective instrument of prevention, planning and response in emergency situations, and until 2030 to complete the implementation of infrastructure for monitoring the National Integrated System for Monitoring of Environmental Impact (SNIMIM) and bring it in *System European Reaction to Emergency situations* (SCERSU) cost share allocations being 10-15% of annual programs.

9. Priority goals for the future exploitation of coal pit deposit from Jiu Valley

Jiu Valley mining area is one of Romania where currently exploiting a coal pit deposit, which has important reserves of balance that can ensure beneficiaries' needs (CTE Paroşeni and Mintia) for a period of several decades.

Of the 22 coal seams contained in this deposit currently being exploited coal seams 3, 5 and 13.

Complicated tectonics ore deposit makes this one of the most complex existing coal deposits in the world and very difficult to operate by the methods

and technologies widely used worldwide. Add to those difficulties emanations of methane, coal tendency to self-ignition, low stability of rocks, large depth of positioning of small and medium coal seams and their inclinations.

These conditions difficult geological and mining led the most use of traditional technologies with low yields and high consumption of labor and materials.

Structural changes that have occurred in the Romanian economy led to layoffs / redundancies collective personnel reorganization / activity restrictions in the mining units and the closure of some mines with no prospects of viability.

Currently in the Jiu Valley mining basin operates four mines, considered viable (Lonea, Livezeni, Vulcan and Lupeni) and three are in various stages of closure (Petrila, Paroşeni and Uricani). Since 2016 and the four viable mines became insolvent.

So, mining sector of coal pit deposits exploitation in Romania, i.e. mining activities in the Jiu Valley mining basin, are at an impasse from which it can exit not only by technical and organizational measures but through responsible political decisions.

The following plot some of the measures / priority decisions to be taken as a matter of urgency, to rescue the sector mining potential, tradition and necessity for the Romanian economy.

National and European political decision: **repositioning of coal as a primary energy strategic source.**

To discuss at this time, coal exploitation in Romania have European and national bodies to answer the following question: ***there is in the European Union strategy/policy and implicitly in Romania to use the solid fossil fuels for produce electricity and heat?*** If **YES**, then it has taken the following decisions [2], [3]:

Legislative decisions:

- the support to use methane gas from coal in areas licensed (CBM);
- the extension operation period of collective dismissal by 2018;
- the practicability to use by the viable mines of machinery, equipment, material support etc. are recovered from the mines being closed;
- the establishment a target price or a grant of the price of gcal whit difference between the cost price and the trading market.

Government decisions:

- the approval of investment of approx. **142 millions Euro** for the endowment of four mining with equipment and mining technological performance equipment, reliable, automated and high productivity as data sheets developed and are in possession of each operation;
- the purchase of equipments and technologies for processing inactive tailings dumps, recovery of these fractions carbonaceous fuel dumps and introduction of energy in the circuit;
- the purchase of equipments and technologies for gathering of CH_4 from underground in order to use it to produce thermal energy;
- the endowment every mine whit sorting plant, reliable, automated to improve the quality of coal supplied to two power plants;
- the providing human resource - competent staff, specializing in mining by activating vocational schools, post-secondary courses and vocational courses;
- the establishment of a National Institute for Research and Development Mining, law institution public, role to coordinate and approve the entire research - development - innovation and the information and technology transfer in the mining industry in Romania;
- the completion of the desulphurization installation of the flue gas from Paroşeni CET (works executed 90%);
- if the decision to close and mines viable, taking into account the maintenance in operation of Livezeni mine and Vulcan mine, which could provide the necessary fuel for at least Paroşeni CET.

If we do not take account of these decisions, the mines in the Jiu Valley will close with a major social impact for people in the region, which relies heavily on the exploitation of coal, mostly in the area. It also imperils the operation of power plants based on coal, with major implications for the population - risk not being able to feed residents with heat heating during the winter, hot water supply interruption - resulting in major discomfort for residents.

Note: At the time (november 2016) in which this work was ready to be sent for publishing news that appears: *Romanian Government adopted a memorandum on increasing state aid granted to the National Society of Mine Closures Jiu Valley (SNIMVJ) with 129 milions lei (approx. 28,7 milions euros) for inclusion in the closure (until end 2018) belonging to two mines unviable Hunedoara Energy Complex: Lonea and Lupeni*.

The authors, us knowing why the Government believes, that the decision failed to consider the feasibility studies carried out for the four mines viable preference to grant a sum of money for closing, representing approx. 75% respectively 57% of the amount (spread over a period of 16 years respectively 9 years rather than two years as the state aid) that would have revived Lupeni mine respectively Lonea mine that energy sector would be given over 600000 t/year, respectively 380000 t/year, and would have

improved socio-economic conditions of Lupeni, respectively of eastern Jiu Valley, and in general the whole area. At the same time authors and some satisfaction that mines will remain viable are those that concern them and they, as a last resort, in this paper, but also in [2] and [3] in the bibliography below.

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