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ENERGY SECURITY: MACEDONIAN DILEMMAS AND PERSPECTIVES

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Abstract

Since independence until today, in the period from 1991-2008, were prepared more energy strategies, with funds from foreign sources, but they have not been adopted or implemented by the Government of the Republic of Macedonia. The lack of vision and lack of a long term strategy for the development and operation of the energy sector led to strong stagnation in its development and improvement. This has resulted in the need to carry the Energy Development Strategy of the Republic of Macedonia. Energy Development Strategy in the Republic of Macedonia for the period 2008-2020 with a vision to 2030 was made at the request of the Ministry of Economy of the Republic of Macedonia. This paper will analyze the most strategic commitments of the Republic of Macedonia which are supposed to offer opportunities for a secure energy future. In this context, paper will analyze the oil and gas pipeline in the region of Southeast Europe and the possibilities for achieving the concept of diversification of energy sources.

Key words: *energy security, energy strategy, Macedonia, electro-energy potential, diversification.*

INTRODUCTION

The usual definition of energy security is pretty straightforward: the availability of sufficient supplies at affordable prices. According to Daniel Yergin there are several dimensions. First is physical security-protecting the assets, infrastructure, supply chains, and trade routes, and making provision for quick replacements and substitution, when need be. Second, access to energy security is critical. This means the ability to develop and acquire energy supplies – physically, contractually, and commercially. Third, energy security is also a system – composed of the national policies and international institutions that are designed to respond in a coordinated way to disruption, dislocation, and emergencies, as well as helping to maintain the steady flow of supplies. And, finally and crucially, if longer-term in nature, is investment. Energy security requires policies and innovation to ensure that adequate supplies and infrastructure will be available, in a timely way, in the future (Yergin, 2011: 268-269).

Given the fact that global energy resources are limited, the problem of energy security is gaining significant importance. This is a consequence of the increased demand and consumption of energy resources which increases with the enlargement in world population and the development of new technologies. Also, the geographic distribution of resources and their consumption is extremely uneven. The biggest consumers of natural gas are countries from European Union and their main supplier is the Russian Federation, which holds one-third of the world's gas reserves. On the other hand, the greatest demand for oil are U.S. and "Asian tigers" and as a major oil exporters are countries from Middle East.

Unequal intercourse on relations offer - demand for energy causes addiction which, on the other hand appears on the relation manufacturer - buyer.

However, such dependence is not direct, i.e. not only countries are depending to import energy from producers, but producers themselves are dependent on stable demand and market to sell their products. In economic terms stated, the initial assumption would be that the market and its regularities are the main regulatory mechanism and the assumption that the main actors behave rationally in that market. However, the basic energy resources are limited and non-renewable, and the demand for them is increasing steadily since the functioning of modern economies is unthinkable without them. It causes energy trade to becoming more a matter of public importance to each state, which implies involvement of state institutions and an object of public policy. In a situation where the supply of energy is raised to the level of state policy, the relationship between supplier and buyer specifies not only economic sense but also political motives and foreign policy interests. As a consequence of these relations and the politicization of energy supply, appear unpredictability and rising uncertainty and distrust among all participants in the supply of energy dependence.

Setting the energy issue at the political level, condition and initiate discussions on securitization and militarization of energy issues. Securitisation is the process in which an object or a value is determined as an object of primary importance for engagement in his defence. One of the ultimate methods of action in these cases may be the use of military force. However, it must be not the use of military force, but also are possible and

other methods that are in the domain of foreign policy means, as introduction of sanctions or suspension of diplomatic relations. (Radoman, 2007: 36-37).

In this paper, the basic assumptions are relating to energy security in the Republic of Macedonia. Specifically analyzed are the main strategic energy directions of the state in the context of providing sufficient quantities of energy, at a good price, from various energy suppliers.

1. ENERGY INFRASTRUCTURE OF THE REPUBLIC OF MACEDONIA

The energy infrastructure of the state is an important segment in the structuring and evaluation of overall energy security. A good part of the analysis of energy security, covering the protection of energy infrastructure. In particular, the energy infrastructure of the Republic of Macedonia provides the exploitation of domestic primary energy consumption, imports and exports of primary energy, processing of primary energy and the final energy production, transport and distribution of energy. Under the "Energy Strategy of the Republic of Macedonia for the period 2008 - 2020 with a vision to 2030" prepared by the Macedonian Academy of Sciences and Arts, the energy infrastructure of the Republic of Macedonia is composed from following sectors: coal, electricity, oil and petroleum products, natural gas and sector for heat production.

1.1. DEPARTMENT OF COAL

From fossil fuels, lignite is low calorie coal which has been used and exploited in Republic of Macedonia. This means that all remaining types of fossil fuels, oil, natural gas and other types of coal, are provided through imports.

As intended, existing coal mines are divided into two groups: mines producing coal for thermal power objectives of state ownership within Macedonia's ELEM (surface mines Suvodol and Oslomej) and mines producing coal consumption (surface mines BRIC Berovo and Drimkol - lignite) that are exploited by concessionaires which are joint-stock companies in private ownership.

Extremely important for the purposes of REK Bitola is a surface mine Brod-Gneotino. Potential for open pit mining and the needs of REK Bitola is a surface mine Suvodol - underlying series.

Of the remaining deposits of coal that can be used for electricity are Zhivojno, Mariovo, Popovjani and Negotino.

Surface mine Suvodol is the most important coal mine in the country, which, since 1982, continuously supplies the TPP REK Bitola with coal. Annual production of coal in mine Suvodol varies in the range of 6-7 million tons. The total remaining exploitation reserves of coal in surface mine Suvodol is estimated to be around 36 million tons.

Meeting the needs of coal in PPT Oslomej is realize through the exploitation of surface mine Oslomej - west. According to the energy balance of the country in the period of 1996-2007 years., from the TPP Oslomej - East and after 2002/2003, and Oslomej - west, the annual production of lignite ranged from 530 thousand to 1.07 million tons. The remaining total exploitation of coal reserves TPP Oslomej - West, are estimated at approximately 11 million tons of coal.

Surface mine BRIK Berovo is located near the city Berovo. The total exploitation reserves are estimated at approximately 1 million tons. Annual exploitation is in a function of demand and ranges between 35 to 70 thousand tons. Lignite is crushed and separated and used for industrial goals and consumer needs.

Surface mine Drimkol - lignite is located on west and it is adjacent to the dam of the reservoir Globochica. Annual exploitation is almost identical to BRIC Berovo and ranges between 40 to 70 thousand tons of coal. The coal is from the type of lignite with much higher carbonification over other lignite in the country, which brings it closer to brown coal. The total amount of coal is crushed and separated into individual classes, which are used for industrial goal and consumer needs (MASA, 2009: 39-40).

1.2. ELECTRICAL POWER SYSTEM OF THE REPUBLIC OF MACEDONIA

Electrical power system of Macedonia is directed primarily to the production, transmission and distribution of electricity. The structure of the power system of Macedonia comprises: hydro plants with a total installed capacity of 581 MW, thermal power plants on oil, with a total installed capacity of 1010 MW and a transmission and distribution system of electricity.

Management of electrical power system of the Republic of Macedonia is realized by four entities, namely: ELEM AD - Skopje (Macedonian Power Plants), a state-owned joint stock company for production and supply

of electricity, MEPSO - Skopje (Macedonia Electricity Transmission System Operator) in state-owned, operator of electrical transmission system in Macedonia - joint stock company for electricity transmission and power system of Macedonia, the distribution company EVN Macedonia AD "Negotino" state-owned company to produce electricity.

1.3. DEPARTMENT OF OIL AND OIL PRODUCTS

Within department of the oil and petroleum products is performed import and export of crude oil and petroleum products, processing crude oil, biofuel production, distribution and sale of petroleum products.

Refinery OCTA was built in 1980 and began to work in 1982. The designed capacity is 2.5 million tons per year until the maximum capacity is reached 1.36 million tons in 1988. From 1999 become private company with majority shares package of strategic investor EL.P.ET Balkanika, Greece.

In 2002 began with work pipeline Thessaloniki - Skopje (213km) with a capacity of 2.5 million tons per year. The control and monitoring of the operation of the pipeline is realized through - SCADA system. Oil pipeline is managed by joint Macedonian - Greek VARDAX Company based in Thessaloniki and offices in OCTA. The capacity of the refinery OCTA and pipeline OCTA - Thessaloniki port, fully meet the needs of the petroleum products in Macedonia but is needed modernization of the refinery for the purpose of effective protection of the environment and to improve efficiency (MASA, 2009: 39-40).

1.4. DEPARTMENT OF NATURAL GAS

Natural gas sector performs transmission, distribution and sale of natural gas. The place and role of natural gas in the modern era is extremely high. These conclusions stem from the fact that natural gas is extremely useful fuel because it has a wide range of household through industrial and transportation use in the production of electricity and heat. The advantages that natural gas has over other fuels derived primarily from simple storage capabilities and reduced negative environmental impact. In some cases its use means additional financial effects of the projects in terms of reducing global pollution of the atmosphere by reducing the specific emissions of gases that cause the greenhouse effect. Natural gas is the most appropriate fuel to meet energy needs in urban areas.

Macedonia does not have deposits of natural gas and is connected only with one main pipeline. The overall amount of natural gas imported from Russia via international corridor 8 passing through Ukraine, Moldova, Romania and Bulgaria. Pipeline enters Macedonia at border crossing Deve Bair with Bulgaria border and extends through Kriva Palanka, Kratovo and Kumanovo to Skopje in length of 98 kilometers. Main pipeline has a capacity of 800 million Nm^3 per year with an option to increase to 1200 million Nm^3 with building a compressor station at the beginning of the pipeline.Максималната пропустливост на магистралниот гасовод изнесува 145000 Nm^3/час. The maximum permeability of main gas pipeline is 145000 Nm^3/hour. On the pipeline are built five major measurements - control stations. Also on the main gas pipeline are performed power points for distribution pipelines for future connections to Veles, South Serbia, Romanovce and Gostivar.

1.5. DEPARTMENT FOR PRODUCTION OF HEAT

Heat is produced in plants (55%), individual boiler rooms that generate heat for own use (37%) and cogeneration plants for manufacturing of heat and electricity needs for own needs (8%). For fuel is used petroleum products (71%), natural gas (19%), coal (8%) and bio mass (2%). Much of the boiler rooms are outdated with low coefficient of efficiency.

1.6. RENEWABLE ENERGY SOURCES

From renewable energy sources in Macedonia used primarily are hydro power for manufacturing electric energy, biomass in most part timber mass in the household, in most geothermal energy for heating greenhouses and some solar energy in households and wind energy. Using renewable energy is supporting with a range of measures and expected their increased use in the future. (Strategy for utilization of renewable energy in the country by 2020, 2010).

1.7. GROSS PRIMARY PRODUCTION BY TYPE OF ENERGY IN REPUBLIC OF MACEDONIA

Total primary energy production in the country in the last decade moving straight, without any significant change in the structure of energy involved in the overall production. The biggest share in total primary production has solid fuels, i.e. lignite. As a new fuel which occurs in 2007 is biodiesel which belongs to the group biofuels, and in 2010 for the first time has a slight production of solar electricity produced by photovoltaic plants.

000 toe

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	**1 595 070**	**1 642 405**	**1 577 270**	**1 666 112**	**1 597 511**	**1 577 826**	**1 617 109**	**1 503 697**	**1 634 956**	**1 606 956**	**1 615 631**
Solid fuels	1 272 684	1 419 480	1 356 096	1 353 128	1 293 253	1 288 423	1 295 612	1 254 115	1 377 602	1 293 211	1 194 131
Hydroelectricity	100.587	53.826	65.099	118.117	127.404	128.245	141.812	86.830	72.221	109.209	208.841
Solar energy	-	-	-	-	-	-	-	-	-	-	0.002
Geothermal heat	15.590	23.118	12.962	13.153	11.750	10.047	10.356	9.850	8.918	9.749	11.913
Biomass	206.210	145.980	143.222	181.715	165.104	151.111	169.329	149.933	164.257	194.279	198.978
Befouls	-	-	-	-	-	-	-	2.969	1.059	0.508	1.766

Table no. 1. Gross-primary production by type of energy
(Source: Energy Statistics 2000-2010. Statistics review: Industry and Energy no. 6.4.12.01/707)

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	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	**1 103 951**	**1 010 944**	**1 486 289**	**1 029 428**	**1 152 376**	**1 247 750**	**1 323 339**	**1 460 712**	**1 403 515**	**1 273 144**	**1 267 608**
Solid fuels	93.297	86.016	69.521	97.442	77.797	115.834	134.984	154.831	152.572	44.008	121.701
Total petroleum	940.290	813.891	1 271 687	785.121	916.973	933.460	968.064	1 007 917	920.235	1 033 559	922.505
Natural gas	53.189	71.231	74.024	64.692	57.017	61.770	66.760	84.899	96.407	63.809	95.393
Electricity	9.644	37.076	68.018	81.953	101.115	137.498	154.326	214.175	234.907	123.617	122.094
Biomass	7.531	2.731	3.039	0.219	- 0.527	- 0.812	- 0.795	- 1.110	- 0.606	8.151	8.123
Befouls	-	-	-	-	-	-	-	-	-	-	- 2.208

Table no. 2. Net energy imports by type
(Source: Energy Statistics 2000-2010. Statistics review: Industry and Energy no. 6.4.12.01/707)

Net imports represents the difference between imports and exports of energy to and from the country. Negative values are found in certain biomass and biofuels in 2010, indicating that only these fuels in the respective years were more exports than imports, and all other given values prevail over import export. The total petroleum products in the presented time series have the largest share of net imports.

%

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
39.9	**37.8**	**51.4**	**37.6**	**41.9**	**43.6**	**45.2**	**48.2**	**46.4**	**45.3**	**44.1**

Table no. 3. Energy dependence of total energy
(Source: Energy Statistics 2000-2010. Statistics review: Industry and Energy no. 6.4.12.01/707)

Energy dependence is calculated as the ratio between net imports of energy and total energy requirements. It measures the degree of dependency of the country on imports to meet its energy needs. The goal of each country in keeping energy policy is to reduce the country's dependence on energy imports. (State Statistical Office, 2012: 22-24)

2. ENERGY SECURITY IN REPUBLIC OF MACEDONIA, CONDITIONS AND CHALLENGES

Overall, according to the existing energy potential, the Republic of Macedonia is geographically located in the central Balkan peninsula as European country. Its main energy potential in the context of electricity generation is based on utilization of coal and hydro potential of artificially constructed reservoirs. Statistical indicators suggest that the Republic of Macedonia represents a country that is import dependent of the electricity, i.e. the country needs are higher for consumption of electricity than their capacity to produce it.

It is evident that the overall energy production potential depends mostly on the opportunities for exploitation of hydro potential and utilization of coal as the primary raw material for the production of electricity in the state's largest capacity REK Bitola. These findings suggest that the Republic of Macedonia as an energy import dependent country also represents security dependent country in terms of the stability of its electrical power system, and hence relative to its national security.

Today, modern industries and their emergence are based on the constancy of the potential sources of fundamentals energy resources such as oil and natural gas. Macedonia today haven't access to oil deposits and natural gas resources so that more than clear that these energies can only be imported and adapted, but without affecting the global trends in decision making for production and trade of oil and natural gas.

Concerning the production of electricity, as already mentioned, the key factors are coal and water potential. Comparative analysis of the period of construction of strategic facilities for electricity energy will indicate the condition associated with several decades of stalled progress in the construction of new power and hydro plants. In fact, most of the existing facilities in the country have been built before 1990, while after 1990 put into use just two hydropower plants, Kozjak and HPP St. Petka. These indicators point to condition that a time interval has elapsed unused to boost its own energy infrastructure. Part of the justification for such situations we can assign to to the fact that the early nineties of the last century was the period of independence of the Republic of Macedonia and the transition from one to another system of regulation of social relations. Poor financial resources and lack of interest from foreign investors is also a key factor that long time there has been no investment in building energy infrastructure.

Contemporary literature that treats energy security undoubtedly concluded that geopolitical changes have influence upon energy security worldwide. Moreover, terrorism stands out as one of the biggest security risks and challenges in terms of security of national and regional energy infrastructure. The solutions are often directed to the theoretical framework of regional security, with an emphasis on regional cooperation, liberalization of the energy market and common theoretical and institutional approach in dealing with threats to the security of energy infrastructure.

These considerations and potential developments do not passes Republic of Macedonia. The relationship between energy potentials, including energy infrastructure is unbreakable with security concept of a state. This particular is vital when we considering the potential development that usually is based on the rational utilization of its own energy potential (a context of sustainable development) and to their physical security. Recent developments in the past 10 years on the relation the Russia-Ukraine-EU regarding the transportation of Russian gas, clearly indicate the potential possibilities of energy resources to turn into a powerful tool for achieving certain political goals and economic pressures. In that way is directly affects on the energy security of the end-consumers of natural gas, in this case.

In the Republic of Macedonia in 2001 as an act of terrorism vents were closed of Lipkovo dam, which Kumanovo lefted without drinking water extended period of time. In that way water resources were put in function of achieving of certain terrorist-military-political goals and was impaired energy security on one part of the national territory. That strongly affected the normal functioning of the citizens, civilian and military institutions who live and work in the territory of the city of Kumanovo.

Two previous examples suggest that the main object of interest are noted via energy potentials that manifests power and serve for political pressures for achieving political goals. For these reasons for achieving a high level of energy security, is primarily needed modernization of the energy infrastructure and construction of new energy facilities. Republic of Macedonia as energy import dependent country close attention should be paid to satisfy the principle of diversification of energy facilities and energy potentials. These two segments of the

diversification principle underlying the whole concept of energy security. Thereby, adequate attention should be paid to the maximum utilization of renewable energy sources.

3. DIVERSIFICATION OF ENERGY POTENTIALS AND ENERGY RESOURCES IN THE REPUBLIC OF MACEDONIA

As we already mentioned, one of the important indicators that indicate on achieved level of energy security is the principle of diversification. This principle basically refers to the ability of having different capacities for the production of energy in all its forms and the ability to utilize as many types of the energy resources (oil, natural gas, coal, hydropower potential, sun, wind etc.).

We have already pointed out that in the past twenty years in the country little has been done in the field of energy development, and thus indirectly affect on reducing the level on energy security of the country. Macedonia is a territorially small Balkan country which lacks sources of oil and natural gas, making them imported for the needs on its citizens and its economy needs.

When analyzing the energy system of the Republic of Macedonia we found that the basic resources of the country are coal and water potential. The largest producer of electricity in Macedonia is REK Bitola, but it is necessary to emphasize that coal reserves are increasingly reduced as quantitatively and in terms to the class quality coal. The above mentioned indicates that for two to three decades coal resource will gone or is going to be in very small quantities, which may absolutely reduce the possibility of exploiting the largest power plant in the state, which participates with 72% of total electricity production in Republic of Macedonia.

Water potential is the second source of energy in the country, but it is clear that is primarily dependent on hydrology and weather conditions. In dry years when the hydrological year is a poor then it is absolutely reduced possibility to produce electricity by harnessing of potential of water reservoirs. If coal mines are limited by the amount of coal, and if hydro potential depends on hydrology and weather conditions then more and more is imposed the next question: whether in the Republic of Macedonia there is a chance to meet the principle of diversification of resources?

Facing the truth, if are going to take appropriate measures and activities, then it would hardly be satisfied with the principle of diversification of resources. Hence, it becomes clear that the degree of energy security, or the growing dependence on imported foreign energy resources will greatly reduce the energy security of the country.

Do not running away from the truth such an opportunity exists to entirely country to have only one resource available for energy production, to become completely dependent on energy imports, and therefore country with less security. Always the expert public in Macedonia needs to explore ways to promote and satisfy the principle of diversification of resources in order to maintain energy security of the country.

Special emphasis should be placed on the development of new technologies that are becoming more economically feasible and make systems produce electricity to use the potential of the sun and wind. The territory of the Republic of Macedonia is a region of sunny days, approximately 235 days from 365 in the year, due to it can be used for potential of solar production of electricity. Besides the use of solar energy in the country, Macedonia also has the ability to produce electricity by harnessing the potential of wind. The stage of completion is the first wind power plant "Bogdanci". If in the coming years we prioritize construction of windmills and construction of solar power plants for electricity production then will increasingly promote and realize the principle of diversification of energy resources and capacities in the country.

Another important issue in the context of diversification of energy resources and infrastructure and is undoubtedly closely related to regional cooperation in the energy sector of the Balkan states refers to the possibility of building a nuclear power plant in joint investment in order to stabilize the region's energy and increasing energy security of the Balkans in general.

In an era when energy security is slowly but surely starting to play a key role in international relations and searching for the safe and environmentally clean energy, governments of economically powerful countries considering for even safer nuclear facilities and new nuclear power. From USA to Italy, Arab countries, Russia and Vietnam, the construction of safe and clean nuclear power plants is becoming a reality and a new energy policy.

For several years the policy of "green" energy in the European Union reluctantly connected nuclear fission as an alternative, despite the fact that some EU Member States have active antinuclear movements. The rise of nuclear agenda in the last few years at EU level is not empty postulate. The quest for economic growth and sustainable

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development of nuclear energy as a technology with low carbon is seriously reconsidered within the energy systems of the EU. (Council of the EU Council Directive 2009/71/Euroatom 2009).

In the region of Southeast Europe nuclear energy have tradition as an energy source dating back to the previous social order - communism. Bulgaria and Slovenia are the only countries that have nuclear power plants on its territory. However, since the 90's of the last century, nuclear energy option was a policy with the lowest priority in the region due to reconstruction of economic and political systems and the fear of the possible destruction of the environment. Until recently the governments in the region did not show particular interest in investing in nuclear energy, because Chernobyl accident and its consequences were felt strongly in South Eastern Europe. So the governments in the region for some time didn't open up discussion about the possible use of nuclear energy. However today Bulgaria, Albania, Croatia, Macedonia are countries wishing to invest in its nuclear power plants, while Serbia has recently expressed willingness join in the investment in nuclear power plant in Bulgaria.

Macedonian Academy of Sciences explores the problem of nuclear energy development in strategy for the energy sector. The strategy develops scenario which stress that, providing sufficient quantities of electricity and heat for the period from 2020 to 2030, is also necessary nuclear option for the country's.

As possible additional manufacturing facilities for the production of electricity in the period 2020 - 2030, the Macedonian Academy of Sciences and Arts analyze two thermal power plants (Mariovo and Negotino) with capacity of 300 MW and a maximum annual production of around 2000 GWh, nuclear power plant with capacity of 1000 MW and a maximum output of about 7,500 GWh and a hydro power plant (Veles) with installed capacity of 89 MW. Thermal power plants will be supplied with lignite from planned mines with pits exploitation in Mariovo and Negotino.

Small hydropower, wind power, solar power plants and combined heat and power plants for the production of electricity and heat by burning biomass are considered integral in momentum of development of 45 MW and annual production of 90 GWh per year every 5 years (2025 and 2030). Such dynamics of development means that on the end of the analyzed period their total capacity will be 180 MW and 360 GWh produced in a year.

What is particularly interesting in the third scenario, is the plan to build a nuclear power plant of 1000 MW and a maximum output of about 7500 GWh that will be put running in 2026.

	SCENARIO 1	SCENARIO 2	SCENARIO 3
	Consume 2,5%	Consume 3,0%	Consume 3,0%
	Strategy LIGNIT	Strategy LIGNIT	Strategy NE+LIG
2021	HE Veles	HE Veles,, TE Mariovo	HE Veles
2022	TE Mariovo		
2024	TE Negotino	TE Negotino	
2026			HE_1000

Table no. 4. Timeframe for construction of new production facilities in Macedonia for all three scenarios (Source: MASA Strategy for Energy Development in the Republic of Macedonia for the period 2008-2020 with a vision to 2030, Skopje, June 2009)

The period after 2020 is emphasized as a critical period characterized by replacement of existing thermal power plants with new base plants for production of base power. The existing TE on lignite (Bitola 1, 2, 3 and Oslomej) and TE Negotino of oil entering the final period of his working life of about 40 years. In this period it is expected termination of these facilities, except Bitola 3 which was entered last in the EPS of Macedonia (1988). The working expectations of Bitola 3 to 2030, and the timetable for termination of the existing thermal power system, under scenario 1 and 2 is Negotino in 2021, Oslomej in 2023, TPP Bitola 1 in 2024 and Bitola 2 in 2026, while under scenario 3 Negotino, Oslomej, Bitola 1 and Bitola 2 in 2026.

If the scenario realized with the construction of a nuclear power plant, electricity demand at average hydrology would be met and through increase of consumption at an annual rate of 3%. In this case, the dry hydrologic conditions in 2030 would require importing electricity from around 600 GWh which would be about 3-4% of electricity consumption in that year.

As emphasized in the Strategy for Energy Development in the Republic of Macedonia for the period 2008 - 2020 with a vision to 2030, nuclear option is a realistic opportunity for the development of the power system of the

Republic of Macedonia after 2025. As a potential location for the construction of nuclear power plant is Mariovo. Mariovo location is a suitable in terms of water supply for cooling of the planned hydropower complex Cebren and Galiste. Hydro-nuclear energy production center Mariovo would have an advantage that would consume part of the produced electricity for pumping water when electricity is a cheap and would produce the reversible when power is a more expensive. According to calculations included in Strategy, the cost of electricity produced will be around 5,3 c €/kWh for nuclear power and 4 c €/kWh for thermal power plants. However, need to keep in mind that the option with thermal power plants will require substantial imports of electricity whose price is expected to be around 7 c €/kWh. The nuclear option will have even greater advantage in terms of power plants, if the price you are paying for emissions of greenhouse gases reach high values if the technologies for producing electricity from coal without emissions of greenhouse gases by that time not be commercially available at competitive prices.

The strategy emphasizes certain conclusions that we could agree that the nuclear option will provide satisfying the principle of diversification, and thus more reliable supply of electricity. About 42% of electricity could be produced from nuclear power, 22% of the combined power of natural gas and 18% of the lignite fired power plants and renewable energy sources. (MASA 2009: 177). If the scenario is realize with the construction of a nuclear power plant that would cost about 5.2 billion euros, in the period after 2026, from the power plants will remain just Bitola Bitola 3 and Bitola 4. Their work requires 600-700 ktoe of coal that will be provided from surface mines and from mine pit excavation Zhivojno. (MASA, 2009: 179-185)

These assumptions, especially with recent events in Japan after the earthquake of 2011 and the nuclear plant accident "Fukoshima Daiichi", should be taken with some caution, because certain nuclear power will not be so cheap, because new nuclear power plants will must invest more resources in themselves for maximum security of the entire production process of nuclear energy. The events of Fukoshima already effected the exchange of energy, more expensive cost of nuclear power. These assumptions are confirmed by the analysis of the latest Institute of Technology Cambridge, Massachusetts, USA. The new generation of nuclear plants will have a long period of construction and increased capital costs. According to analysis by the Institute of Technology, the cost of nuclear power plant (capital and operational) will make electricity from new nuclear plants functional for 40 years with 85% of capacity to 6.7 cents/kWh. That compared with the cost of electricity produced by power plant that runs on coal, which is 4.2 cents/kWh and the cost of electricity to power a gas turbine which amounts to 4 to 5.6 cents/kWh depending the assumed cost of natural gas, nuclear energy does not be profitable and would hardly be dominant (Portney, P. 2005).

Certainly we have to mention that as a subject expert and public debate, far there is no comprehensive policy analysis for nuclear energy that would objectively reviewed the benefits and weaknesses in nuclear power plants in Macedonia. Lack of research on nuclear energy in the country and the negative climate that prevails in the experts and the public sector for the opening of discussions on "hot topics" can be singled out as the reason why there is no specific debates about the construction of a nuclear power plant.

Any good analysis should be heading in direction of the professional staff estimate the potential for implementation of any project for the construction of a nuclear power plant in Macedonia. Besides human resources is always necessary to make economic and financial analysis of state economic opportunity to stand this capital project. It is impossible to think of building such a facility and avoid the possibility of analyzing the safety of the environment in terms of the exploitation of such a facility. Everything said above should seriously be analyzed in order to accurately pave the way for the use of nuclear energy in the country as one of the possibilities to increase the energy security of the country and before the opening of the opportunity to satisfy the principle of diversification of energy and path to stable energy in the coming decades.

4. CONCLUSION

Energy security of one state can not analyze, review and advance beyond the segment of the overall national security. One of the basic elements that have an impact on the overall security system of the Republic of Macedonia represents electrical power system of the state. Republic of Macedonia as the aspirant fulfilled the criteria and standards for accession to NATO repeatedly discussed at all meetings, forums and bilateral meetings on the economic need for access to energy resources and promoting the own electrical power system as the basis for a quality power supply.

The stagnation in the development of the energy sector in Macedonia in recent years has led to endangering the energy security of the exhaustion of coal for REK Bitola through increasing electricity imports and rising prices on the world markets of oil and oil derivatives strongly touches economy on the state and standard of the citizens. Alarming indicators indicate that we have to search for new energy sources in new ways of producing

electricity and moving toward to regional association for a common approach to solving the problem of energy resources.

Strong contribution to the realization of the concept of energy security of the Republic of Macedonia can be achieved if we first remove the basic set of anomalies presented in current energy system of the Republic of Macedonia. It must leave outdated technology and to work on attracting investment to maintain and modernize the existing power system of the Republic of Macedonia. Modernization is necessary in all segments of the power system of the Republic of Macedonia in terms of monitoring, control and automatically analyze all technical parameters. The introduction of innovations constantly provides monitoring of global technological trends in replacement parts thoroughly computerized monitoring of all input and output devices to avoid the possibility of technological stagnation. Technological stagnation can lead to deficiency of spare parts to technical malfunctions due to dilapidation and obsolescence of technological processes in the system.

Next, it is necessary to reduce the high electricity losses whether they are technical or commercial losses. Obsolescence of systems leads to increased losses and the poor transmission and distribution of electricity. In Macedonia there are larger towns where there is little recovery of consumed electricity and the occurrence of the illegal exploitation of energy. Loss and theft of energy burden and further endanger the system from a technical aspect and completely irrational leading to depletion of energy resources.

As a special need arises to increase the energy efficiency as the individual household access, and overall through a responsible approach to economic operators and above all the state institutions. Increasing energy efficiency will significantly contribute to reducing electricity consumption in any segment, and it will directly extend the depletion of energy resources.

Important activities should be an improvement of the infrastructure for the production, distribution and export of various types of energy from environmental, economic and technical aspects. If the Republic of Macedonia intensify ongoing projects for gasification, then surely that citizens and economic operators will have reliable access to cheap energy, will save on the purchase of expensive energy and resources and will provide greater own market competitiveness. At the same time the positive effects of gasification will manifest also on the environment.

It is necessary to take measures to curb monopolies in certain energy sectors with an opportunity to realize economic benefit through opportunities for different market supply and development of competition. Almost all analyzes are pointed in the direction of generation, transmission and distribution of electricity. After separation of the distribution network and after the privatization of EVN in Macedonia remained state-owned electricity generation ELEM and high voltage distribution network MEPSO. In 2014 it is expected that large firms alone will buy electricity at liberalized free market on market price. Liberalisation and competition bring quality, timeliness and operational functionality.

Also, it is necessary to complete a distinction of the production, transmission and distribution of energy in all energy sectors. Delineation of these three segments fully establish market norms and responsibilities and leads to regulated legal rules regarding the production transmission and distribution of energy.

Regional cooperation is needed in building a common manufacturing facilities that need to be addressed to solve the problem with the power supply of the Balkan states. In almost all Balkan countries economic situation is similar. Increasingly, the Balkan countries have become dependent on energy imports and thus its energy security make import dependent. Regional capital energy projects will enable the division of costs and reduce dependence on imported energy, and would presumably affect the principle of diversification of resources and capacities.

Full commitment to finding economic opportunity for building solar and wind power. Macedonia needs to be fully committed to the use of renewable sources for electricity production. The sun and wind are renewable resources that need more in the future to exploit in order to increase the level of energy security of the Republic and to satisfy the principle of diversifications of sources.

Comprehensive approach to the analysis and use of all facilities to build a nuclear power plant. Although in the strategic documents can be found scenario which predicts nuclear power plant, due to the large capital investment in such energy infrastructure, for the Republic of Macedonia will be viable possible inclusion in a regional joint project to build a nuclear Balkan power plant. This activity will also provide increased energy security and regional diversifications of resources and energy infrastructure.

Gradual replacement of electricity with natural gas, which will be an important economic and environmental benefits. It is known that about 85% of electricity in the country is produced in thermal power plants where for every kWh of electricity produced is consumed 3 kWh energy and emitted 1kgCO2.

Already taken measures and strategic objectives in Macedonia hint that energy independence is not a major strategic objective. That means that we already we delay in the process of protecting energy supplies, and the whole emphasis on political action is set to the increased energy efficiency of the used resources.

In the process of the development projects of the EU, Macedonia is ranked third in the region, after Croatia and Serbia. The basic directions of Macedonia regarding the development of the natural gas sector are indirectly connecting Macedonia with major pipelines in the region, starting a process of gasification of the state and use of natural gas for electricity generation. In this regard, several projects are important:

- Building stream of pipeline Skopje - Tetovo as the missing link in the regional project on "gas ring" on the territory of Macedonia as basis for connection to Albania with branches of the pipeline to Debar, Struga and Ohrid. The length of the pipeline is 48 kilometers with an annual capacity of 350 million cubic meters of natural gas;
- Construction of the pipeline section of Petrich (Bulgaria) to Strumica (Macedonia) as part of an existing pipeline that Sofia-Petrich used as a source of Russian natural gas. The planned length is 25 km with an annual capacity of 71 million cubic meters of natural gas. The significance of this pipeline is great because the possibilities for development of secondary network of pipelines for the wider region around Strumica, Gevgelija and Dojran. Another significant finding is the possibility that the branch Petrich-Strumica can enable Macedonia connection with TGI and TAP pipelines that passing directly along the south border of Macedonia. This is especially important for the security of supply of natural gas, because Macedonia will not only be dependent on Russian gas, but would have supplies from the Caspian region;
- Construction of the section of pipeline that will connect Klechovce-Veles-Stip-Negotino as an important project for internal gasification of Macedonia. With the branch would be completed secondary gasification of the country that would be linked Sveti Nikole, Veles, Stip, Kocani, Gradsko, Demir Kapija, Negotino and Kavadarci. The total length of the pipeline amounts 101 km with a capacity of 286 million cubic meters and an additional 400 million cubic meters of natural gas if TE Negotino connects to the system.

Starting from the premise that the diversification of the supply of energy resources, suppliers and routes is a fundamental principle in the process of planning and energy security means providing access to diverse sources of supply, it is obvious to conclude that the activities associated with prior mentioned in the SEE region in the coming period will gain momentum. The basic intentions are aimed at alleviating some supply disruptions in energy resources. This approach allows taking specific policy actions to ensure a steady supply of resources in the SEE region, important for the entire region which becomes crucial transit region which can not bypass on the path of Asian, Caspian and Middle Eastern pipe capacity on their way to European Union.

The basic strategic decisions for effective energy security and diversification of sources of supply of natural gas for Macedonia should be designed in order to find suitable solutions to establish active participation and cooperation within the Energy Community in SEE. It is also necessary to strengthen political and economic relations with key countries in the sector of natural gas as Russia, the U.S., the EU and the Black Sea countries and the countries of the Middle East.

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