



**МЕЃУНАРОДНА НАУЧНА КОНФЕРЕНЦИЈА
„КРИЗЕН МЕНАЏМЕНТ: ПРЕДИЗВИЦИ И
ПЕРСПЕКТИВИ“**

**INTERNATIONAL SCIENTIFIC CONFERENCE
“CRISIS MANAGEMENT: CHALLENGES AND
PROSPECTIVE”**

ЗБОРНИК ТРУДОВИ / CONFERENCE PROCEEDINGS



ЦЕНТАР ЗА УПРАВУВАЊЕ СО КРИЗИ,
РЕПУБЛИКА МАКЕДОНИЈА

УНИВЕРЗИТЕТ ЏОНС ХОПКИНС,
СОЕДИНЕТИТЕ АМЕРИКАНСКИ ДРЖАВИ

АМБАСАДА НА СОЕДИНЕТИТЕ АМЕРИКАНСКИ ДРЖАВИ
ВО РЕПУБЛИКА МАКЕДОНИЈА

**ЗБОРНИК ТРУДОВИ
ОД МЕЃУНАРОДНАТА НАУЧНА КОНФЕРЕНЦИЈА
„КРИЗЕН МЕНАЏМЕНТ:
ПРЕДИЗВИЦИ И ПЕРСПЕКТИВИ”
НОЕМВРИ 2015 ГОДИНА
СКОПЈЕ, РЕПУБЛИКА МАКЕДОНИЈА**

Скопје
март 2016



CRISIS MANAGEMENT CENTER,
REPUBLIC OF MACEDONIA

JOHNS HOPKINS UNIVERSITY,
UNITED STATES OF AMERICA

EMBASSY OF THE UNITED STATES OF AMERICA
IN THE REPUBLIC OF MACEDONIA

PROCEEDINGS
OF THE INTERNATIONAL SCIENTIFIC CONFERENCE
“CRISIS MANAGEMENT:
CHALLENGES AND PROSPECTIVE”
NOVEMBER 2015
SKOPJE, REPUBLIC OF MACEDONIA

Skopje
March 2016

Издавач:

ЦЕНТАР ЗА УПРАВУВАЊЕ СО КРИЗИ НА РЕПУБЛИКА МАКЕДОНИЈА

Центар за управување со кризи
ЗБОРНИК ТРУДОВИ ОД МЕЃУНАРОДНАТА НАУЧНА КОНФЕРЕНЦИЈА
„КРИЗЕН МЕНАЏМЕНТ: ПРЕДИЗВИЦИ И ПЕРСПЕКТИВИ“,
НОЕМВРИ 2015 ГОДИНА, СКОПЈЕ, РЕПУБЛИКА МАКЕДОНИЈА
Димче Мирчев бр. 9, 1000 Скопје
Телефон: +389 2 3249 101
Интернет адреса:
Веб-страница на Центарот за управување со кризи:
www.cuk.gov.mk/international-conference-proceedings

ISBN 978-608-65138-9-4

Скопје, март 2016 година

Печати: Пруф Принт ДООЕЛ; Тираж: 500 примероци

Publisher:

CRISIS MANAGEMENT CENTER OF THE REPUBLIC OF MACEDONIA

Crisis Management Center
PROCEEDINGS OF THE INTERNATIONAL SCIENTIFIC CONFERENCE
“CRISIS MANAGEMENT: CHALLENGES AND PROSPECTIVE”,
NOVEMBER 2015, SKOPJE, REPUBLIC OF MACEDONIA
Str. Dimce Mircev No. 9, 1000 Skopje
Telephone: +389 2 3249 101
Internet address:
WEB of the Crisis Management Center:
www.cuk.gov.mk/international-conference-proceedings

ISBN 978-608-65138-9-4

Skopje, March 2016

Printed by: Pruf Print DOOEL; Circulation: 500 copies

CIP - Каталогизација во публикација
Национална и универзитетска библиотека "Св. Климент Охридски", Скопје

327.5.008.1/.2(082)

INTERNATIONAL scientific conference "Crisis management challenges and prospective"
(2015; Skopje)
Proceedings of the International scientific conference "Crisis management challenges and
prospective", November 2015, Skopje, Republic of Macedonia. - Skopje: Crisis management
center of the Republic of Macedonia, 2016. - 260 стр.: граф. прикази; 23 см

На наспор. насл. стр.: Зборник трудови од Меѓународната научна конференција "Кризен
менаџмент: предизвици и перспективи", ноември 2015 година, Скопје, Република
Македонија. - Фусноти кон текстот. - Библиографија кон трудовите

ISBN 978-608-65138-9-4

I. Меѓународната научна конференција "Кризен менаџмент: предизвици и перспективи"
(2015 ; Скопје) види International scientific conference "Crisis management challenges and
prospective" (2015; Skopje)

а) Кризен менаџмент - Управување со ризици - Зборник
COBISS.MK-ID 100804362

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Координација за печатење и издавање: Центар за управување со
кризи/Одделение за медиумска продукција

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Printing and publishing coordinated by: Crisis Management Center/Media Production Section

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USE OF RENEWABLE ENERGY SOURCES FOR PREVENTION OF ENERGY CRISIS IN MACEDONIA

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Abstract: *The use of renewable energy sources is a priority in every country in the wake of the 21st century, part of the backbone of energy supply security and a key precondition for further development, especially in the economy, but also for society as a whole. The uses of renewable energy sources contributes to energy independence and reduce energy dependence and aims to reduce the risks associated with energy dependence.*

The scientific conception of exploration of the issues in the paper title "Utilization of renewable energy sources to prevent an energy crisis in the country," grew out of two strategic interests of the Republic of Macedonia, the strategic interest in providing diverse energy at an economically reasonable price, and the strategic interest in promoting energy efficiency and reducing overall energy imports, which directly reduces the possibility of an energy crisis.

By utilizing renewable energy sources Macedonia reduces the risk of a possible energy crisis and contributes to the reduction in imports of electricity. And with that Macedonia contributes to strengthening the European energy strategy as the ultimate aims: reducing energy dependence, provision of energy at an affordable price for citizens and industry, security and continuity of the availability of energy, competitiveness of the energy market and environmental environment.

Keywords: *strategy, energy, renewable energy sources, energy efficiency.*

Introduction

In the Green Paper, which is a new beginning for energy policy in Europe, enter the "new energy era" marked by major challenges. The main objective of the package is a new energy policy for Europe, known as the "three (3) times 20 by 2020". Namely, it is for the purpose of energy efficiency (20% increases), use of renewable energy sources (20% increase) and reducing emissions also by 20%.¹

Providing continuous, stable and uninterrupted supply of energy on the activities of the energy infrastructure that are involved in the production, transportation, storage and distribution. By clarifying the objectives of the European energy strategy and the Strategy for Energy Development in Macedonia, expected results of the research to highlight the urgent need for a serious and comprehensive approach to monitor some countries of Europe and the world, through public-private partnership, investment and investing in renewable energy.

Since the independence of the Republic of Macedonia has the energy crisis several times knocked on our door. First during the economic embargo imposed in 1994 by Greece, then breaking the delivery of natural gas from the Russian Federation in 2007, 2010 and 2014.

Macedonia as a country dependent on energy imports as a candidate country for membership in the European Union takes steps to mitigate the risk of subsequent energy crisis. It is a signatory and has ratified the following documents:

- The Energy Charter, together with the Protocol on Energy Efficiency and Related Aspects of Environmental Protection (1998);
- Framework Convention of the United Nations Climate Change (1997);
- The Kyoto Protocol (2004);
- Energy Community Treaty (2006);
- Statute of the International Renewable Energy IRENA (2009) and
- Memorandum of Understanding to enter Macedonia amongst Subprogram Intelligent Energy Europe (2011).

The strategic goals of the Republic of Macedonia in the energy sector, including the commitment to comply with the "acquis communautaire" of the Second Energy Package of the EU are incorporated in the Law on Energy, adopted in February 2011.²

Energy policy of the Republic of Macedonia is determined by the Strategy for Energy Development.³ Strategy for energy development in the country by 2030 is the responsibility of the Ministry of Economy of the Republic of Macedonia. The current strategy was developed in 2010 and covers the period until 2020 with a vision to 2030. This Strategy defines the best long-term development of the energy sector in the country in order to provide reliable and quality supply to consumers. Energy Strategy identifies them as priority needs for providing energy security: increasing the diversification of energy resources, maximum utilization of renewable energy resources, improving energy efficiency, and competitive participation in the regional energy market and the European energy community. Based on the Strategy Program was adopted for implementation of the strategy for energy development in Macedonia for the period 2012 -2016 year.

¹ Rosner K, The European Union: On Energy, Disunity. In: Luft, G., Korin, A. (eds) (2009) Energy Security Challenges for 21 Century: a reference Handbook. (Santa Barbara: ABC-CLIO 2009),168.

² MASA, Energy Development Strategy in the Republic of Macedonia until 2030 (Skopje, 2010),

1.

³ Energy Law (Fig. Gazette, No. 16 of 10.02.2011 years)

This directly affects the monitoring obligations under the European strategy for sustainable, competitive and secure energy.⁴ And in that context, the Republic of Macedonia also has to follow EU policies to increase the utilization of renewable energy sources, thereby directly contributing to the reduction of harmful emissions in the air and preserve the environment.

Renewable energy sources in Macedonia

From renewable energy sources in the country used before: hydropower for electricity generation; biomass, mostly wood table in the household; geothermal energy, mostly for heating greenhouses, and some export solar energy in households; and wind energy. Using renewable energy is supported by a range of measures and expected their increased use in the future.⁵

Hydropower in the country is used by the seven major hydroelectric power stations and dozens of small hydro power plants and the production of electricity from the same depends on the meteorological conditions during the year.

In the energy balance for 2006, hydropower accounted for 5% of total primary energy consumption. However, the consumption of hydropower in Macedonia varies greatly (from 600 to 1650 GWh) depending on meteorological conditions and analyzed year 2006 had the highest value.⁶

Biomass has a significant place in energy balance of the country. The total biomass which is used for energy purposes, wood and coal account for 80%.⁷

After lignite from domestic energy sources, biomass is the second most significant in the energy balance of the country. It accounts for 166 ktoe (1930 kWh; 6950 TJ), which is 11.5% of the total energy produced in the country in 2006, or 6% of the total primary energy consumed.⁸

Geothermal energy in Macedonia has extensive experience in its use. However, use of this potential down to the local level. In total use of primary energy, geothermal energy accounts for about 0.4%.⁹

Solar energy in Macedonia is used symbolic level, mainly for water heating in households. However, solar systems will become more attractive because of the introduction of the market price of electricity (market liberalization) and because of the

⁴ European Commission, A European Strategy for Sustainable, Competitive and Secure Energy, Green Paper, COM 105 (Brussels: 2006), 15.

⁵ Toni Milevski, Energy security. "St. Kiril and Metodi "Skopje - Faculty of Philosophy (Skopje, 2014), 114.

⁶ Ibid 2, 54.

⁷ Governmental Strategy for utilization of renewable energy sources in the country by 2020 (Skopje, 2010), 3.

⁸ Ibid 2, 54.

⁹ Ibid 7, 3.

USE OF RENEWABLE ENERGY SOURCES FOR PREVENTION OF ENERGY CRISIS IN MACEDONIA

expected increase of electricity in Southeast Europe due to the fact that thermal power plants will pay for emissions that cause the greenhouse.¹⁰

In the analyzed period, solar energy has a modest place in the energy balance. In 2006 Macedonia consumed heat of 7,4 GWh (0,6 ktoe), which represents 0.02% of the total primary energy consumption.¹¹

Wind energy is quite topical issue that deserves special attention. The Republic of Macedonia in 2014 was built the first wind parks "Bogdanci" with 16 wind turbines.¹² But energy production is negligible due to the lack of sufficient wind throughout the year, and the financial costs of construction and maintenance are very large.

Increased uses of renewable energy represent one of the priorities in the Macedonian Energy Development Strategy. A Strategy for Energy Development Strategy stems renewable sources, which are made for a period of 10 years and should be aligned with the Strategy for Energy Development.

The era of new renewable energy sources (NOIE) comes, because of their inexhaustibility and friendship with the environment. And without excuse me, all energy future is in the sun, but under conditions of uncertainty, technical and technological limitations, and in recessions things themselves are sorted by location and time needed priority.¹³

Chance of energy crisis in Macedonia

Strong contribution to the fulfillment of the concept of protection of a possible energy crisis (energy security) in the country can be achieved if first remove the main anomalies determined the current power system in the country. You need to perform modernization of existing energy system of the Republic of Macedonia in all segments of operation of the same in terms of monitoring, control and automatic analysis of all technical parameters.¹⁴ These are necessary for Macedonia as a candidate for EU membership to fit the regulations of the European Security Strategy and the European Energy Strategy.

In this time while the EU is concerned by the lack of natural gas, Macedonia more vulnerable to electricity. This can be inferred from energy balances of Macedonia, the share of electricity used by households, but also industry, and the fact that increasing imports of electricity. Through a detailed analysis of the electricity crisis in

¹⁰ Ibid 7, 4.

¹¹ Ibid 2, 55.

¹² Ibid 5, 117.

¹³ Ljupco Gestakovski "New renewable energy sources", energetskaefikasnost.info/novite-obnovlivi-izvori-na-energija/ (Retrieved 20 October 2015)

¹⁴ Ibid 5, 133.

2012, should make efforts and find mechanisms to reduce this state of vulnerability of electricity. This can be achieved by enabling other sources of heating for households than electricity (gas, developed central heating, efficient use of wood, energy efficiency measures, etc.), Focusing on the use of renewable sources and natural gas.

Suffice it to recall the crisis that engulfed part of the European Union due to problems in the supply of natural gas from Russia in 2010. Of which the Republic of Macedonia with Bulgaria, Slovakia, Serbia and Bosnia and Herzegovina, was on the list of EU countries most affected by the gas crisis. Just the fact that we have one of the least developed and no outspread gas networks in Europe this situation does not turn into drama. Macedonia is of the few countries on the European continent that has no gas reserves (even Bulgaria is three days), other alternative fuels only for the industry.¹⁵

To reduce the energy crisis in the country need greater diversification of energy sources by type, sources and suppliers, as well as active participation in the regional energy market and the European Energy Community. Therefore, it is the maximum utilization of domestic resources, with special emphasis on renewable energy.

The energy infrastructure of the Republic of Macedonia enables the exploitation of domestic primary energy, import and export of primary energy, processing of primary energy and produce final energy, transport and distribution of energy. The energy infrastructure of the Republic of Macedonia make up the electricity sector, coal, oil and oil products, natural gas and heat. The general characteristics of the energy infrastructure of the Republic of Macedonia are:

- Obsolete technologies and lack of investments for maintenance, modernization and expansion of existing facilities and construction of new facilities;
- High electricity losses (technical and commercial);
- Low energy efficiency;
- Unfavorable structure of the energy types (production, import and consumption) from an environmental and economic point of view and in terms of security of supply;
- Existence of monopolized structures in specific segments of the sector;
- Incomplete separation of production, transmission and distribution.

For electricity generation, key factors coal and water potential. The situation in the country indicates a multi slowdown in progress in construction of new power plants

¹⁵ Slobodanka Jovanovska "Macedonia between energy most vulnerable countries", Utrinski Vesnik 2009, www.utrinski.mk/?ItemID=bcf446c10face2479A187977FAA5BF7B (Retrieved 23 October 2015)

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and hydropower plants. Most of the existing facilities are built in the period before 1990, while in 1990 put into operation only two hydropower plants, HPP "Kozjak" and HPP "St. Petka", which indicates great weakness in strengthening their own energy infrastructure. The reason for the above is the weak financial potential and lack of interest from foreign investors. The largest producer of electricity in Macedonia is REK Bitola, but it should be emphasized that coal reserves are increasingly reduced as quantitatively and qualitatively. Water potential as a source of energy in the country depends on the hydrology, and the weather in that if hydrological year is poor, then reduced ability to produce electricity by harnessing the potential of water reservoirs.

Macedonia is dependent on energy imports. It imports its total demand for oil and petroleum products and natural gas from 2000 and part of the electricity. Energy imports are growing in the past, but recent years have grown particularly electricity imports due to rapid economic growth and the construction of new production facilities. And this leads to an increased risk of a possible energy crisis in the country.

Prevention of a possible energy crisis in Macedonia

Renewable energy has become interesting to the Macedonian region.

With the introduction of the legal framework that would try to reach the goal in the share of renewable energy to 20% by the European Union is the first step to unify the European energy market. It is necessary to ensure proper implementation of the law in the Member States to facilitate an increase in the share of renewable energy in the coming decades. A Republic of Macedonia as a candidate to join the EU must monitor and implement these steps in the future.

The proper implementation of the legal framework will give investors confidence to invest in all projects related to renewable energy (production, storage and distribution). Also, construction of a distribution network of electricity from renewable sources is urgently needed, because when would achieve the target of 20% of the share to be from renewable energy sources, the current distribution network could not cope. Therefore in the current construction projects: wind (wind), solar power plants and power plants need to anticipate and provide adequate transmission and distribution network in order to produced energy can be distributed to areas with the highest consumption.

The basic principles of energy policy for the establishment and functioning of the internal energy market of the European Union (EU) are set out in the provisions of

the Energy of the Lisbon Treaty¹⁶, which aim: safe and efficient operation of the energy market, secure energy supply, promoting energy efficiency, energy saving and renewable energy sources, promoting energy networks connections.

Macedonia tends to reduce the consumption of petroleum products. The fact is that oil is a non-renewable source of energy and its inventory shrinks. By reducing inventory automatically reduced availability, as opposed to the energy policy of the European Union. Securing reliable energy supplies is solely the task of the energy market. The guarantee of enough good transport infrastructure on affordable energy. Of course, accompanied by safety nets that can be activated at a time when the market was not ready (when an economic crisis).

For successful implementation of the Strategy for Renewable Macedonia will require investments primarily directed towards measures for development of the transmission and distribution network and policies that create conditions for greater utilization of locally available, environmentally friendly, renewable energy, especially solar.

If the country really wants to become energy independent, or to terminate the import of energy you use solar energy as a huge potential and planning the same in the strategy documents and the real policy on the ground.

Investments made in network development are key to long-term energy development in our country and necessary step in energy independence of the country. Because until modernize the network was not able to exploit renewable, fluctuating energy sources.

During the XX-th century the world face the exhaustion of reserves of conventional energy sources (coal, oil) and the need for replacing them with new, environmentally more acceptable as natural gas and renewable energy sources. Currently, enormous sums of money from the funds of the US and the EU are flocking to accelerating research for finding economical ways for the exploitation of renewable energy sources, new technologies, methods of saving and energy efficiency. It is supported by appropriate legislation of the European Union translated into Directives which Member States and candidate countries are required to adopt and adapt their own legislation. Directives relating to energy-efficient use of available energy and renewable energy sources (93/76 / EEC, 96/57 / EC, 2000/55 / EC, 2001/77 / EC, 2002/91 / EC, 2003/30 / EC, 2003/96 / EC, 2004/8 / EC), and define appropriate mechanisms to ensure monitoring of their implementation. We face a serious task as a whole to adopt and adapt our legislation, but more is needed to create reliable

¹⁶ Official Journal of the European Union (2007), <http://eurlex.europa.eu/JOHtml.do?uri=OJ:C:2007:306:SOM:EN:HTML> (Retrieved 22 April 2015)

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mechanisms for their implementation, monitoring, control, penal provisions, encouraging, supporting, maintaining the database, etc.

Improving energy efficiency requires maximizing the use of renewable energy sources, to provide conditions for greater utilization of natural gas and passage of the energy sector of the Republic of Macedonia on market conditions. The transition to market prices for electricity will improve the investment climate; strengthen the interest to introduce renewable energy sources and to improve energy efficiency.

Tendency of the Republic of Macedonia by 2020 to reduce the use of coal (39%), oil products with biofuels (31.6%), and the expense of increasing the use of natural gas to (16%) . Biomass combustion and hydropower to participate with around 6%.Solar and wind energy will together contribute to the production of primary energy 0.6% and geothermal with around 1%.¹⁷

The Strategy for Energy Development was developed four scenarios for the development of production facilities in the electricity sector of the Republic of Macedonia, and the capability of existing production facilities, the real potential candidates, and of course by the development of consumption. All scenarios of development guided by the following principles of development:

- Maximum engagement of existing Thermal Power lignite opencast;
- Utilization of hydro potential in Macedonia;
- Use of natural gas for electricity energy;
- Use of renewable energy sources.¹⁸

Macedonian special emphasis should be placed on development of new technologies that are becoming more and more cost-effective because it makes the system for electricity generation with the potential for exploitation of renewable sources, such as sun and wind. With construction of the first wind power plant "Bogdanci" began the promotion and realization of the principle of diversification of energy resources and facilities in the country.

With the implementation of the envisaged pace of construction of new production facilities will improve the diversity and therefore security of supply of electricity. In the past, at average hydrology, 80% of electricity is produced in coal thermal power plants and 20% from renewable energy sources (hydroelectric). In 2020 planned production of electricity from coal thermal power plants accounted for 42% - 51% depending on the scenario, natural gas and renewable energy sources by 24% - 28% and fuel oil thermal power plant 2% - 3%.¹⁹

¹⁷ Ibid 2, 128.

¹⁸ Ibid 2, 117-119.

¹⁹ Ibid 2, 121.

To achieve optimum results with limited resources is a challenge. The complexity of the activity, aimed at better insight into the overall risk and priorities, emphasizing the need to link all stakeholders: government, industry, science and the public. This is important as the level of management and construction management of the power system and the level of activities in preparation for a partial or complete loss of power supply. Particularly important association of property and liability risk, and thus would increase the security of the power system due to the introduction of significant market principles.

Projects for the use of renewable energy sources must be supported and must emphasize the importance of these projects, not only to the energy future, but for many other branches of the projects that will be able to give a new quality. In particular environmental situation of the Republic of Macedonia will improve. And that will confirm our commitment to the production of healthy food. If we use renewable energy sources, we will directly help our producers to have a cleaner environment in which to produce its products. It will also contribute in terms of development of the industry and tourism. By receive state in which the potential investors that tomorrow will come easier to decide to execute an investment in our country, and of course there is what we constantly seek, and that new hires.

Membership in the Energy Community also enables the development of competition, liquidity and utilizes economies of scale. In the Treaty establishing the Energy Community devotes a special section to improve the environment with respect to natural gas and electricity, through improved energy efficiency and use of renewable energy.²⁰

By decision of the European Commission from 6376 18.12.2007, the Republic of Macedonia can take part in the horizontal program through the EU financial instrument for energy efficiency (Energy Efficiency Finance Facility - EEFF). Through the IPA program by 2016 the EU will grant 100 million Euros for financing energy efficiency projects in the fields of construction and industry. And the EU will provide grants totaling 35 million Euros.²¹

The total amount of the Republic and were available 500 thousand US \$ for energy efficiency projects and 400 thousand US \$ for renewable energy. For the hydropower plants of 10 MW, producing electricity and thermal energy based on biomass heating projects based on the industrial surplus heat or renewable heat sources and projects for energy from sun and wind.²²

²⁰ Ibid 2, 190-191.

²¹ Foundation Open Society Institute - Macedonia, "Energy efficiency and the EU" (2010), 33.

²² Ibid 21, 36.

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Most of the available funds are used and thus become clear that although these funds are too small to feel the share of renewable energy in the total energy needs of the cake in the Republic of Macedonia still has commenced the process of capacity building utilization of renewable energy sources and we hope that this trend will continue at an accelerated pace further.

Conclusion

To prevent an energy crisis in the country, it will require investments primarily directed towards measures for energy saving and development of the transmission and distribution network and policies that create conditions for greater utilization of locally available, environmentally friendly, renewable energy, especially solar.

If the country really wants to become energy independent, or to terminate the import of energy you use solar energy as a huge potential and planning the same in the strategy documents and the real policy on the ground.

Investments made in network development are key to long-term energy development in our country and necessary step in energy independence of the country. Because until modernize the network was not able to exploit renewable, fluctuating energy sources.

Macedonia needs to be fully committed to exploiting of renewable production of electricity. Sun and wind are renewable energy resources in the future should no longer be utilized to reduce the level of energy dependence of the Republic and to satisfy the principle of diversification of sources.

Strong contribution to the fulfillment of the concept of managing the energy crisis in the country can be achieved if first remove the main anomalies determined the current power system of the country. Should abandon outdated technology and to work on attracting investments to maintain the modernization of existing energy system of the country. Modernization is necessary in all segments of the power system of the Republic of Macedonia in terms of monitoring, control and automatic analysis of all technical parameters.

The availability of energy and energy is primarily a matter to managing the energy crisis of any state, and it is a key precondition for further development, especially in the economy, but also for society as a whole.

The main political and economic efforts of the Republic of Macedonia should be aimed at providing functional sustainability which in future could be ensured only through the energy stability and the timely and cost effective delivery of energy and development of alternative energy sources.

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