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ENERGY INDUSTRY OF HORNÁ NITRA AND ITS POSITION IN SLOVAK ENERGETICS

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Slovakia is one of those countries poor on energy sources, highly dependent on their import. Therefore the effective exploitation of own disposable energy sources is necessary. Most part of this sources are the deposits of soft coal in the region of Horná Nitra. On the basis of these low quality coal sources was developed here the energy industry, which includes three coalmines and the biggest steam power station in Slovakia.

This region was the former core of Slovak energetics, and recently is one of the two centers, besides Jaslovské Bohunice nuclear power station. Analysis of development of coal and electricity production in Horná Nitra region in the scope of total production of Slovak republic during the period 1976-1992, is also a base for consideration about conditions of further development of this region.

Key words: energy industry, energy sources, production of electricity and coal, mining, regional development

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I INTRODUCTION

The energy industry is the determining factor of the regional development of Horná Nitra and has a dominant influence on both the environment and the standard of living of this region. Therefore, an analysis of its structure, location and spatial interaction is an important part of the complex geographical research of this region.

Energetics and energy industry are created by a structurally and territorially closely tied system of elements influencing each other. Complexity of energy systems that have built within the frame of large territorial units, their strategic importance and unified managing on the state level, makes the partial exploration of its parts on the micro and mezoregional level more difficult. Therefore it is inevitable to analyse the energy industry of Horná Nitra in context of whole energetics of Slovakia. We consider for the purpose of this exploration the territory of Slovakia as a macroregion and the explored mezoregion of Horná Nitra is defined in boundaries of Horná Nitra basin (Lukniš and Mazúr 1978).

Energy system is composed from the structural point of view of great amount of activities, which extend from exploration and exploitation of the primary energy sources, through their mining, processing and transformation to other kinds of energy, transfer of energy transport and its consumption. A complicated spatial system arises, which can be more or less concentrated in dependence on the physical and chemical characteristics of the particular energy sources and on the differentiated technological, economical and ecological aspects of their exploitation (Szöllös 1989).

Particular structural elements of the energy system are closely connected and tied one to another. Therefore we have used the method of J.D. Chapman energy supply chains for the analysis (1989). Each primary source of energy creates its own chain, links of which are facilities for mining, preparation, storage, transport, transformation of the energy source and facilities for delivering and end using of the gained energy. Unavoidable parts of these chains are ecological facilities and buildings (Szöllös 1993). We analyse here the soft coal (lignite) energy chain in the region of the Horná Nitra.

2 BRIEF CHARACTERISTIC OF THE SLOVAK ENERGETICS

Territory of Slovakia is poor in primary energy sources. Only limited sources of fossil fuels, technically usable hydroelectric power and local sources of geothermal heat occur here. Other energy sources like solar energy, wind energy and biomass produced energy have not wide using so far and their importance is small. Energy system is distinguished for high concentration of production of electric power and heat in two centers - Jaslovské Bohunice and Horná Nitra.

2.1 Energy sources and their mining

The most important source of energy is soft coal, of which the identified total resources were 1178 mil.t in 1993 from which 828 233 kt are usable (Geofond, 1993). Great part of this amount is soft coal and lignite with low quality (Table 1). Their deposits are located in the regions of Horná Nitra, Modrý Kameň, Kúty and in Eastern Slovakia (Figure 1).

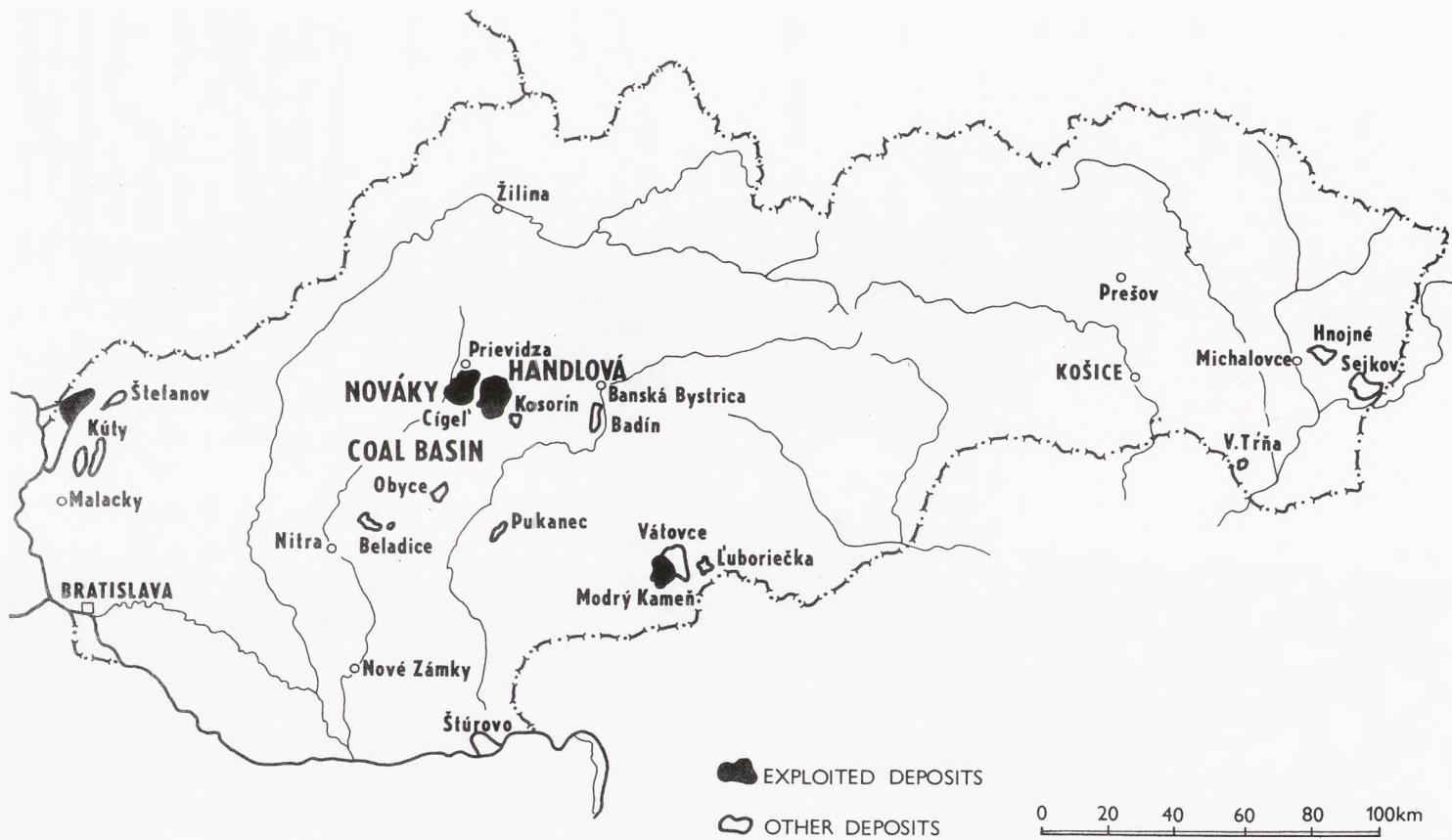


Fig. 1. Coal deposits in Slovakia.

Table 1. Coal reserves in Slovak Republic in 1993 (kt)

	Amount	Usable	Mineable
Total geological reserves	1 177 982	828 233	454 691
of which anthracite	7 547	7 461	7 461
soft coal	584 901	508 714	317 019
lignite	585 534	312 058	130 211

Source: Bilancia zásob výhradných ložísk Slovenskej republiky k 1. januáru 1993. Bratislava (Geofond).

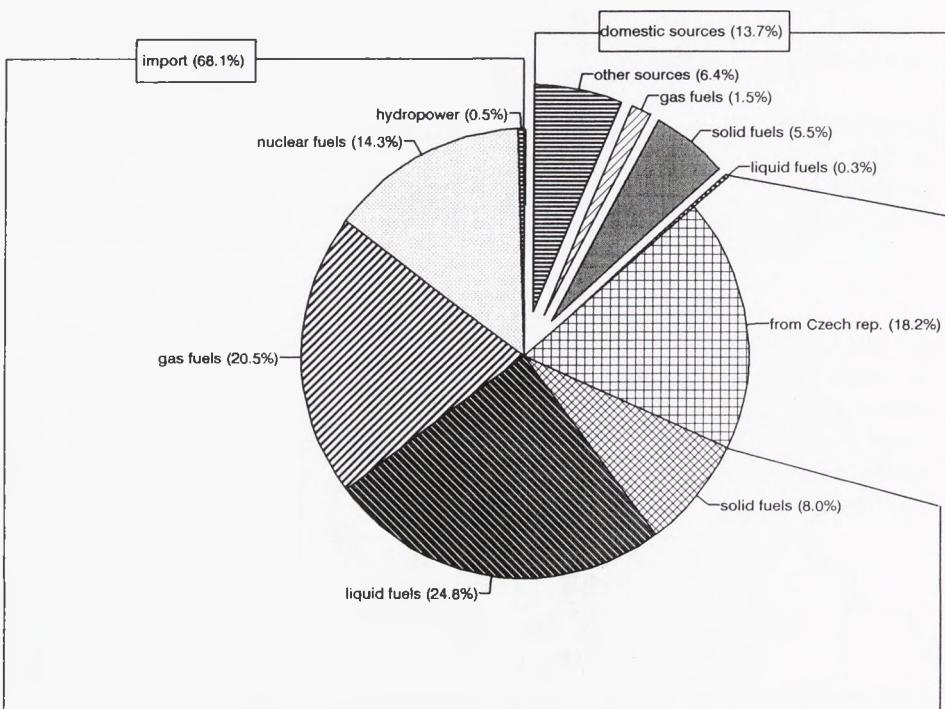


Fig. 2. Supply of primary energy sources in Slovakia, 1990.

Other fossil fuel sources are minimum. Geological sources of crude oil are only 9 287 kt and natural gas 25 554 mil. m³. Their deposits are mainly in Záhorie around Gbely. Renewable sources were represented by hydroenergetic power. Its total technically usable hydroenergetic potential reach in installed capacity 2575 MW with a possible year average of production 7362 GWh (Investconsulta, 1990). Majority of this power is located on the rivers Váh and Dunaj. Estimated heating energy potential of geothermal energy sources located dominantly in the region of south-western Slovakia reached 5600 MW.

Slovakia disposes of minimum amounts of own energy sources and this fact determines the importance of their effective using for energetics. Therefore all the mentioned sources are used. The coal mining output reached in 1992 3523 kt, production of crude oil 72.0 kt, natural gas 400 mil.m³ (1990). Hydroenergetic power with production of 2322 GWh (1992)

was used at 31,5 % and geothermal heat at 2 % of their potential capacity. (SEP 1993, Investconsulta 1990).

Domestic energy sources supplied only 13,7 % of the total consumption in 1990, transmission from Czech Republic created 18,2 % and import supplied 68,1 % (MH SR, 1991) (Figure 2). Slovak economy is highly dependent on import of basic energy sources. This dependence makes worse the fact, that practically the whole amount of crude oil and natural gas is still imported from the countries of CIS (Commonwealth of Independent States), especially from Russia.

Structure of energy fuels consumption is showed in Table 2. Main energy sources are coal, crude oil and natural gas, which together satisfied 90 % of energy demand.

Total consumption of energy fuels in a year per capita is higher than in neighbouring developed countries with comparable climatic conditions (Table 3). This high consumption is caused by energy wasting production in technologically obsolete industrial plants. It will have to be cut down.

Table 2. Structure of consumption of energy sources in 1990

Source of energy	ČSFR	ČR	SR
Coal	54,3 %	62,1 %	36,2 %
Natural gas	14,0 %	10,6 %	21,8 %
Crude oil	20,3 %	15,9 %	30,6 %
Primary electric power	3,3 %	2,3 %	5,4 %
of which electricity from WPS*	0,5 %	0,3 %	1,0 %
electricity from NPS*	2,8 %	2,0 %	4,4 %
Import of electric power	1,2 %	0,6 %	2,5 %
Another sources of heat	6,9 %	8,5 %	3,5 %

* WPS - Water Power Station

* NPS - Nuclear Power Station

Source: Prognóza vývoja spotreby energie v ekonomike SR. (Prognosis of energy consumption in Slovak economy).

Table 3. Total consumption of primary energy sources per capita in 1990

ČSFR	6,96	Switzerland	4,07
ČR	7,27	Germany	6,11
SR	6,38	Austria	5,36

Source: Prognóza vývoja spotreby energie v ekonomike SR. (Prognosis of energy consumption in Slovak economy).

2.2 Production and consumption of electric energy

The structure of productive facilities and that of electric power production is similar to structure in developed world economies, but its weak point is high level of concentration into one facility. About 50 % of electric power is generated in single nuclear power station in Jaslovské Bohunice, 10 % in water power stations and the rest in steam power stations. On the territory of Slovakia in 1992 78,9 % of demanded electricity was generated, import from Czech republic reached 19,2 % and 1,9 % was supplied by import from neighbouring countries (Figure 3) (SEP, 1993).

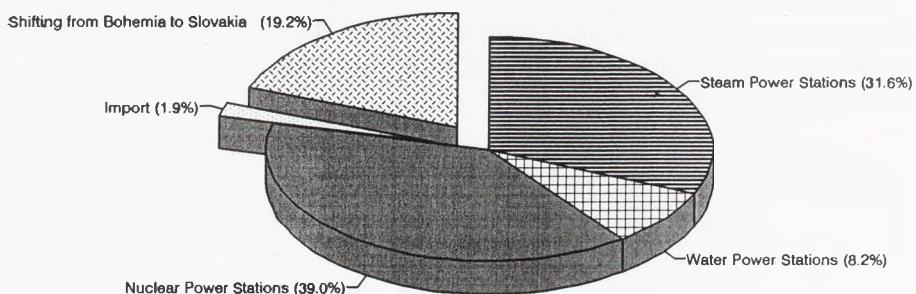


Fig. 3. Structure of electric power supply in Slovakia, 1992.

Balance of energy supply and demand as well as the structure of production could be improved after implanting the Mochovce nuclear power station and water power station in Gabčíkovo in use. The rapid growth in production of electricity during last years was supplied by nuclear energy. The share of other sources of energy in production of electricity decreased (Figure 4).

3 ENERGY INDUSTRY OF HORNÁ NITRA AND ITS POSITION IN SLOVAK ENERGETICS

Position of Horná Nitra in Slovak energetics is determined by general structure of energy sources, energy production and consumption in Slovakia. Because of great share of coal in the production and consumption of electricity and heat in Slovakia, energetic complex located in this region, is one of the two most important elements of energy system of Slovakia together with Jaslovské Bohunice.

Region of Horná Nitra is unique according to structure of energy industry. It is the only region in Slovakia, where there is a complete energy supply chain. It is based on soft coal, and it extends from underground mining to preparation and transformation of coal into electricity and heat, and to their end uses. The principal reason for the origin of this complex chain was the low quality of coal mined here, which is ineffective to transport to long distances on one side and on the other side the need for the exploitation of such sources, because of few energy sources in Slovakia.

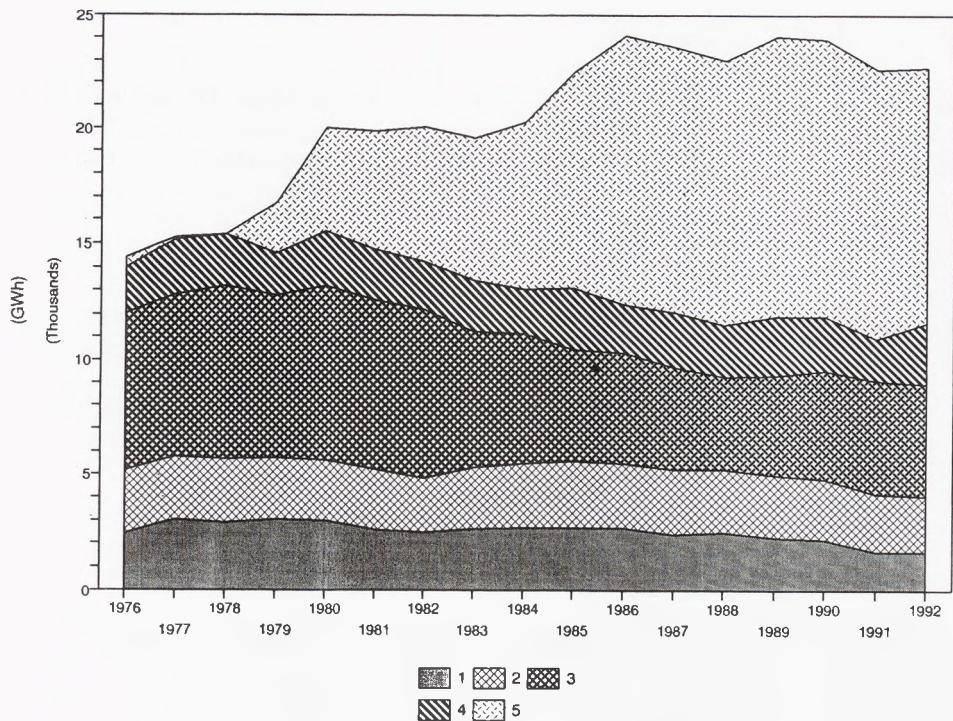


Fig. 4. Structure of electricity production in Slovakia, 1976 - 1992.

1 - Nováky power station (ENO)

2 - factory power stations

3 - other steam power stations

4 - water power stations

5 - nuclear power station

3.1 The sources of energy

In Horná Nitra 31.4 % of all identified resources, 41,6 % of usable resources and 73,8 % of usable resources in exploited deposits of coal in Slovakia are located in two deposits - Nováky and Handlová (Figure 5). These two deposits create Handlová - Nováky coal basin, which occupies northern and north- eastern part of Horná Nitra basin. The amount of geological sources of coal in this basin has been explored and verified already, so there is no possibility of discovering new deposits.

The rank of neogenic coal and lignite is very low in these deposits. The heating value is in average for whole basin 11,5 MJ/kg, sulphur content is 1,7 % and ash content is 30 % (SUB 1991). These characteristics determined bad environmental impact of using this coal for heat and electricity production.

3.2 Coal mining

Coal has been mined here since the middle of the 19th century, and there are three contemporary coalmines here today - Handlová, Nováky and Cígel'. The amount of coal production varied year by year in dependence on geological conditions and ongoing exploration. This trend continued during the period of observation from 1976 (Figure 6).

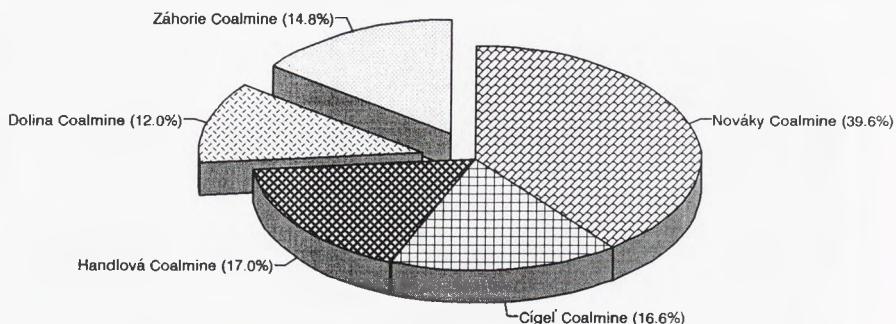


Fig. 5. Share of Horná Nitra in exploited deposits of coal in Slovakia in 1993.

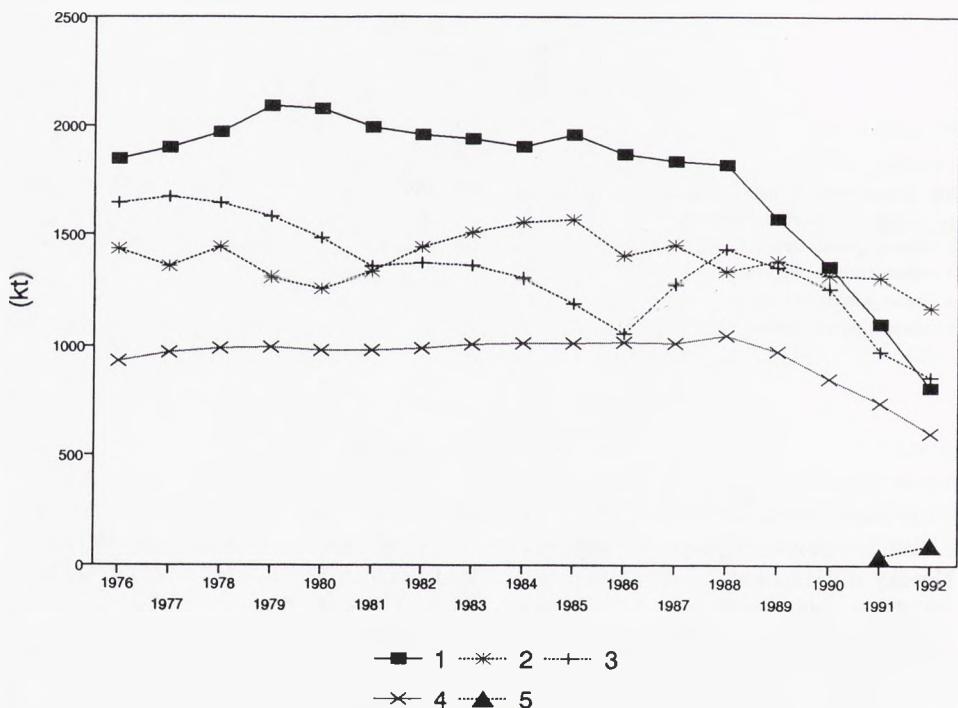


Fig. 6. Development of coal production in Slovak coalmines, 1976 - 1992.

1 - Nováky coalmine

3 - Handlová coalmine

5 - Záhorie coalmine

2 - Cígel' coalmine

4 - Dolina coalmine

The most stable and highest mining was during these years in the Cígel' coalmine. Mining in Handlová and Nováky coalmines was in that period very unstable and the periods of rapid decline and growth alternated here. In the last period from the year 1988, production in all coalpits of Horná Nitra region as well as in coalmine Dolina (in district Veľký Krtíš) is in decline. It is caused by many interconnected factors, mainly by exhaustion of resources, by worse geological conditions for mining, by growing expenses and declining effectiveness of mining and by changed macroeconomic conditions. Increase of production was only in a new coalpit Záhorie (in district Senica), which has been put in production in 1991.

The dominant position of Horná Nitra region is confirmed by the fact, that about 80 % of a year's coal production in Slovakia is mined here. The remaining production comes from coalmine Dolina in Modrý Kameň soft coal basin, and from a new coalmine Záhorie in Gbely lignite basin (Figure 7). Increase or decline of mining in the region of Horná Nitra has therefore a great impact on the total production of coal in Slovakia.

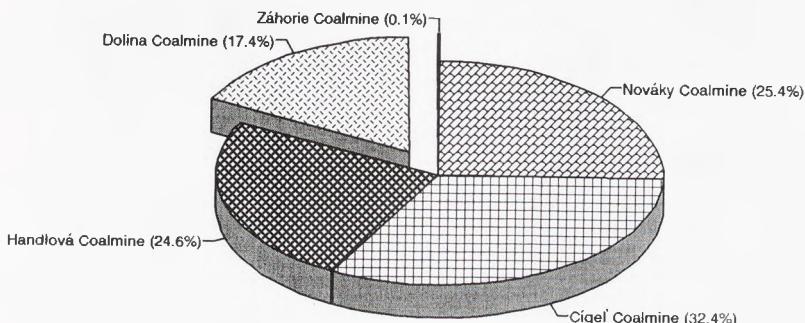


Fig. 7. Share of coalmores in the total production of coal, 1976 - 1992.

3.3 Conversion and exploitation of energy sources

Two thirds of total amount mined in Horná Nitra consist of the coal suitable only for industrial using in power stations and heating stations. Transportation of this coal is ineffective, so it is transformed directly on the mining place in local power station to electricity and heat.

A small steam power station had worked in Handlová before first world war. Construction of the oldest part of Nováky steam power station (ENO) - ENO A, with 22,4 MW and 32 MW blocks had been finished in 1957. The total installed capacity of this station reached 178,8 MW and declined after reconstruction to 108,8 MW recently. A part of ENO enterprise is also a former power station in Handlová, which has been used until 1981 only for heat production. Majority of electricity produced in ENO comes from power station ENO B, consisting of four blocks by 110 MW constructed in the years 1964 - 1975 (Kubín, 1989) (Figure 8). The ENO total production as well as its share in Slovak production is gradually decreasing (Figure 4). While the production here was 2823 GWh

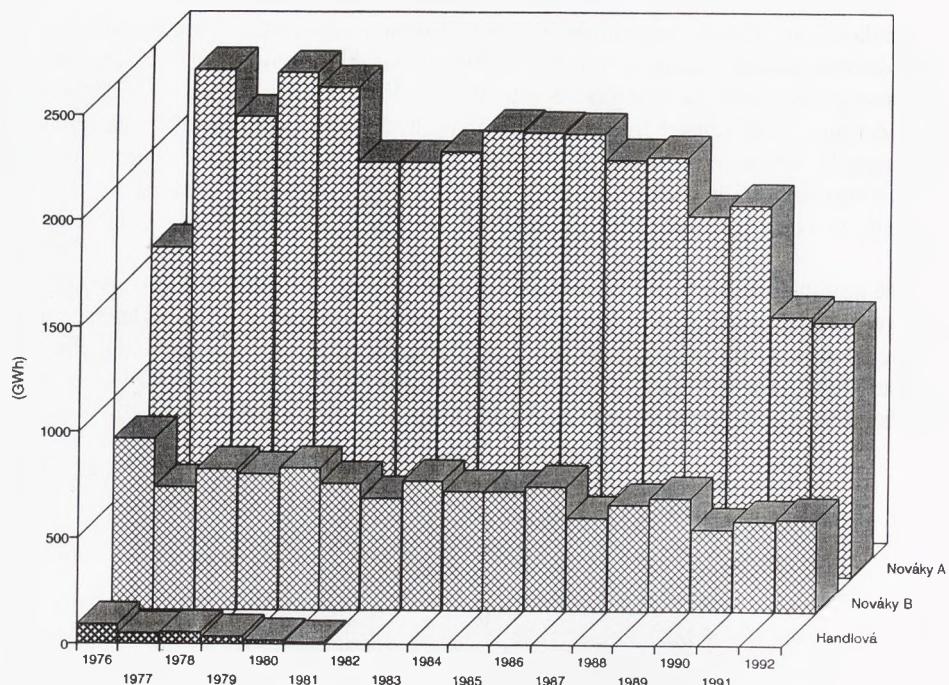


Fig. 8. Production of electricity in Nováky power station, 1976 - 1992.

in 1978 (18,3 % of total Slovak production of electricity), after the nuclear power station in Jaslovské Bohunice was put in operation, the production of ENO declined to 1634 GWh, (relatively to 7,3 %) in 1992 (SEP, 1992, 1993).

The ENO is also the largest producer of heat in Slovakia recently. Its production reached 3200 TJ in 1990, which is approximately 10 % of total centralised heat production in Slovakia.

Steam power station in Nováky is connected to distribution network of 110 kV, and that allowed to deliver electricity directly into local network and supply local needs. Therefore practically the whole production of electricity from ENO is used up by two major consumers - chemical plant in Nováky and aluminium plant in Žiar nad Hronom. The heat produced here is used up for heating in communal and industrial sphere directly in the region of Horná Nitra.

4 DISCUSSION

We tried to reflect the very recent position of Horná Nitra in Slovak energetics, but not all statistic data for the year 1992 were available. For this reason we have had to use also some especially macroenergetic characteristics about Slovak energetics from the year 1990

and 1991 (e. g. Fig. 2, Table 2). In spite of this we could consider this data as representative also for recent state of Slovak energetics.

The period of economic transformation after the year 1989 is too short for considerable impact on the transformation in macroenergetic level. The changes in structure of primary energy sources consumption and supply, are dependent on rebuilding and reconstruction of infrastructure and transformation facilities, which need large and expensive investments.

On the other side, the changes in microenergetic level have been already started. Because of the changing economic conditions, the decrease of production of coal and electricity in Horná Nitra region in last years was quite large. We considered for the purpose of this study to include also the data from the years 1991 and 1992.

5 CONCLUSION

The Slovak energetics is strongly dependent on import of energy sources. It is not reasonable to increase this dependence. Therefore the effective exploitation of available energy sources is necessary. The largest usable sources are the deposits of soft coal in the region of Horná Nitra. The complex energy chain based on them allows to use economically mineable reserves of coal until their exhausting.

Own energy sources, dominant position in their production, large share in the total Slovak production of heat and electricity, these are the facts that placed the region of Horná Nitra in position of one of the two main centers of Slovak energetics, besides Jaslovské Bohunice. In spite of fact, that after the nuclear power station in Mochovce and water power station in Gabčíkovo will be finished, the Horná Nitra region will lose its contemporary position, there are favourable conditions for further production of electricity in this region. Production of electricity is a key link of the existing energy chain. Without this chain it would be impossible to use effectively the coal resources and to supply the contemporary needs of major electricity consumers in this region. Solution of environmental problems connected with mining, preparation and transformation of bad soft coal and lignite, is an imperative condition for ongoing exploitation of energy sources from local deposits. It is necessary to complete the facilities of the ecological link of the mentioned soft coal energy chain. Recultivation of lands destroyed by mining and the reconstruction of power plant is going on. After the reconstruction will be finished, there will be here furnaces with fluid burning, mitigating environmental disturbances of production to minimum and improving its effectivity.

On the base of mentioned facts we can assume, that the energy industry of investigated region will gain an important position in next 5-10 years in Slovak energetics and will be an important factor influencing regional development of Horná Nitra.

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Ján Szöllőss

ENERGETICKÝ PRIEMYSEL HORNEJ NITRY A JEHO POSTAVENIE V ENERGETIKE SLOVENSKA

Energetický priemysel je jedným z určujúcich faktorov rozvoja regiónu Hornej Nitry a má dominantný vplyv aj na životné prostredie a kvalitu života v tejto oblasti. Analýza jeho štruktúry, lokácie a priestorovej interakcie je preto dôležitou súčasťou komplexného geografického výskumu uvedeného regiónu.

Energetika a energetický priemysel vytvárajú v rámci väčších územných celkov štrukturálne, ako aj teritoriálne úzko zviazaný systém vzájomne sa ovplyvňujúcich prvkov. Energetický priemysel Hornej Nitry preto treba analyzovať v kontexte energetiky Slovenska.

Energetika Slovenska veľmi závisí od dovozu zdrojov energie zo zahraničia (obr. 2). Nie je únosné túto závislosť zvyšovať, a preto je nevyhnutné efektívne využiť tie zdroje energie, ktoré sa na území Slovenskej republiky nachádzajú. V súčasnosti sú najväčším využíteľným zdrojom energie ložiská hnedého uhlia, ktorého geologickej zásoby boli v roku 1993 1178 tis. kt, a z ktorého je dnes využíteľných 454 691 kt. V regióne Hornej Nitry sa z nich nachádza 41,6 % (obr. 6).

Vlastné zdroje energie, dominantné postavenie v ich produkcií (80 % ročnej tlačby) (obr. 8), významný podiel na celoslovenskej produkcií tepla a elektriny (obr. 5), stavajú región Hornej Nitry, popri Jaslovských Bohuniciach, do pozície jedného z dvoch hlavných centier slovenskej energetiky. Nevyhnutným predpokladom pokračujúcej

exploatacie energetických zdrojov z miestnych ložísk je však vyriešenie ekologických problémov spojených s t'ažbou, spracovaním a transformáciou nekvalitného hnedého uhlia a lignitu.

Obr. 1. Ložiská uhlia na Slovensku.

Obr. 2. Zabezpečenie primárnych energetických zdrojov v SR, 1990.

Obr. 3. Štruktúra zdrojov elektrickej energie v SR, 1992.

Obr. 4. Štruktúra výroby elektrickej energie v SR, 1976-1992.

1 - Elektráreň Nováky (ENO), 2 - závodné elektrárne, 3 - ostatné tepelné elektrárne, 4 - vodné elektrárne, 5 - jadrové elektrárne.

Obr. 5. Podiel Hornej Nitry na geologických zásobách t'ažených ložísk uhlia v SR v r. 1993.

Obr. 6. Vývoj t'ažby uhlia v slovenských baniach, 1976-1992.

1 - Baňa Nováky, 2 - Baňa Cígel', 3 - Baňa Handlová, 4 - Baňa Dolina, 5 - Baňa Záhorie.

Obr. 7. Podiel bani v SR na celkovej t'ažbe uhlia, 1976-1992.

Obr. 8. Výroba elektriny v Elektrárni Nováky (ENO), 1976-1992.

Tab. 1. Zásoby uhlia v Slovenskej republike v r. 1993.

Tab. 2. Štruktúra spotreby energetických zdrojov v r. 1990.

Tab. 3. Celková spotreba primárnych energetických zdrojov na obyvateľa v roku 1990.