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The energy security strategy of the Slovak Republic

Paper deals with the energy security strategy of the Slovak Republic.

Keywords: energy security strategy

I. INTRODUCTION

The growth of the energy and raw material demands of industrial branches and the growing people requests on quality of life increase the dependence of countries on vital important sources, including foods and probability of the beginning of raw material and energy crises.

The many years utilized procedures are changed by the globalization of world economy and these changes affects all sectors of social life. In order to provide the economy growth and employment and also improvement of living standard of population, requests on production and services, raw and energy sources are growing. The scientific-technical progress multiplies the possibilities of production and consumption, but it also means the growing demand for raw materials and energy, including demand for alternative energy sources. The energy becomes one of the key factors of economy growth. The negative effects, even short-term energy breakdown, establish the problem of energy security; on the other side they contribute to the consolidation of energy companies and revitalization of interest for nuclear power energy utilization.

Nowadays, the European Union (EU) is not able to guarantee the energy security of membership countries. Further, the establishment of energy policy remains in competence of membership countries, that are focused on ensuring of energy security and efficiency of utilization as well on the alternative energy sources usage.

Calculations of OECD and EU indicate, that by the year 2030:

- the global demand for primary energy will increase about 53 % with 55 % emission growth;
- the fossil fuels will be the main energy source, they will participate by 83 % in supplying the growing demand for energy sources;
- there will be increased coal portion of electric energy generation;
- the developing countries will participate by 70 % on growing demand for primary energy sources;
- it is necessary to invest 20 trillions USD in the energy sources ensuring.

II. ENERGY POLICY OF THE SLOVAK REPUBLIC

The basic aims and scopes of power engineering development in long-term perspective are determined by energy policy of the Slovak Republic and it states, that maximal economy growth in conditions of perpetually sustainable developing is conditioned by reliability of energy supply with optimal costs and adequate protection of environment [2].

The energy policy aims of the Slovak Republic

The energy policy was the starting point for development of electric power engineering, thermal power engineering, gas industry, mining, processing and transport of oil, coal mining and utilization of renewable energy sources. The policy defined the following aims:

1. ensuring energy with maximal efficiency, safe and reliable supply of all energy forms in required quantity and quality,
2. reduction of portion of gross domestic consumption in gross domestic product – reduction of energy demands,
3. ensuring such amount electricity, that covers requests based on economic effective principle.

The following priorities were determined to achieve the aims of energy policy:

1. replacement of the decommissioned equipment for electric energy generation in order to ensure the generation of such amount of electric energy, which will primarily cover the national requests based on economically effective principle,
2. acceptance of actions focused on energy savings and enhancement of energy efficiency on the side of consumption,
3. reduction of the dependence on energy supplies from risky regions – diversification of energy sources as well as ways of transport,
4. utilization of the national primary energy sources for generation of heat and electricity, based on economically effective principle,
5. increase of the use of cogeneration,
6. utilization of the nuclear energy as a diversified, economically effective and adequately environmentally acceptable option for electric energy generation,
7. ensure nuclear safety of all working devices,
8. increase the portion of renewable energy sources for cogeneration in order to create adequate additional sources, which will be necessary to cover domestic demand,
9. building up of the electric power system (EPS) and grid that they will be able to provide the secure and reliable transmission, transfer and distribution of electric energy and gas,
10. building up of new lines in order to improve connection to internal market of EU as well as to market of third countries,
11. support of alternative fuels in traffic.

The aims and priorities of energy security strategy of the Slovak Republic

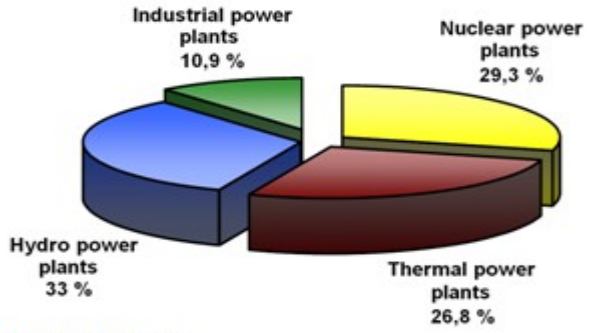
The aim of energy safety strategy is achievement of competitive power engineering, ensuring safe, reliable and effective supply of all energy forms at reasonable prices taking into the account customer protection, protection of environment, perpetually sustainable development, safeness of supply and technical safety.

The power engineering is a key factor influencing all of the economic sectors and one of the main economic pillars. Energy security is a part of the national security and one of the tools for ensuring the sovereignty, political independence and economic security.

The energy security strategy of the Slovak Republic with the perspective by the year 2030 has to provide the self-sufficiency in electric energy generation, optimal price policy, exportable ability of the Slovak Republic and reinforce transit position of the country in the market with the electricity, gas and oil and ensure reliable supply of heat and other energy-bearers.

Electricity

The electricity supply of Slovakia is reliable with the respect to optimal structure of production basis and well built up supply system, with the minimal occurence of outages, that would endanger the safety of electriciy supply as well as it was in the case of outages (black-outs) in the USA, Italy, the Czech Republic or in November 2006 in Germany. After building up of two blocks in nuclear power plant Mochovce in the years 1998 and 2000, Slovakia became self-sufficient in electricity supply and by the year 2006 Slovakia was exporter of this strategic commodity. The decision to disconnect nuclear power plant V1 will have the essential influence on electric energy supply of Slovakia.



Source: SEPS, a. s.

Figure 1. Installed electric power in the Slovak Republic in 2007

The first block was disconnected on December 31st 2006 and the second block will be disconnected on December 31st 2008. Slovakia will be dependent on electricity import finishing of the new sources, especially 3rd and 4th in nuclear power plant Mochovce.

The present state

The overall consumption of Slovakia in the year 2007 was 29 632 GWh and in comparison to 2006 there was the increase about 8 GWh. Similarly, there was also decrease of annual maximal load capacity about 5 MW and in 2007 it achieved the value of 4 418 MW.

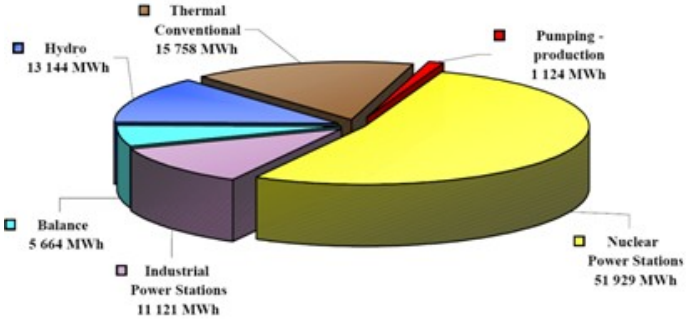


Figure 2. Production of Electricity on the Day of Yearly Peak (19th December 2007)

The total installed electric power in Slovakia was in the year 2007 7508 MW. The power structure of production basis was uniformly divided among the nuclear, thermal and water power plants. The overall electricity production in Slovakia achieved the value of 27 907 GWh, the portion of nuclear power plants was 52 %, thermal power plants 27 % and 15 % was generated in water power plants.

Development of electricity consumption of Slovakia

The average annual growth of electricity consumption is expected within the range of 0,8 to 2,3 % in the period by 2030, see Table I.

Development of electric power system

The development of electric power system is based on the fundamentals specified by directive of the European parliament and the European council 2005/89/ES concerning measures to ensure safety of electricity supply and infrastructure investment, while taking into the account:

- appropriate level of production capacity,
- appropriate balance between delivery and demand,
- sufficient level of cross-border interconnection while satisfying the *n–1*.

Removing of production capacities from the balance of EPS of the Slovak Republic

From the balance of Slovakia there was removed from the operation 880 MW of installed power by end of year 2006 (1. block of nuclear power plant Jaslovské Bohunice V1 and four blocks in

TABLE I
Prognosis of electricity consumption development in Slovakia

		2005	2007	2010	2015	2020	2025	2030
low scenario	GWh	28572	29632	30379	32008	33330	34603	35987
reference scenario	GWh	28572	29632	31892	34713	37534	40418	43112
high scenario	GWh	28572	29632	32815	37121	41530	45990	50544
average annual growth	%	3,7						
low scenario	%	0,8						
reference scenario	%	1,6						
high scenario	%	2,3						

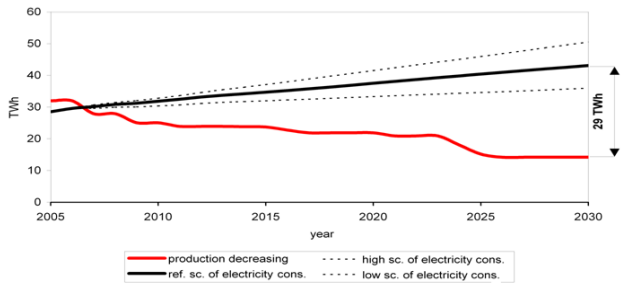
Source: SEPS, a. s.

TABLE II
Decommissioning of installed production capacities from balance of EPS of the Slovak Republic

Year		2010	2015	2020	2025	2030
Nuclear power plants	MW	880	880	880	1760	1760
Thermal power plants	MW	490	1177	1607	1875	2095
Total power	MW	1370	2057	2487	3635	3855

Source: SEPS, a. s.

Requests for covering of deficit in production in EPS of the SR



Source: SEPS, a. s.

Figure 3. Installed electric power in the Slovak Republic in 2007

thermal power plant in Vojany). There is assumption to disable from operation another 490 MW by the end of 2010. The overall capacity decrement during the period from 2006 till 2010 will be 1370 MW. The tendency of production capacities disabling will continue by reasons of production devices lifetime also in the next period.

By the year 2015 there will be decommissioned from the operation 2057 MW and in perspective by 2030 will be disabled from the operation entirely 3855 MW. The mentioned decrement of electric power represents the loss in electricity generation of almost 56 % compared to 2006.

From the point of long-term perspective by the year 2030 in relation to expected growth of electricity consumption and decommissioning of existing production capacities it is necessary to provide for the Slovak Republic about 6600 MW of new energy sources covering expected deficit in production in the amount of approximately 29 TWh.

Electricity supply by the year 2030

Nowadays lines to Hungary are the most loaded lines. They are loaded by the part of export from Slovakia, by transmission from the third parts and by so-called round flows. Due to utilization of this profile, transfers are regulated by auctions. The profile is loaded as a consequence of excessive electricity flows from the west, north and east to the deficient south. This causes the dominant loading of south profile of the Slovak EPS.

TABLE III
Balanced electricity consumption and generation may be achieved by building up of power-plants

Year		2010	2013	2015	2020	2025	2030
Nuclear power plants	MW	164	1044	1106	1106	2306	2306
Thermal power plants and cogeneration	MW	142	266	412	1132	1612	1642
Renewable sources	MW	190	450	700	1000	1400	2100
Pumped storage hydro plant Ipel'	MW				600	600	600
Total	MW	496	1760	2218	3838	5918	6648

Source: SEPS, a. s.

TABLE IV
Transmission capacities derived from the real cross-section of lines

Interstate profiles of ES THE SLOVAK REPUBLIC	Unit	Max. transmission capacity
Slovakia – Czech republic	MVA	4760
Slovakia – Hungary	MVA	2770
Slovakia – Poland	MVA	2880
Slovakia – Ukraine	MVA	830

Source: SEPS, a. s.

Investments demand

The development program of production basis of electric power engineering for balanced consumption and generation requires investments about 464 mld. Sk by the year 2030. The highest portion of the investments represents renewable sources 44 %, nuclear sources 36 %, thermal sources 15 % and building up the pumped storage hydro plant Ipeľ 5 %.

The investment demand in renewable sources for electricity generation is high. It represents almost one half of all investments in new capacity increments, whereby the obtained powers achieve something above one third and the electricity generation will not achieve neither one fifth of the amount, that is needed for providing by the year 2030.

The development of the Slovak EPS, including transmission network and distribution grid by the year 2030 will require more than 600 mld. Sk.

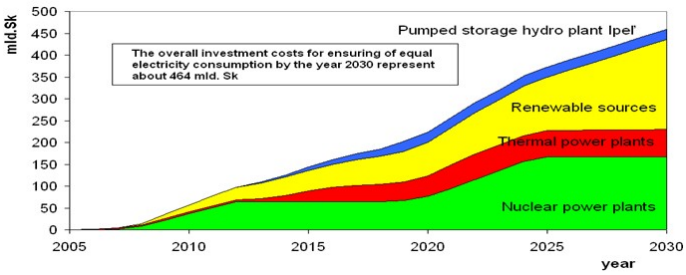
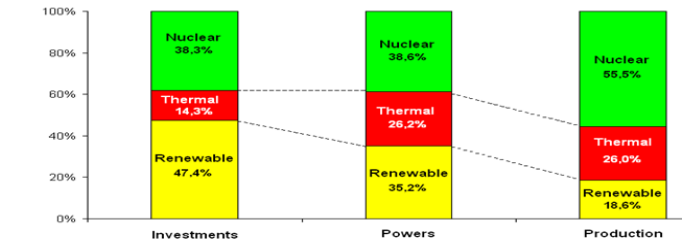


Figure 4. The cumulative investment demands in sources for balanced consumption and generation



Source: SEPS, a. s.

Figure 5. Prognosis of portion increments of particular types of sources by the year 2030

III. PRIORITIES OF SECURITY STRATEGY OF ELECTRICITY SUPPLY IN THE PERIOD BY THE YEAR 2030

The main focus in the area of electric power engineering development will be directed to provide its safety, competitiveness and perpetual-sustainability [3].

1. Orientate the development of production basis leading to balance between the consumption and domestic sources with approximately 20 % power reserve.
2. Support programs leading to electricity savings on the side of consumption as well as on the side of generation in order to decrease energy consumption of 45 % compared to 2006 by the year 2030.
3. Preserve the present optimal structure of production basis with uniform power division among the nuclear power plants, thermal power plants and renewable energy sources including water power plants of higher power and in order to cover electricity consumption with approximately 50 % portion of generation from nuclear power plants. The rest of the consumption will be covered by thermal power plants and by generation from renewable energy sources. The suggestion is optimized from following views: economical, ecological and operational characteristics of particular types of technology.
4. By the year 2030 provide approximately 6600 MW of new sources with the generation of approximately 29 TWh. The mentioned development together with distribution will require investments more than 600 mld. Sk.
5. Support the development of renewable energy sources, especially water power plants and biomass so, that by 2030 there will be increased portion of renewable sources covering electricity consumption at the level of 23 %, including the large water power plants.
6. Prefer the mixed combustion of biomass with coal in larger production units in the range of 10 to 30 % of biomass to specially designed for mentioned purpose in order to decrease price risk and risk from the possible absence of biomass in future.
7. Orientate the development of thermal power plants by 2015 to coal power plants with high conversion efficiency as an alternative to stale capacities, especially in power plants Vojany and Nováky. The coal combustion cycle shows a higher stability of fuel price and it is supposed, that coal will have higher source reliability and security for electricity supply.
8. The increase of installed capacity from renewable energy sources by 2030 is assumed almost of 2100 MW. It represents the increase in production of approximately 5,3 TWh. The realization of such development of renewable energy sources will require the investments for more than 200 mld. Sk.
9. From the renewable electricity sources advantageous influence for safety of electricity supply will have small water power plants, geothermal energy and biomass and it will be possible to support their built up without special restrictions. The built up of wind power plants can be supported only in accordance with recommendations of detailed impact analysis of their connection to the EPS of the Slovak Republic.
10. The optimal solution will be the sequential built up of sources - thermal power plants in years 2015 till 2025 to the value of 1200 MW in order to ensure the appropriate level of control power for EPS. The total power increase in thermal power plants including cogeneration is assumed at the level 1560 MW by the year 2030.
11. The expressive portion of nuclear power plants on overall balance of electricity production (approximately 50 %) and prognosis of progressively increased portion of wind power plants and solar sources require sufficient control power in EPS. The significant impact on EPS may have long-term prepared pumped storage hydro plant Ipeľ. It is necessary to create the adequate conditions for potential investor that are appropriate to signification of such source for electric power system.
12. Orientate the development to utilize all available low-carbon production technologies (nuclear power plants, thermal power plants, renewable energy sources) with high conversion efficiency of primary energy sources.
13. Optimize the development of production basis from the point of view of economical and operational characteristics of particular types of technology.
14. Ensure the building up of a new nuclear source with the power of 1200 MW by the year 2025 as a compensation for retired nuclear power plant V2 in Jaslovské Bohunice.
15. Support building up and preparation of large water power plants and create sufficient supporting environment as well as in the case of small water power plants.

16. Orientate the arrangement of the new sources for purpose of energy intensity decreasing, especially to fossil fuels, to the regions with insufficiency of consumption covering from the local sources. By that fact there will not be the opposing energy flows, the electricity to the east and fuels (coals and gas) to the west.

17. Accept the binding directions relating to the further actions of investors for security preparations and realization of sources that had issued conformity certificate according to the energy policy.

18. Continue in negotiation with foreign partners about building up of new interstate interconnections according to the direction 2005/89/ES in order to accelerate realization. Analyze the application possibilities of other interstate interconnections to finish enhancement of secure electricity supply of Slovakia.

19. Terminate the transfer of 220 kV system in Slovak transmission grid to 400 kV voltage level.

20. Continue in ensuring of sequential renovation of important transformers 400/110 kV and components of 400 kV lines and electric substations.

21. Ensure the development of 400 kV transmission grid together with connecting of the new sources to the grid for the requirements of secure electricity supplying of Slovakia so, that the system satisfies the reliability and quality according to criterions of UCTE. Realize the replacement of important devices and components of 400 kV transmission grid.

22. Continue in sequential renovation of distribution networks and important equipment.

23. Ensure the development of distribution networks together with connection of new sources, especially renewable ones, to provide secure and superior supply of final customers.

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