

б) АГ з к.з. ротором обмежені в промисловому вживанні із-за спотворення форми вихідної напруги і незадовільних динамічних властивостей.

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NUCLEAR POWER PLANTS AS THE BALANCING SOURCE IN FULFILLMENT OF ENERGY REQUIREMENTS – FORECAST UP TO 2030

The energetic management in most of the countries, mainly based on the hard coal and lignite consumption, must be changed up to 2030 and the natural gas energy as well renewable energy should be more and more significant. As the energy forecast up to 2030 for Poland shows, taking into consideration growth the national requirement and the necessity of lowering the environmental pollution (being the effect of Union Directives), it is necessary to introduce the nuclear energy into energetic balance. The paper shows that the energy development decision makers took into account renewable energy and nuclear energy, which were neglected in the past by the government and ignored by coal energy producers. The newest data of nuclear energy in energy balances of various countries were presented.

Енергетичний менеджмент, який у більшості країн світу базується на кам'яному вугіллі та споживанні лініту, повинен зазнати змін до 2030 року, а видобування енергії з природного газу, як більш екологічно чистого джерела енергії, повинно збільшитися. Прогнози для Польщі до 2030 року, враховуючи зростання національних потреб і вимог (згідно Директив Євросоюзу) щодо зниження екологічного забруднення, показують, що в енергетичний баланс країни необхідно ввести ядерну енергетику. Стаття показує, що теперішня влада, на відміну від попередньої, почала враховувати потреби використання відновлювальної та ядерної енергетики, що раніше ігнорувалося з огляду на виробників енергії з кам'яного вугілля. У статті також наведено найновіші дані про частку ядерної енергії в енергетичних балансах різних країн.

Introduction

Together with growth of human population on Earth the energy requirement also grows. The analysis of current energy consumption rate indicates its exponential character. That is because the problem of energy supply is crucial and strategic problem of each country economy.

The important factor forming currently energetic sector development in European countries is growth of relation between environment and economical activity. The necessity of political integration in both these areas influenced on increase of costs connected with development of installations serving limitation of harmful emissions, lowering of energetic sector expansion, implementation of combustion technologies for environmentally friendly fuels.

The improvement of natural environment condition depends mainly on how ecological politics will be integrated with economy. Otherwise, the economical growth may cause growth of pollution.

The crucial assumptions of energy politics in European Union are competitiveness and energetic safety and this is possible by fuel diversity. The Union recommendations in this area state that the participation of fuels from one direction should not be bigger than 30%.

Currently, the basic energy carriers are still traditional raw materials as coal, oil and natural gas, which applications caused high air pollution. Because of the environmental pollution growth people face the problem of searching for other energy sources not causing the degradation of natural environment.

As it was mentioned before, the crucial problem in world energy politics is minimization of its harmful influence on environment. It was stated that the biggest threat for environment is not the possibility of lack of conventional fuels deposits but global pollution caused by their combustion products: dusts, sulfur, nitrogen and coal oxides. This problem was the topic of many international conferences, including World Energy Congresses. One of the important rules of sustainable development is the energy politics allowing fulfillment of energy requirements, but not being harmful for environment.

Nuclear energy

One of the “clean” energy sources is nuclear energy. The construction of nuclear power plants is a controversial issue. Since a long time there is a “small war” between scientists presenting the advantages of it and ecologists seeing a potential threat. Both sides are rather hard to change their points of view. Currently, there is 437 nuclear reactors in 31 countries. They produce about 17% of energy. This type of energy is very common in countries of Far East. Also in Europe, the interest in this energy source grew. Table 1 shows the current state of nuclear power plants in Europe. Table 2 presents the list of countries having nuclear power plants. Figure 1 shows percentage share of nuclear power plants in energy production in chosen countries.

The nuclear energy should be treated as the option supporting renewable sources of energy (OZE).

International Agency of Nuclear Energy forecasts that in 2020 the installed power in nuclear plants will be from 437 GWe to 542 GWe. The forecasts for 2030 indicates the range 510-810 GWe, while the biggest growth of installed power will occur in countries already exploiting nuclear power plants (the influence of current economical crisis on nuclear sector investments was taken into consideration). It is worthy to notice that these values increased in comparison to forecasts from previous years (before 2008) – for example, comparing to forecasts from 2001 these values grew twice and considering the economical crisis grew by 8%!

Even in 2001 the “pessimistic” forecast indicated the decrease of installed power till 2020 and currently the “pessimistic” forecast predicts stable and gradual small growth. According to forecasts the share of nuclear reactors applications to other purposes than energy production also will increase (sea water desalination, heating production, technological heat production, hydrogen production).

The growth of energy consumption in nearest perspective and necessity of lowering environmental pollution caused that the nuclear energy became the balancing source (closing energy balance) in many countries, including Poland.

Table 1. European countries having nuclear power plants or planning their construction (state on 22.05.2010)

Country	Working reactors	Reactors in construction	Planned reactors
Belgium	7		
Bulgaria	2	2	2
Czech Republic	6		3
Estonia			(2) together with Lithuania on its territory
Finland	4	1	3
France	59	1	2
Spain	8		
Netherlands	1		1
Lithuania			2
Latvia			(2) together with Lithuania on its territory
Germany	15		
Poland			4
Romania	2	2	1
Slovakia	4	2	2
Slovenia	1 with Croatia		1
Sweden	10		4
Hungary	4		2
Great Britain	19		8
Italy			4
<i>Albania</i>			(1) together with Croatia on its territory
<i>Belarus</i>			4
<i>Croatia</i>			1
<i>Russia</i>	32	9	27
<i>Serbia</i>			(2) together with Bulgaria on its territory
<i>Switzerland</i>	5		3
<i>Turkey</i>			8
<i>Ukraine</i>	15		22
Overall	142(EU), 52 (outside EU)	8 (EU), 10 (outside EU)	38 (EU), 66 (outside EU)

Sources: [1]

Remark: Countries not being member of EU were marked by cursive

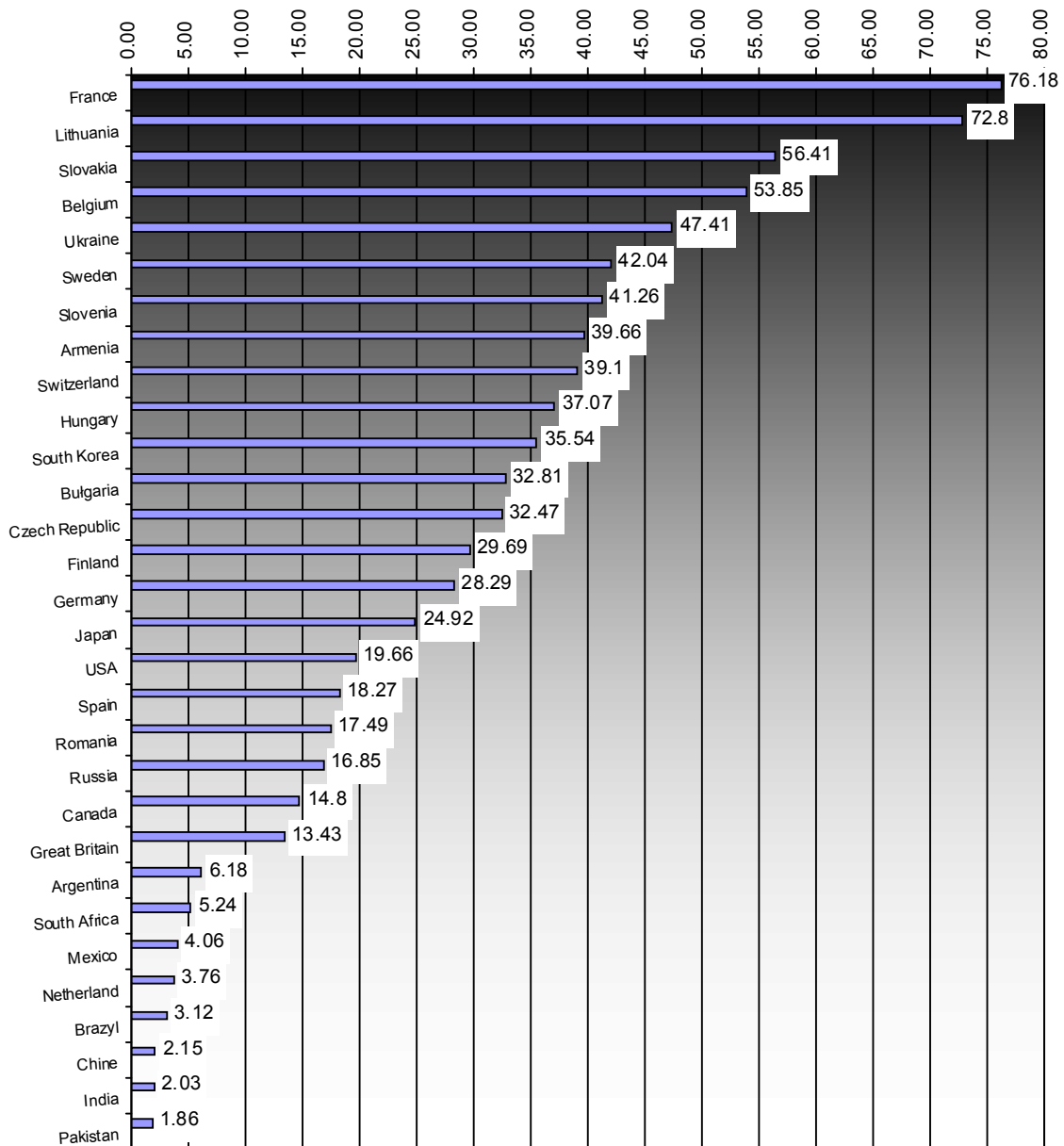
Table 2. Countries having nuclear power plants (world) (data for 2009)

Country	Number of working reactors	General installed power net (MWe)	Ratio of produced energy to energy produced in certain country (TWh) in 2009	Share in national energy production (%) in 2009
Argentina	2	935	7,6/109,3	6,95
Armenia	1	375	2,3/5,1	45,10
Belgium	7	5902	45/87	51,72
Brazil	2	1884	13/443,2	2,93
Bulgaria	2	1906	15,3/42,5	36,00
Chine P.R.*	11	8438	71/3714,7	1,91
Czech Republic	6	3678	25,7/76	33,82
Finland	4	2696	22,6/68,7	32,90
France	58	63130	390/518,8	75,17
Spain	8	7516	50,5/288,9	17,48
Netherlands	1	487	4/108	3,70
India	19	4189	14,7/683,3	2,15
Japan	54	46823	263,1/900,1	29,23
Canada	18	12569	85,3/575,3	14,83
South Korea	20	17705	141,1/405,7	34,78
Mexico	2	1300	10,1/210,6	4,80
Germany	17	20490	127,6/488,8	26,11
Pakistan	2	425	2,6/96,3	2,70
South Africa	2	1800	11,6/239,3	4,85
Russia	32	22693	153/858,5	17,82
Romania	2	1300	10,8/52,5	20,57
Slovakia	4	1762	13,1/24,4	53,69
Slovenia	1	666	5,5/14,4	38,19
USA	104	100683	796,8/3951,1	20,17
Switzerland	5	3238	26,3/66,5	39,55
Sweden	10	9303	50/133,7	37,40
Ukraine	15	13107	77,8/160,1	48,60
Hungary	4	1889	14,6/33,9	43,07
Great Britain	19	10137	62,9/350,7	17,94

Source: [2]

Data: IAEA PRIS (International Atomic Energy Agency, Power Reactor Information System)

* and Chinese Taipei: 6 blocks, general power 4980 MWe



Source:[2]

Fig. 1. Participation of nuclear power plants (EJ) in national energy production in various countries (%) (state for 25.03.2009).

Profitability of nuclear power plants

Because of the high cost of construction and equipment of nuclear power plant and relatively low cost of nuclear fuel and maintaining this power plant, the price of produced energy depends mainly on bank credit interest rate and forecasted period of this power plant exploitation. As the result, common observed elongation of nuclear power plants work – also these built in 60-ies and 70-ies – till 50 or even 60 years causes that although the high costs of reactors shutting down and managing with combusted fuel and radioactive wastes are taken into account while the energy price is established, the nuclear energy becomes more and more competitive comparing with other technologies. The additional benefit is high and still growing power availability coefficient in nuclear power plants, which achieved 77% in 2006 (world average), while in 14 countries was above 80% (in Finland, exploiting in Lovissa reactors of the same type as these which were being built on Żarnowiec in Poland – above 90%). These factors caused that the nuclear energy prices drastically lowered, in most of the countries below

the level of prices of energy from other sources; it occurs mainly in Republic of Korea and Japan, but also in United States, especially after introducing new Energy Law in 2005 (US Energy Act) [3].

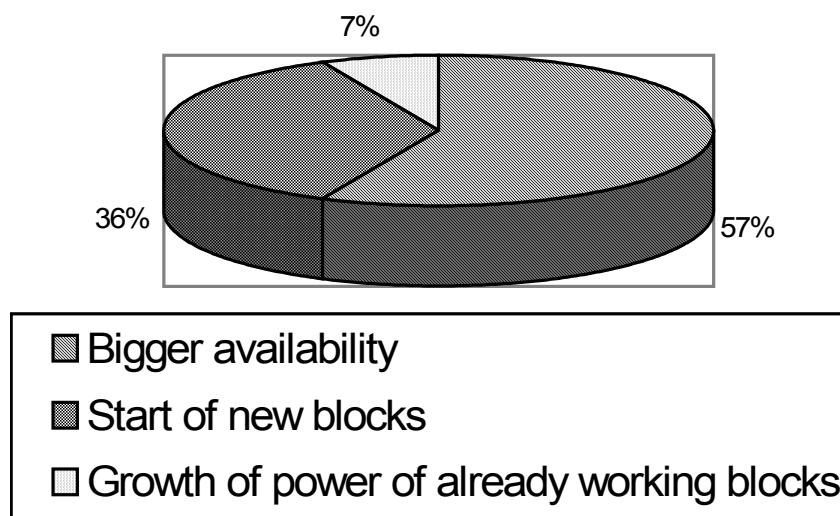


Fig. 2. Sources of growth of energy production in nuclear power plants

Radioactive wastes

The problem of long-living highly active radioactive wastes and combusted nuclear fuel is very important in debates over the future of nuclear energy. It seems that it is clear among specialists that the best and completely safe solution is final storing of such wastes in stable geological formations; current lack of such type of stockyards is effect of the fact that there is still time to solve this problem (combusted fuel is stored on power plant area for dozen years). From other side, the experience obtained during research, construction and lasting from March 1999 exploitation of American stockyard WIPP in Karlsbad (New Mexico), where military transuranium wastes are being stored in rock salt layers seem to confirm the positive opinion about deep stockyards.

Future of nuclear energy

As it was mentioned above, although there are protests against nuclear energy demonstrated by various political movements in the whole world, the economical and ecological regards and mainly issue of energy safety – the easiest available by nuclear energy caused that there is significant growth of interest in further development of nuclear energy. Not only growing number of started and designed reactors proves that opinion but also the technical and organizational solutions accepted and prepared for future reactors and power plants.

Conclusions

Factors for investments into nuclear energy:

- ✓ growing demand for energy;
- ✓ low and stable price of energy produced in EJ;
- ✓ lack of competition from renewable sources of energy which cannot work in the basis of network load and/or are dependent on weather conditions;
- ✓ concern of dependency of energy supply from abroad;
- ✓ growing prices of oil and natural gas;
- ✓ lack of monopoly of the market of nuclear energy, nuclear fuel cycle and nuclear power plants components production;
- ✓ overrun of nuclear technology and big experience in nuclear blocks work;
- ✓ natural environment (lack of CO₂ emissions by nuclear power plants);
- ✓ stimulation of many scientific and economical fields by nuclear energy.

Factors making hard the investments into nuclear energy:

- necessity of relatively high costs for nuclear energy power plants construction;
- necessity of additional costs connected with preparing future workers, informing society, building infrastructure and scientific and research backup (concerns countries not having nuclear power plants yet);
- in some cases the necessity of adjusting national energy system to possibilities of transferring power from big energetic blocks (above 1000 MWe).

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КОНЦЕПТУАЛЬНЫЕ ПОДХОДЫ В УПРАВЛЕНИИ ОРГАНИЗАЦИОННЫМИ ИЗМЕНЕНИЯМИ НА ПРЕДПРИЯТИИ

Досліджена проблема забезпечення ринкового успіху підприємства шляхом поліпшення реалізації проектів організаційного розвитку. Сформульовані ключові чинники успіху промислового підприємства і відповідна концепція його діяльності. Розроблена методико-інструментальна основа розвитку організації і запропонована структурна схема вдосконалення управління її розвитком.

Исследована проблема обеспечения рыночного успеха предприятия путем улучшения реализации проектов организационного развития. Сформулированы ключевые факторы успеха промышленного предприятия и соответствующая концепция его деятельности. Разработана методико-инструментальная основа развития организации и предложена структурная схема совершенствования управления ее развитием.

Введение. В настоящее время, когда наши промышленные предприятия уже второй десяток лет работают в условиях рынка, когда пройдена «нижняя точка» экономического спада в стране, когда заработало производство и наметилась устойчивая тенденция роста ВВП [1], главной задачей все большего числа отечественных товаропроизводителей является не только и не столько выживание, сколько дальнейшее укрепление уже завоеванных каких-то, пусть еще слабых, но все же рыночных позиций [2].

Решение этой задачи зависит от того, насколько руководству предприятия удастся организовать эффективную производственно-хозяйственную его деятельность с учетом реалий сегодняшних внешних условий, что требует в первую очередь:

- адекватной оценки тенденций и характера изменений макросреды деятельности предприятия;
- обоснования рациональных способов адаптации системы управления предприятием к постоянным изменениям условий его деятельности;