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ANALYSIS OF SUSTAINABLE DEVELOPMENT OF COAL SUPPLY FROM THE PERSPECTIVE OF THE ENERGY SECURITY IN THE EU AND THE SLOVAK REPUBLIC

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Abstract: *This paper analyses sustainable development of coal supply from the perspective of the energy security. Initial chapters provide briefly characteristic of energy security and sustainable development in the European Union and the Slovak Republic and are also dedicated to analysis of mineral fuels utilization in the Slovak Republic. An essential part of the paper describes the importance of the mentioned fossil fuel in ensuring energy security of the Slovak Republic as the European Union member state. Based on the specific kinds of moving averages, the prognosis of gross inland consumption of coal in the Slovak Republic until 2018 is calculated. Estimated evolution of gross domestic consumption of coal in the Slovak Republic together with estimated extraction of brown coal in the Slovak Republic will influence also demand for import of this fossil fuel to the Slovak Republic. In the second part of the paper are studied the general economic interest in the production and supply of electricity from domestic coal and processes of restructuring of the domestic coal production. The last chapter summarizes possibilities of future use of coal in the Slovak Republic.*

Keyword s*:* Sustainable development, energy security, coal, gross domestic consumption of coal, general economic interest

1 INTRODUCTION

Energy security issues are highly topical theme in the world, at EU level as well as within the Slovak Republic framework. Energy is a part of almost all negotiations and affects relationships of not just individual states but also large clusters for example EU-US or EU-Russia relation and so on.

The concept of energy security is relatively new. It was implemented to the theory of international affairs by Copenhagen school in the early 1990s. There are many definitions of energy security in practice. [1] defines energy security as „*the availability of sufficient supplies at affordable prices*“, while admits that „*different countries interpret what the concept means for them differently*“. Whereas the Slovak Republic is a member state of the European Union, it is important to mention the definition of the European Commission which describes the energy security as „*the ability to ensure that future essential energy needs can be met, both by means of adequate domestic resources worked under economically acceptable conditions or maintained as strategic reserves, and by calling upon accessible and stable external sources supplemented where appropriate by strategic stocks*“ [2]. In the Slovak Republic the energy security is defined as a reliable supply of energy and ensuring access to energy resources and fuels in the required quantity and quality at affordable prices [3].

For the purposes of this paper, it is necessary to indicate the three basic forms of energy security:

- External security (or energy supply security) – means „*esuring that the imported energy products meet the needs of the consumers in time and quantity*“.
- Internal security – means „*ensuring that the national production, transmission and distribution system are able to provide final customers with the energy they need*“ and.
- Energy consumption – which „*has a significant impact on energy security by means of its volume and quality*“ [4].

Energy policy and energy security issues are part of the strategic documents setting out the direction of the energy sector in the European Union. In January 2007 the European Commission published Communication “An Energy policy for Europe”. This Communication, while respecting the sovereignty of individual EU countries in setting out their energy mix, established three basic pillars of the EU's energy policy up to 2020 [5]:

- Energy security.
- Competitiveness.
- Sustainability.

The European Council in March 2007 adopted the EU's new energy and environment policy which established *„a forward-looking political agenda to achieve the Community's core energy objectives of sustainability, competitiveness and security of supply*" [6]. This document became the basis for the development of the legislative framework in the next period.

The main principles and objectives in the field of energy by the year 2020 are based on the strategy Europe 2020 and are further elaborated in Communication "Energy 2020: A strategy for competitive, sustainable and secure energy". According to this document the new energy strategy focuses on five priorities:

- „Achieving an energy efficient Europe.
- Building a truly pan-European integrated energy market.
- Empowering consumers and achieving the highest level of safety and security,
- Extending Europe`s leadership in energy technology and innovation.
- Strengthening the external dimension of the EU energy market" [7].

In December 2012 the European Commission released Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – "Energy Roadmap 2050". This document established a framework for long-term measures in the field of energy and in other related sectors. *„The EU is committed to reducing greenhouse gas emissions to 80-95% below 1990 levels by 2050*" [8].

"Energy policy of the Slovak Republic" is in accordance with the EU energy policy. This document indicates the future direction of the energy sector of the Slovak Republic in the long term. Its task is to ensure a well-functioning energy market with a transparent competitive environment and optimal conditions for investments in the energy sector. Above mentioned document also defines four pillars of the energy policy of the Slovak Republic [9]:

- Energy security.
- Energy efficiency.
- Competitiveness.
- Sustainable energy.

Energy security issue of the Slovak Republic is elaborated in complex and detail way until 2030 in the strategic material "The proposal of Energy Security Strategy of the Slovak Republic" approved on 19th October 2008 by the Resolution of the Government of the Slovak Republic No. 732/2008. This document sets out the priorities and proposes a series of measures to increase the energy security of the Slovak Republic.

Issues of energy policy and energy security should be understood in relation to sustainable development. By the careful assessment of measures in these areas, national governments can help to maintain healthier environment for future generations. Responsible approach to the extraction of non-renewable energy sources also allows preserving part of their volume for the future.

Issue of sustainable development started to be discussed at the turn of 60s and 70s of the 20th century. In this period the knowledge extended, that unlimited or uncontrolled growth of any type (population, production, consumption and so on) is not sustainable in an environment of really existing scarce resources. It is therefore necessary to replace them by more durable and fair development concept – concept of sustainable development [10].

As defined in the article "Evaluation of Sustainable Development in the Member States of the European Union", published in the journal Problemy Ekorozwoju, „in 1990 sustainable development became a political principle in the European Union. In 2001 in Gothenburg, the European Council established a sustainable development strategy which was renewed in 2006 and aimed to meet the needs of the present without compromising the ability of future generations to meet their needs" [11]. This idea was also incorporated in the strategy Europe 2020 and in many other Community documents and initiatives.

In the Slovak Republic sustainable development is defined in § 6 of [12] as the development that maintains the opportunity to satisfy basic needs of current and future generations, while it does not reduce the diversity of nature and preserves the natural functions of ecosystems.

In relation to achieving sustainable development, the United Nations Conference on Climate Change was held in Paris in 2015. It resulted in agreement that individual countries will adopt national targets to reduce emissions. In addition, each state shall send to the United Nations secretariat national contributions containing different types of commitments, which the countries are going to accept. The European Union presented its position as the first in the year 2014 at COP20 in Lima, Peru. The EU Member States have committed themselves to continue reducing greenhouse gas emissions after a year 2020 up to 40%, compared to greenhouse gas emissions from 1990. The main instrument for emission reduction should be the European emissions trading market [13].

2 DATA PROCESSING AND METHODS USED

The aim of this paper is to analyse sustainable development of coal supply from the perspective of the energy security. Paper also describes the position of coal in the energy security of the Slovak Republic, analyses evolution of gross domestic consumption of coal in the Slovak Republic, studies the general economic interest in the production and supply of electricity from domestic coal, describes the State aid to the coal summarizes the possibilities of future use of coal in the Slovak Republic.

Important part of submitted article is represented by the statistical analysis of gross inland consumption of solid fuels in Slovakia. To predict the development of gross inland consumption of solid fuels in the Slovak Republic, regression analysis was applied. When modelling time series in order to forecast future values, we used quadratic equation. Estimation of the parameters of a polynomial equation was carried out in Microsoft Excel on the basis of the values of time series using the method of least squares.

The data necessary for analyses performed in individual chapters were obtained from the Eurostat, Ministry of the Economy of the Slovak Republic and Principal Mining Office and District Mining Offices of the Slovak Republic.

3 MINERAL FUELS IN THE SLOVAK REPUBLIC

Mineral fuels account for approximately 7% of overall reserves of mineral resources in the Slovak Republic [14]. Their importance for the Slovak Republic is anchored in Act No. 44/1988 Coll., on the protection and use of mineral resources as amended. According to this Act, mineral fuels, specifically radioactive minerals, all types of coal, oil and flammable gas and bituminous rock, suitable for energy usage are among the reserved minerals [15]. Reserves of these minerals are given in **Chyba! Nenašiel sa žiaden zdroj odkazov.**.

Table 1 Mineral fuels reserves in the Slovak Republic on January 1st 2012, source: own elaboration based on [16]

Energy source	Economic reserves	Potentially economic reserves
Brown coal and lignite (in kt)	440,520	644,629
Natural gas (in mil. m^3)	8,793	15,752
Mineral oil (in kt)	1,922	8,248
Uranium (in t U)	6,561	3,488

The Slovak Republic has at its disposal small amount of reserves of oil and natural gas; more important are stocks of brown coal and lignite. The hydropower potential and biomass and to a less extent solar and geothermal energy may be included among another important domestic energy sources. In spite of these sources, the Slovak Republic is highly dependent on import of energy raw materials – it imports 90% of primary energy sources such as nuclear fuel (100%), natural gas (98%), crude oil (99%) and coal (68%) [3], [17].

Regarding the gross inland energy consumption, the Slovak Republic has balanced energy mix. In 2012 natural gas and nuclear energy were among the key energy sources in Slovakia (see Fig. 1). It is anticipated that this trend will be maintained in the future.

The Slovak Republic also has the opportunity to develop its own energy sources, especially extraction of brown coal, hydropower potential and renewable energy sources. Concerning brown coal extraction, cca 2,300 kt of domestic coal supplied to the thermal power plant Nováky, represents important contribution to the state energy security [9], [19].

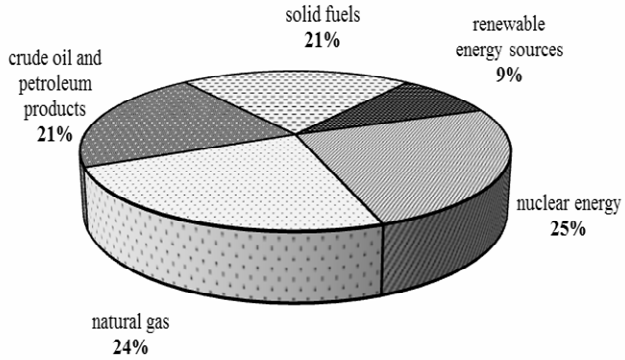


Fig. 1 *Gross inland energy consumption in the Slovak Republic in 2014 (in %), source: own elaboration based on the data from [18]*

4 POSITION OF COAL IN THE ENERGY SECURITY OF THE SLOVAK REPUBLIC

The importance and the position of coal are evaluated within the current conceptual materials of the Slovak Republic, specifically in the Raw

Material Policy, the Energy Policy and also in the Energy Security Strategy until 2030.

The updated Raw material policy of the Slovak Republic (Resolution of the Government of the Slovak Republic No. 722/2004 as of 14 July 2004) states, that brown coal and lignite will remain the significant fuel and energy raw material in future with the principle of the rational use of opened deposits [20].

The Energy Policy of the Slovak Republic (approved by the Resolution of the Government of the Slovak Republic No. 548/2014 as of 5 November 2014), as a starting point for the development of power engineering, thermal energy, gas industry, mining, processing and transportation of oil, coal-mining and use of renewable energy sources has defined two goals of coal mining in the Slovak Republic [9]:

- To ensure enough domestic coal to produce electricity for the population and industry until 2035.
- To gradually replace the conventional mining methods by underground coal gasification after 2020 and thereby to ensure a synthesis gas for production of electricity and heat, resp. for chemical use.

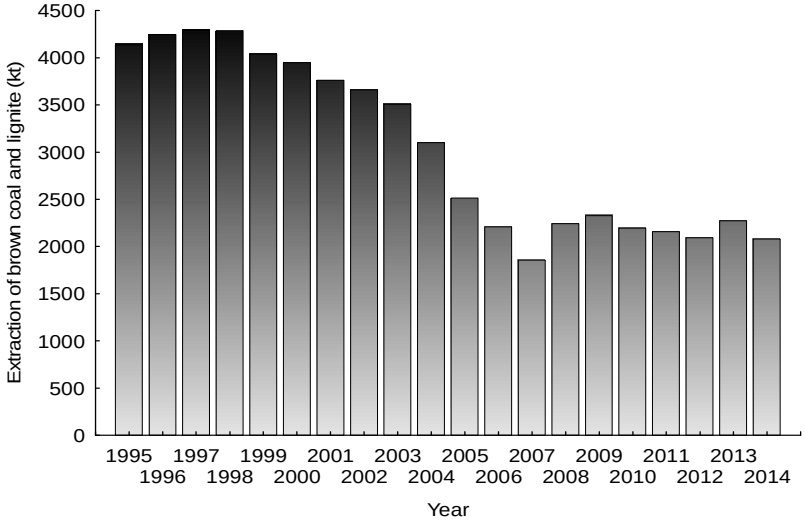
The Energy Security Strategy of the Slovak Republic was approved by the Resolution of the Government of the Slovak Republic No. 732/2008 as of 15 October 2008. According to mentioned document exploitation of brown coal deposits contributes to the security of energy supply, particularly electricity, provides partial domestic energy self-sufficiency, leads to the stabilization of the national economy and reduces the high import dependence on precious energy resources [3].

To the date of January 1, 2011 the Slovak Republic disposed of 454,051 kt of economic coal reserves and 650,831 kt of potentially economic ones (see **Chyba! Nenašiel sa žiaden zdroj odkazov.**). Not all of these stores are recoverable because the extraction takes place under the difficult conditions.

In 2014 solid fuels accounted for 21% of gross inland energy consumption in the Slovak Republic (see **Chyba! Nenašiel sa žiaden zdroj odkazov.**). In the same year 3.9 million tons of hard coal and 2.5 million tons of brown coal were consumed. Domestic extraction of brown coal in 2014 amounted to 2,188 kt (see **Chyba! Nenašiel sa žiaden zdroj odkazov.**), the residue was imported mainly from the Czech Republic (66%) [21].

Extraction of domestic brown coal is intended firstly for the electricity and heat generation in thermal power plant Nováky, therefore extraction development is closely related to the operation of the mentioned power plant. The thermal power plant Nováky is influenced by the new Directive of European Parliament and Council 2010/75/ES on industrial emissions, applied after the year 2015. So the further progress of the coal extraction after the year 2015 is closely influenced by the electricity and heat generation mainly in the thermal power plant Nováky.

Price of the steam coal extracted in the Slovak Republic is influenced by the incurred costs for the underground mining. Domestic steam coal is characterized by the high content of sulphur and ash, calling for the implementation of the flue gas desulfurization and fly ash collection facilities when exploited in the power plant in accordance with requirements for the implementation of emission limits set by the law. Storage of the ash causes also the increase in the operating costs. Price of electricity generated from the domestic coal is influenced by these factors too.



** the years 2006 and 2007 were adversely affected by the accident in the mine Nováky*

Fig. 2 Extraction of brown coal and lignite in the Slovak Republic in the period 1995-2014 (in kt), source: own elaboration based on the data from [22]

Hard coal is not extracted in Slovakia. Its consumption was in the year 2014 entirely covered by import, mainly from the Czech Republic (29%), Russia (22%), Poland, the USA and Ukraine [21]. It is primarily intended for the steel industry and electricity generation in the thermal power plant Vojany (EVO). Hard coal consumption follows a downward trend. Decline in imports of hard coal in recent years is connected with economic crisis, implementation of gasification and with decreased electricity generation in the thermal power plant Vojany.

Table 2 Anticipated development of brown coal and lignite mining in Slovakia (in kt), source [9]

	2014	2015	2016	2017	2018	2019	2020	2025	2030
HBP, a.s.	1 975	1 825	1 600	1 550	1 450	1 400	1 350	1 300	1 300
BČ, a.s. a BD., a.s.*	250	250	200	250	350	400	450	500	500
Spolu	**2 225**	**2 075**	**1 800**	**1 800**	**1 800**	**1 800**	**1 800**	**1 800**	**1 800**

**BČ, a.s. - Mine Čáry, a.s.; BD, a.s. - Mine Dolina, a.s.*

In the last decade, coal mining in Slovakia reported a decreasing trend, which is considered to continue into the future (see Table ***2 Anticipated development of brown coal and lignite mining in Slovakia (in kt), source [9]***). The largest share of the lignite mining in Slovakia has Hornonitrianske bane Prievidza, a. s. Prievidza. "*Exploitation was again restored in the mine Čáry, a.s. Čáry. In the mine Dolina, a.s. Veľký Krtíš liquidating exploitation of residual reserves is in the progress*" [23].

5 ANALYSIS OF THE DEVELOPMENT OF GROSS INLAND CONSUMPTION OF COAL IN THE SLOVAK REPUBLIC

For the purposes of this paper the future development of gross inland consumption of solid fuels in Slovakia was predicted. Data from the period 1994-2014 (see Fig. 3) were used applying method of regression analysis. The analysis was implemented on the basis of historical data under the "ceteris paribus" condition - all the other factors affecting the gross domestic consumption of solid fuels in the Slovak Republic were considered constant.

The aim was to make prognosis of the development of the gross domestic consumption of solid fuels until 2018. When modelling time series in order to forecast future values, we used quadratic equation. Estimation of the parameters of a polynomial equation was carried out in Microsoft Excel on the basis of the values of time series using the method of least squares. We visualized regression curve on the Fig. 3.

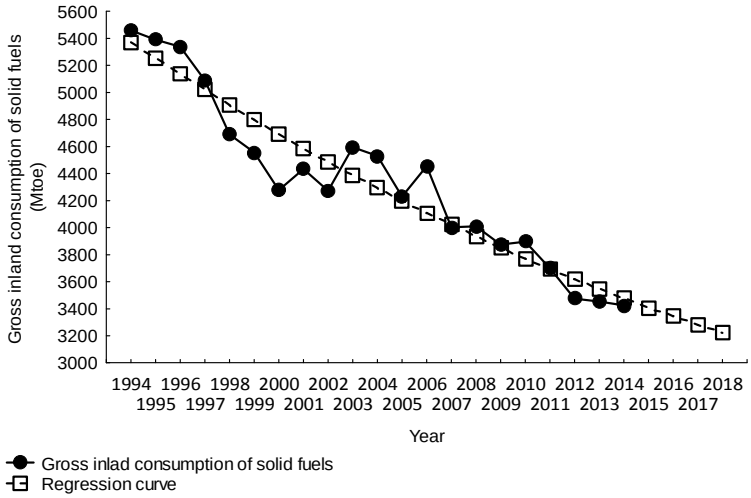


Fig. 3 Gross inland consumption of solid fuels in Slovakia in the period 1994-2014 and prognosis until 2018 (in Mtoe), source: own elaboration based on the data for the period 1994-2014 from [18]

It can be seen that prognosis of the development of gross inland consumption of coal in Slovakia until 2018 shows downward trend. This forecast anticipates the average interannual rate of decline on the level of 1.5% until 2018.

6 ANALYSIS OF ELECTRICITY PRODUCTION FROM DOMESTIC COAL

Since the year 2005 the so-called general economic interest is applied for the production of electricity from the domestic coal in Slovakia. The main reason for its use is the security of electricity supply and technical safety of the power system of the Slovak Republic, where the source for electricity generation in the thermal power plant Nováky plays important role not only in covering the demand in the basic regime, but also in provision of the ancillary services, regulatory electricity supplies and hereby covering the peak consumption and system deviation in the electricity supply grid.

Based on the Resolutions of the Government of the Slovak Republic No. 356/2005 as of 4 May 2005 and No. 639/2006 as of 19 July 2006, the domestic use of coal for the electricity generation was adjusted in the general economic interest (see Table *3 General economic interest in the production of electricity from domestic coal in the period 2005 – 2010, [9]*).

Table 3 General economic interest in the production of electricity from domestic coal in the period 2005 – 2010, [9]

SE, a. s. – ENO*		Approved general economic interest (2005-2010)					
		2005	2006	2007	2008	2009	2010
Electricity production	GWh	1,651	1,603	1,603	1,957	1,881	1,890
Electricity supply	GWh	1,411	1,375	1,375	1,717	1,651	1,659
Heat supply	TJ	1,759	1,748	1,738	1,733	1,711	1,707
Coal consumption for electricity	Kt	2,031	1,936	1,936	2,179	2,097	2,102

**ENO – Power plant Nováky*

On 19th January 2010 the Resolution of the Government of the Slovak Republic No. 47 was adopted. This resolution extended the General economic interest in the production and supply of electricity from domestic coal until 2020 with a view to 2035 [19].

Optimization of production of electricity from domestic coal until 2030 (see Table 4) was carried out after evaluating mining capabilities of our mines as part of resolution of the Government of the Slovak republic No. 381 from 10th January 2013.

Table 4 General economic interest in the period 2014 – 2030, [9]

SE, a. s. – ENO		General economic interest (2014 – 2030)								
		2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2025**	**2030**
Electricity production	GWh	1 702	1 684	1 584	1 584	1 584	1 584	1 584	1 584	1 584
Electricity supply	GWh	1 466	1 450	1 350	1 350	1 350	1 350	1 350	1 350	1 350
Coal consumption for elekctricity	kt	1 820	1 800	1 700	1 700	1 700	1 700	1 700	1 700	1 700
Coal consumption for heat	kt	200	200	100	100	100	100	100	100	100
Coal consumption together	kt	2 020	2 000	1 800	1 800	1 800	1 800	1 800	1 800	1 800

Based on the above mentioned resolutions of the Government of the Slovak Republic and relevant legislation [24], [25], the Ministry of Economy annually issues decisions, in which it determines the obligations for generation, transmission and distribution of electricity. In relation to these decisions the Regulatory Office for Network Industries annually issues the price obligations, to predict a tariff as supplementary charge for each MWh of electricity supplied to the system, that was evidently produced from the domestic coal in a thermal power plant.

In the following period it is necessary to monitor the cost development in the field of electricity generation from the domestic coal to optimize the supplement to electricity price. 100% of allowances for electricity sector have to be bought at the auction from 2013. For this reason the Slovak Government imposed the Minister of Economy in collaboration with the Minister of Environment to submit proposal of measures to streamline functioning of the mining support in response to new carbon dioxide emission trading scheme in 2013 as regards the extension of the Novaky plant lifetime in 2015 until the end of March 2012 [26].

On 5 September 2012 the Government of the Slovak Republic adopted Resolution No. 449/2012 which brought into force material *"The update of the analysis of the operation of state aid for mining industry."* This Material analyses current status of domestic coal use and simultaneously proposes measures to streamline functioning of the mining support in the response to new carbon dioxide emission trading scheme after the year 2013.

In paragraph B.1 of the above mentioned Resolution, the Slovak Government imposed to the Minister of Environment in collaboration with the Minister of Economy to prepare a state aid scheme for the use of revenues generated from auctioning allowances. These revenues will be used to support energy facilities for electricity and heat generation operated in general economic interest.

The aim of this task leads to the environmental measures, in particular to reducing the production of pollutants. This could be achieved by improving the technology of electricity generation with an expected reduction in the greenhouse gas emissions after 2015, with a reduction of negative environmental impact. In the case of Novaky plant, there is no possibility for support of the combustion of coal under current conditions. The revenues generated from auctioning allowances will not be used on tariffs for the operation of the system but only for the reconstruction and modernization of the combustion plants which will have to demonstrate compliance with the strict environmental conditions.

7 PROCESSES OF RESTRUCTURING OF THE DOMESTIC COAL PRODUCTION

Since the 1950s part of the domestic coal production could no longer compete in the market mainly due to a reduction of transport costs of coal from the third countries, depletion of coal fields with attractive geological conditions and increased labour costs. The European Coal and Steel Community (since 1993 European Community), allowed its member states to provide the subsidies for their coal industry in order to enable the smooth process of restructuring and closure.

In view of Council Regulation (EC) No. 1407/2002 on the State aid to the coal industry in the period 2004-2010 the state aid to coal mines was provided in Slovakia in total amount of 28,149 mil. EUR (see

Table 5 An overview of the State aid provided the coal industry in the Slovak Republic during 2004- 2010 (in mil. EUR), [19]

). The largest share of this amount consisted of the funds for accessing coal reserves and social and other exceptional costs, related to the severence, rents and penalties [19]. Council decision No. 2010/787/EU on the State aid to facilitate the closure of uncompetitive coal mines came into force on 1 January 2011. Under this decision, the state aid to the coal industry will no longer be directed toward the exploration or recovery of new coal deposits and coal mining but only those coal mines which will close their coal production units pursuant to the closure plan enforceable until 31 December 2018 [19]. „*The coal production units concerned must be closed definitively in accordance with the closure plan*" [27].

Table 5 An overview of the State aid provided the coal industry in the Slovak Republic during 2004-2010 (in mil. EUR), [19]

Year	HBP, a.s.	Mine Dolina, a.s.	Mine Čáry, a.s.	Together
2004	0	1,371.089	0	**1,371.089**
2005	3,235.165	1,301.604	0	**4,536.769**
2006	3,894.311	404.106	0	**4,298.417**
2007	3,674.567	268.506	0	**3,943.073**
2008	3,644.692	240.149	0	**3,884.841**
2009	4,990.041	206.756	0	**5,196.797**
2010	4,708.557	210.000	0	**4,918.557**
Together	**24,147.332**	**4,002.210**	**0**	**28,149.543**

8 POSSIBILITIES FOR THE FUTURE USE OF COAL

Perspective for the further use of brown coal and lignite lies in its co-incineration with biomass and waste. According to [23] in this respect it is necessary to think of gradual increase in the use of biomass and waste, resp. gradual replacement or replenishments of the certain volumes of coal.

Another possible usage of coal in the longer term is the technology of underground coal gasification. This technology was successfully tested in the Slovak Republic in 2010 by HBP, a.s. company in cooperation with the experts from Faculty of Mining, Ecology, Process Control and Geotechnology of the Technical university of Košice. In that way it will be possible to achieve energy from those coal reserves which cannot be extracted by the conventional methods of mining.

According to Energy Security Strategy of the Slovak Republic underground gasification of coal deposits under the Slovak coal mining conditions would have the following advantages [3]:

- Usage of economically unfavourable brown coal seams in the thickness of 1.5-4 m, occurring in the peripheral sections of the coal basins, or possibly the layers from the economically disadvantageously extracting depths being not excavating-able applying the classical extraction methods.
- Usage of pillars from the older depleted layers not excavated until now. The use of these reserves of coal deposit, which are not recoverable applying conventional methods, could increase the energy potential of coal deposit by 50%.
- The positive impact on the environment – there would be no problem with the transportation of coal and disposal of coal cash.

In the future it is also possible to apply the method of carbon capture and storage, utilisation of which in Slovakia defines the Act No. 258/2011 Coll. on the permanent storage of carbon dioxide in the geological environment as amended. With regard to the carbon capture and storage the study of geological potential is being processed in the Slovak Republic [28]. Increased interest of organizations dealing with the extraction of hydrocarbons and fossil fuels in the application of this technology has not been shown yet. Its use is expected in the longer term [28].

9 CONCLUSION

In this contribution the domestic coal was analyzed from the various points of view and its position in ensuring energy security of the Slovak Republic was evaluated.

Within the development of the technologies, the clean coal technologies, which are used in generation of electricity and heat, were designed. These technologies to a large extent mitigate pollution problems by considerable reducing of SO_2 and No_x emissions and dust particles from the coal-fired power plants. They also contribute to the increase in the energy efficiency of converting coal into electricity; however there are still reserves to enhance the energy efficiency of the large coal-fired power plants through ongoing development of these technologies.

By ensuring the commercial utilization of carbon capture and storage in generation of electricity on the basis of coal, there will be created a presumption for its use in the combustion processes by utilization of other fossil fuels, particularly natural gas. This allows the transition to sustainable use of the fossil fuels for energy production.

In the future it will be necessary to focus on the development and industrial application of the integrated technology solutions that will joint utilization of clean coal technologies and technology of carbon capture and storage appropriately in order to achieve the electricity and heat production while minimizing CO_2 emissions.

Because of the improvement of clean coal technologies, thermal power plants efficiency, successful large demonstrative projects and appropriate regulatory framework for carbon capture and storage, the sustainable use of coal could form the utilizable business model for generation of electricity and heat on the basis of coal after the year 2020.

It is necessary to keep in mind that additional equipment used by the new technologies beyond 2020 will require also significant additional investments, which are difficult to estimate currently. They will depend particularly upon the level of technological development, as well as on results of research and development.

For this reason also the incentives for the further use of fossil fuels in the energy sector can be justified. Their aim is to promote sustainable technologies originating in various EU mechanisms.

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