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ESTIMATION OF BELARUS ENERGY SECURITY ENHANCING AT SCENARIOS OF NUCLEAR POWER PLANT OR COMBINE CIRCLE GAS PLANT CONSTRUCTION

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OVERVIEW

Concept of energy security of Belarus has estimated twelve energy security indicators and their threshold levels. Also in concept nuclear power plant (2400 MW capacities) construction is planned. In this paper influence on energy security indicators of nuclear power plant (NPP) constructions with alternative combine circle gas plant constructions is estimated.

METHODS

For energy security estimation in Belarus indicative analysis is used. Indicative analysis is based on the system of quantitative estimations of a situation – these are indicators, describing a degree of threats of energy security. The indicative analysis essence is presented in following: comparison of current and expected values of indicators with some beforehand determined threshold levels, periodically reconsidered; determination of a qualitative condition of energy security, which can be characterised as normal, subcritical, critical. Energy security is expressed through a system of special indicators. If we compared indicators values with beforehand determined threshold levels, it is possible to conclude a condition of security levels of considered systems. The threshold levels divide situations depending on various crisis degrees.

Indicators and their threshold levels were taken from Concept of energy security of Belarus.

For different power system development scenarios values of energy security indicators is calculated. For scenario of NPP constructions following assumptions are making: 2400 MW capacity, coefficient of efficiency – 33,9 %; load factor - 85%; price of installed capacity – 2500 \$ per kW; NPP have fuel on 3 year operation.

For alternative scenario of combine circle gas plant (CCGP) constructions following assumptions are making: 2400 MW capacity, coefficient of efficiency – 55 %; load factor - 85%; price of installed capacity – 900 \$ per kW; CCGP operating in the same regime like NPP.

RESULTS

Results of calculation are presented in table 1.

Table 1. Energy security indicators for 2008 and different power system development scenarios (2020)

Energy security indicators	Threshold levels		2008	NPP scenario	CCGP scenario
	Subcritical	Critical			
1. Energy intensity of GDP, kg c.f./\$	0,35	0,5	0,49	0,51	0,48
2. Share of internal energy resources in fuel and furnace balance of the state, %	30	15	17,9	17,9	17,9
3. Share of possible electricity production on national power plants, %	100	85	100	100	100
4. Share of national oil production in consumption of gasoline, %	35	15	20,2	20,2	20,2
5. Share of dominant energy resources in heat and electricity production, %	65	90	82,4	55,6	63,9
6. Share of dominant energy resources in boiler fuel consumption, %	50	90	78,5	63,1	76,4
7. Share of dominant energy resource supplier in energy consumption, %	65	85	85,8	85,8	85,8
8. Share of heat and power plants which may operating on interchangeable fuels, %	80	50	94,3	73,3	94,3
9. Tear and wear of energy infrastructure, %	45	75	55	42,8	42,8
10. Size of energy reserves vs. energy consumptions, days	90	30	55,7	88,5	55,7
11. Ratio of electricity installed capacities to maximal electricity consumption, %	120	95	134,9	154,3	154,3
12. Share of investments in energy sector to cost of its facilities, %	6	4	6,4	15,6	9,2

CONCLUSIONS

NPP constructions are enhancing seven and weaken two energy security indicators. On three indicators it will not affecting. Main contributions of NPP constructions on energy security enhancing are increasing of energy reserves size and decreasing of dominant energy resources (natural gas) in heat and electricity production.

Combine circle gas plant constructions are enhancing seven energy security indicators. On five indicators it will not affecting. CCGP constructions will decrease natural gas consumption in comparison to present level due to its larger coefficient of efficiency (55% - CCGP; 33% - NPP; 45% - present level for Belarus power system).

For energy security enhancing scenario of NPP constructions is more preferable, but it also more expensive then CCGP constructions.