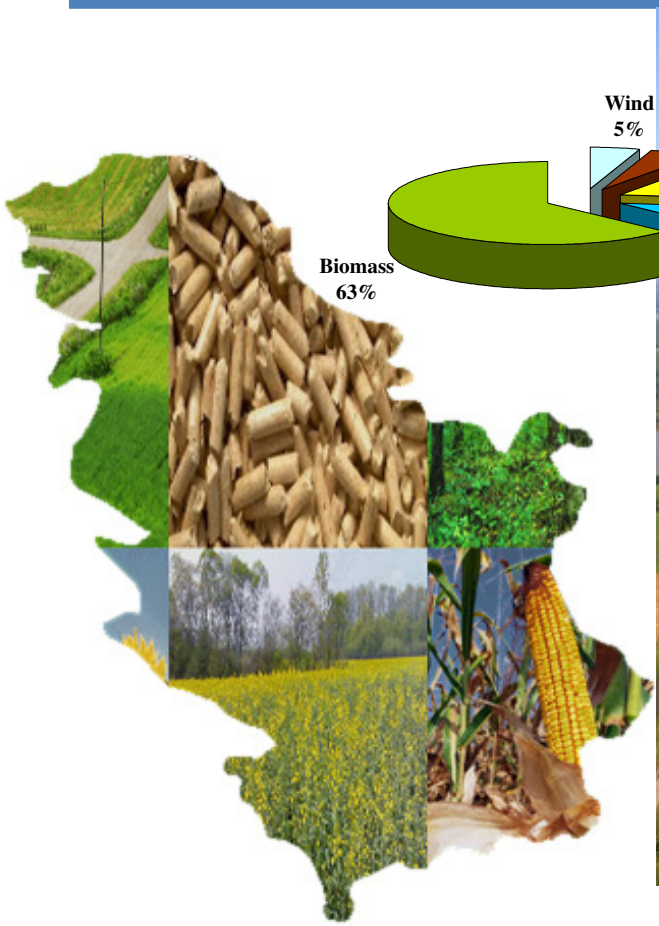
wbc-inco.net
Co-ordination of Research Policies with the Western Balkan Countries

March, 2012.

National background report on Energy for Republic of Serbia



University of Belgrade
Faculty of Mechanical Engineering

Prof. dr DRAGOSLAVA STOJILJKOVIĆ
Prof. dr MIRKO KOMATINA

Vinca Institute of Nuclear Sciences

dr PREDRAG STEFANOVIĆ
Scientific Counselor

Institute Mihailo Pupin

Prof. dr ĐURO KUTLAČA
Scientific Counselor

Ministry of Education and Science

ŽELJKA DUKIĆ, Advisor
DRAGAN SATARIĆ, Advisor

Executive Summary

The objective of this report is to present an overview of the energy sector research in the Republic of Serbia and to identify the main energy research priorities for Serbia for the period 2010-2015.
In 2010, Serbian government has adopted the Scientific and technological development strategy of the Republic of Serbia for 2011 to 2014 period. The Strategy has set seven national R&D priorities among which is Energy and energy efficiency. Five different priorities (explicit target research areas/themes) have been identified in Energy and energy efficiency research.
For decades the main funding body for energy research in Serbia has been the Ministry of Education and Science (MES). While the funding of research projects is based on announced calls for project proposals for research grants in various fields (include the themes of energy) for a typical duration of 4 years.
Since the main research performers in the energy sector in Serbia are in the academic sector, comprised of both higher education (universities) and research organizations (institutes), research in the energy field has so far been driven by the interests of the main research performers themselves. As a result, few common broader research targets, and subsequently, priorities, can be defined. Analysis is based on the consultation process with experts in the field of the Energy, and the extensive analysis of the ongoing project supported by the Ministry of Education and Sciences. Experts include their own experience in the energy problems in this specific area. The focus was covered on the prediction of WBC energy security improvement, environmental friendly power plants, sustainable renewable energy and increasing energy efficiency. As the result two groups of priorities have been identifies: *Energy Sector research priorities on the basis of the country's readiness* and *Energy Sector research priorities on the basis of future potential.*

Table of content

Introduction 1

1 Purpose of the national background report and summary of the consultation process 1

2 The Energy S&T system in Serbia……... 2
2.1 The policy framework……... 2
2.1.1 The overall Energy policy framework…… 2
2.1.2 The elements of Energy research policy making…… 3
2.2 Overview of Energy research activities……... 5
2.2.1 Energy research projects…… 5
2.2.2 Key competencies in Energy research field…… 5
2.2.3 Energy research infrastructure…… 6
2.3 Key drivers of Energy research…… 8
2.3.1 Main Energy trends in Serbia…….. 8
2.3.2 Main socio-economic challenges in Serbia……. 10

3 Integration of Serbia in the European Research Area in the field of Energy Sector…….. 12
3.1 Thessaloniki Agenda for the Western Balkans: Moving towards European integration…... 12
3.2 The Stabilization and Association Agreement between EU and Serbia……... 12
3.3 European Union's Framework Programmes for research and technological development…… 13

4 SWOT analysis of the Energy Sector research capacity in Serbia……... 14
4.1 Strengths…… 14
4.2 Weaknesses…… 14
4.3 Opportunities…… 14
4.4 Threats…… 14

5 Energy research priorities for Serbia…… 15
5.1 Energy Sector research priorities on the basis of the country's readiness……... 15
5.1.1 Priority 1 Energy security improvement…… 16
5.1.2 Priority 2 Environmentally friendly Thermal Power Plants…… 16
5.1.2.1 Co-combustion of selected renewable fuel SRF (selected industrial and municipal waste) and biomass in coal fired Thermal Power Plants…….. 17
5.1.2.2 Energy efficiency and environmental impact improvement of the existing low quality coal fired TPP by co-combustion of pre-dried lignite…… 17
5.1.3 Priority 3: Sustainable renewable energy - Developing new technologies in using renewable energy sources and clean technologies with zero emission……... 18
5.1.3.1 Small hydropower plants…… 18
5.1.3.2 Biofuels……... 18
5.1.3.3 Renewables for heating and cooling…… 19
5.1.4 Priority 4: Energy Sector – Increasing the efficiency of energy production, distribution and usage, with special focus on the efficiency of buildings…….. 20
5.1.4.1 Energy efficiency improvement in the manufacturing industry…… 20
5.1.4.2 Energy Systems Optimization in Smart Cities……... 20
5.1.4.3 Zero net energy building……. 21
5.1.5 Priority 5: Smart grids and Information technologies implementation in energy sector……... 21

5.2 Energy Sector research priorities on the basis of future potential…… 21
5.2.1 Priority 1 Energy efficiency…… 21
5.2.2 Priority 2 Renewable energy……... 21
5.2.3 Priority 3 Smart grids and Information technologies implementation in energy sector…. 21
5.2.4 Priority 4Environmentally friendly Power Plants……... 22
5.2.4.1 Towards Low Carbon Power Generation in WBC……. 22
5.2.5 Priority 5 Energy storage systems……... 22
5.2.6 Priority 6 Power generation in the low temperature range……. 22

Annex I – Classification of the Energy fields…… 23

Annex II – List of Energy R&D institutions…… 24

Annex III – Ongoing Ministry of Education and Science – funded research projects in the Energy research field…….. 25

Annex IV – Involvement of Serbian researchers in European Energy and Energy research projects…… 30

Annex V – Principal results of recent Energy and energy research projects in Serbia……... 33

References…… 35

March 2012

National background report on Energy for the Republic of Serbia

Introduction

1 Purpose of the national background report and summary of the consultation process

The aim of this report is to present an overview on energy sector and research in this sector in the Republic of Serbia (hereinafter Serbia), with a SWOT analysis of the research capacities and identification of energy research priorities for Serbia for the period 2010-2015, based on a consultation process with the experts in the field.

This report is intended to contribute to shaping the future European Union (EU) – West Balkans (WB) research cooperation, through relevant European Commission (EC) initiatives, policies and funding programmes, in the way that meets the interests and actual needs of energy stakeholders in the region.

A consultation process took place from January to March 2012 with the intention to identify research priorities in the field of energy sector. The questionnaires were sent to the project managers of the all ongoing energy research projects (47) funded by the Ministry of Education and Science of the Republic of Serbia. The responses were received from 11 experts directly involved in energy sector.

Based mainly on the outcomes of the consultation process and extended analysis of the published papers in the field of energy sector, this report identifies a set of research priorities for Serbia in the field of energy for the period of 2010-2015, in the line with the proclaimed objective of **wbc-inco.net project**. The idea is to identify RTD potentials and priorities for taking part in FP7 and other European research programmes and the funding schemes, as well as to increase the participation of researchers from the region in the European projects.

2 The Energy S&T system in Serbia

2.1 The policy framework

2.1.1 The overall Energy policy framework

Energy is a strategic infrastructure of a country necessary for its overall development and security. Serbia is not self-sufficient in terms of energy resources and it has to import larger part of its strategic energy generating products (oil, gas and high quality coal), as well as, some energy equipment (especially efficient and environmentally acceptable).

Republic of Serbia is a member of Energy Community of South East Europe from 2006. According to the signed Treaty, Serbia participates in the implementation of the regional energy projects for which individual member states lack sufficient capacities to implement them on their own. Additionally, the government and parliament of Serbia adopted two very essential documents for development of energy sector:

- Energy Sector Development Strategy of Republic of Serbia by 2015 – describe the actual situation in the energy sector and consider development of different sub-sectors (oil-gas, electric power, renewable energy, district heating plants) in the frame of future economic development (prosperous and slow economic development). The document has been recommended the basic objectives of the new energy policy, to determine priority directions of the development in the energy sectors and to approve the program of appropriate instrument adoption, which enables the realization of key priorities in the operation, business activity and development of the whole energy system (in the energy production sectors and energy consumption sectors). The interest is increased for defining and conducting the national energy policy in accordance with the needs for reforming the energy sector and its activities, harmonizing the national energy practice and regulations with the EU practice, taking into account the state of energy resources, the infrastructure of energy production sectors and the energy needs (services) structure. In order to achieve sustainable socio-economic development of the country, which also implies the overall environmental protection, in addition to taking into account the general - generic objectives, it is necessary to pay special attention to the realization of specific objectives, which reflect particularities of all countries.
- Program for Implementation of Energy Sector Development Strategy 2007-2012 - elaborate Strategy in more details and define priorities for utilization of renewable energy sources. Program is updated every two year.

Energy Sector Development Strategy has been identified five priorities in energy sector:

- Priority of Technological Modernization
- Priority of Economic Use and Increase in Energy Efficiency
- Priority of Selective Use of new Renewable Sources of Energy
- Priority of Extraordinary Investments in New Sources (combined gas-steam cycle combined heat and electricity production etc.)
- Priority of Capital Intensive Investments in New Energy Sources/Facilities.

Several important documents in the energy sector have been adopted in the last few years:

- Energy Law (Official Gazette of the RS, No. 57/2011)
- Energy Sector Development Strategy of Republic of Serbia by 2015. (Official Gazette of the RS, No. 44/2005)
- Amendments to the Program for Implementation of Energy Sector Development Strategy 2007-2012 (Official Gazette of the RS, No. 99/2009)

- National Strategy of Sustainable Development (Official Gazette of the RS, No. 55/05, 71/05-correction and 101/07)
- Law on Ratification of the SEE Energy Community Treaty between the European Union and the Republic of Albania, the Republic of Bulgaria, Bosnia and Herzegovina, the Republic of Croatia, the FYR of Macedonia, the Republic of Montenegro, Romania, and the Republic of Serbia and Kosovo, through the United Nations Interim Administration Mission in Kosovo, pursuant to the United Nations Security Council Resolution 1244 (Official Gazette of the RS, No. 62/2006)
- The First Energy Efficiency Plan of the Republic of Serbia for the Period from 2010 to 2012.(Government Decision 05 No. 312-5336/2010)
- Biomass Action Plan (Official Gazette of the RS, No. 56/2010)
- Decree on the Requirements for obtaining the Status of the Privileged Power Producer and the Criteria for Assessing Fulfillment of these Requirements (Official Gazette of the RS, No. 72/2009) - defines procedure
- Decree on incentive measures for electricity generation using renewable energy sources and combined heat and power (CHP) generation (Official Gazette of the RS, No. 99/2009) – defines feed-in tariff s for RES-E generation
- Regulation on technical and other requirements of liquid biofuels (Official Gazette of Serbia and Montenegro, No. 23/06) defines technical requirements for biodiesel and biofuels.

All of these activities in the energy sector had the influence on development of Scientific and technological development strategy and definition of priorities in future period.

2.1.2 The elements of Energy research policy making

In 2010, Serbian government has adopted the Scientific and technological development strategy of the Republic of Serbia for 2011 to 2014 period (Official Gazette of the RS No. 13/10). The Strategy has set seven national R&D priorities among which is Energy and energy efficiency.

The main priorities for Energy and energy efficiency have been identified:
- Increasing the efficiency of energy production, distribution and usage, with special focus on the efficiency of buildings
- Developing new technologies in the exploitation of fossil fuels
- Developing new technologies in using renewable energy sources and clean technologies with zero emission, mostly hydro-power plants, co-generation and biomass
- Modern measuring techniques of energy usage, monitoring and optimal automatic control
- Efficient usage of current mines and research on new locations.

The Serbian Ministry of Education and Science (MES) provides strong funding (currently 47 research projects) in the area of energy. The projects had been selected according to the previous defined priorities - explicit target research areas/themes. MES typically announces calls for proposals for research grants in various fields (include the themes of energy). In 2010, two types of projects have been identified on the last announcement for project proposals:
- Integrated and Interdisciplinary research projects - Energy and Energy Efficiency
- Technology Development - Energy, Mines and Energy Efficiency.

All proposals had been passed through an evaluation process by institutionalized research groups of reviewers qualified (national and international) for selecting projects to be funded.

Budgetary allocation for scientific research and technological development in 2008 was about 100 million EUR which present 0.3% of GDP. According to the Scientific and technological

development strategy, the goal is to reach total budgetary R&D expenditures f 1.0% of GDP by 2014.

Direct MES's support for energy projects in 2008 was 4.25 million € which presented 4.50 % of overall budgetary allocations for S&T.

While the projections for coming years were to increase this amount by a certain percent (as occurred during the whole 2001-2008 period), in view of the global economic crisis it is not realistic to expect an increase in 2012/2013.

2.2 Overview of Energy research activities

2.2.1 Energy research projects

There are presently 47 ongoing projects regarding energy and energy efficiency funded through the MES's last completed call for proposals: *Research programme in the field of science and technology for the 2011-2014*. The projects are led by 19 research institutions:

Institution	Number of projects
University of Belgrade – Faculty of Mechanical Engineering	3
University of Belgrade – School of Electrical Engineering	2
University of Belgrade – Faculty of Civil Engineering	1
University of Belgrade – Faculty of Mining and Geology	8
Vinca Institute of Nuclear Sciences	7
Electro-technical Institute Nikola Tesela	3
Institute Mihailo Pupin	2
Institute for Technology of Nuclear and Other Mineral Raw Materials	1
University of Novi Sad – Faculty of Technical Sciences	3
University of Nis – Faculty of Mechanical Engineering	3
University of Nis – Faculty of Electronic	2
University of Nis – Faculty of Science	1
University of Kragujevac – Faculty of Mechanical Engineering	2
University of Kraljevo - Faculty of Mechanical Engineering	2
Technical Sciences – Cacak	1
Institute of Mining and Metallurgy – Bor	3
Technical Faculty in Bor	1
Faculty of Technology – Leskovac	1
Faculty of Technical sciences, Kosovska Mitrovica	1

Besides that, there are seven bilateral projects with China, Croatia and Slovenia concerning the various aspects of the energy problems.

In SEER-ERA Net call seven Serbian projects passed reviews but were not accepted because of the lack of funding by the MSTD side.

Institute of Nuclear Sciences VINCA is participating in SEE-ERA.NET PLUS Project: ERA 93/01 Supporting Common RTD action in WBCs for developing Low Cost and Low Risk ICT based solutions for TPPs Energy Efficiency increasing.

Beside the projects funded by the MES, there are also 7 projects in the EC Framework Programme 7 (Annex IV) in which Serbian research institutions are taking part with aggregate EC contribution.

The involvement of Serbian research institutions in European energy research projects are presented in Annex IV.

2.2.2 Key competencies in Energy research field

From 47 ongoing research projects in the field of energy funded by the MES (Research programme in the field of science and technology for the 2011-2014. period), nine projects are in the category Integrated and Interdisciplinary Research projects and 38 in the category Technology Development-Energy, Mines and Energy Efficiency. The researchers in the energy sector present 6.28% of overall

number of researchers in Serbia and they participate with 5.29% of total researcher-months financed by MES. In the Integrated and Interdisciplinary Research projects, 7.13% of researchers are involved with 7.08% of all funded researcher-months and in Technology development category 12.24% researchers are participated with 11.15% of all researcher-months. MES is financed 5,869 women from 11,845 researchers which is 49.55%. The percentage of woman researchers in the energy sector is only 26.34%. In the projects financed by MES, from total number of 284 woman doctors less than 35 years only five is in the energy sector.

Collaboration on energy research projects between research institutions and commercial enterprises seems insufficient due to the lack of an initiative for research in energy from stakeholders, as well as to the poor transfer of research findings (results) into (operational) practice. More recently there have been certain initiatives for bringing together the industry and research institutions, such as the programme coordinated by the Ministry of Infrastructure and Energy and Serbian Chamber of Commerce, but with no concrete results as yet.

There is a specific precondition from Ministry of Education and Science for financing specific demonstration projects. By rules, Ministry pays only research stuff and project coordinator must negotiate with industry participant to cover price of demonstration facilities.

2.2.3 Energy research infrastructure

On a national level, energy research is supported first and foremost by Ministry of Education and Science (MES). The MES provides the research grants for projects (salaries of researchers and equipment), as well as, for special service KOBSON (Consortium of Serbian libraries for joint supplies) established with the intention to enable the free access to e-versions of relevant scientific journals for research institutions. Other ministries and public authorities also provide for modest budgetary allocations for science and technology.

The available scientific and professional potential in the domain of energy is very good. For many decades now the institutes and faculties have been active in the entire scientific domain of interest to all the sectors of energy system of Serbia. MES (previous Ministry of Science and Technological Development – MSTD) pursues the policy in those areas in two ministerial committees - for energy and for energy efficiency, and funds a special National program of energy efficiency with about 750 involved researchers (among them 150 women).

Purchase of capital research equipment was planned, but not finished in 2011. Currently is in process delivering of equipment for science and technology totally amount 53,500,000 €, from which 3,420,000 € is for energy research and development (6.4%).

Main research organizations involved in the energy research are given in the Table 1.

Table 1: List of organization involved in the energy research

	Institution	Postal address	Web-site
1.	Institute of Soil Science, Belgrade	Teodora Drajzera 7 11000 Belgrade	http://www.soilinst.rs/
2.	Institute for Testing Materials-IMS Institute, Belgrade	Bulevar vojvode Mišića 43 11000 Belgrade	http://www.institutims.rs/
3.	Institute of Nuclear Sciences Vinča, Belgrade	Mike Alasa 12-14 Vinča, 11 000 Belgrade	http://www.vin.bg.ac.rs
4.	Institute for Technology of Nuclear and other Raw Materials (ITNMS), Belgrade	Bulevar Franš d'Eperea 86 11000 Belgrade	http://www.itnms.ac.rs/
5.	Institute Mihajlo Pupin, Belgrade	Volgina 15 11060 Belgrade	http://www.pupin.rs/
6.	Institute for Mining, Belgrade	Batajnički drum 2 11080 Belgrade	http://www.ribeograd.ac.rs/
7.	Kirilo Savić Institute, Belgrade	Vojvode Stepe 51 Voždovac, 11000 Belgrade	http://www.iks.rs/
8.	Electro-technical Institute Nikola Tesla	Koste Glavinića 8a 11000 Belgrade	http://www.ieent.org
9.	Institute for Mining and Metallurgy, Bor	Zeleni bulevar 35 19210 Bor	http://www.irmbor.co.rs/
10.	University of Belgrade-Faculty of Architecture	Bulevar Kralja Aleksandra 73/II 11000 Belgrade	http://www.arh.bg.ac.rs
11.	University of Belgrade-Faculty of Geography	Studenstki trg 3/3 11000 Belgrade	http://www.gef.bg.ac.rs/
12.	University of Belgrade-Faculty of Civil Engineering	Bulevar Kralja Aleksandra 73 11000 Belgrade	http://www.grf.bg.ac.rs/
13.	University of Novi Sad-Faculty of Civil Engineering - Subotica	Kozaračka 2a 24000 Subotica	http://www.gf.uns.ac.rs/
14.	University of Niš-Faculty of Civil Engineering and Architecture	Aleksandra Medvedeva 14 18000 Niš	http://www.gaf.ni.ac.rs/
15.	University of Kragujevac-Faculty of Economics	Đure Pucara Starog 3 34000 Kragujevac,	http://www.ekfak.kg.ac.rs/
16.	University of Niš-Faculty of Economics	Trg kralja Aleksandra Ujedinitelja 11 18000 Niš	http://www.eknfak.ni.ac.rs
17.	University of Niš-Faculty of Electronic	Aleksandra Medvedeva 14 18000 Niš	http://www.elfak.ni.ac.rs
18.	University of Belgrade-School of Electrical Engineering	Bulevar kralja Aleksandra 73 11120 Belgrade	http://www.etf.bg.ac.rs/
19.	University of Belgrade-Faculty of Mechanical Engineering	Kraljice Marije 16 11120 Belgrade 35	http://www.mas.bg.ac.rs/
20.	University of Kragujevac-Faculty of Engineering	Sestre Janjić 6 34000 Kragujevac	http://www.mfkg.rs/
21.	University of Kragujevac-Faculty of Mechanical Engineering - Kraljevo	Dositejeva 19 36000 Kraljevo	http://www.mfkv.kg.ac.rs/
22.	University of Nis-Faculty of Mechanical Engineering	Aleksandra Medvedeva 14 18000 Niš	http://www.masfak.ni.ac.rs/
23.	University of Niš-Faculty of Medicine	Bulevar Dr Zorana Đinđića 81 18000 Niš	http://www.medfak.ni.ac.rs/
24.	University of Belgrade-Faculty of Agriculture	Nemanjina 6 11080 Belgrade- Zemun	http://www.agrif.bg.ac.rs/
25.	University of Novi Sad-Faculty of Agriculture	Trg D. Obradovića 8 21000 Novi Sad	http://polj.uns.ac.rs/

26.	University of Kragujevac-Faculty of Science	Radoja Domanovića 12 34000 Kragujevac	http://www.pmf.kg.ac.rs/
27.	University of Nis-Faculty of Science	Višegradska 33 18000 Niš	http://www.pmf.ni.ac.rs/
28.	University of Belgrade-Faculty of Mining and Geology	Đušina 7 11000 Belgrade	http://www.rgf.bg.ac.rs/
29.	University of Novi Sad-Technical Faculty Mihajlo Pupin in Zrenjanin	Đure Đakovića bb 23000 Zrenjanin	http://www.tfzr.uns.ac.rs/
30.	University of Belgrade-Technical Faculty in Bor	Vojske Jugoslavije 12 19210 Bor	http://www.tf.bor.ac.rs/
31.	University of Kragujevac-Technical Faculty Čačak	Svetog Save 65 32000 Čačak	http://www.tfc.kg.ac.rs/
32.	University of Niš-Technical Faculty in Leskovac	Bulevar Oslobođenja 124 16000 Leskovac	http://www.tf.ni.ac.rs/
33.	University of Belgrade-Faculty of Technology and Metallurgy	Karnegijeva 4, 11120 Belgrade , Serbia	http://www.tmf.bg.ac.rs/
34.	University of Nis-Faculty of Occupational Safety	Čarnojevića 10 A 18000 Niš	http://www.znrfak.ni.ac.rs/
35.	University of Belgrade- Faculty of Organizational Sciences	Jove Ilića 154 11000 Belgrade	http://fon.rs/
36.	University of Priština-Faculty of Technical Sciences in Kosovska Mitrovica	Kneza Miloša 7 38220 Kosovska Mitrovica	http://www.ftn.pr.ac.rs/
37.	University of Novi Sad- Faculty of Technical Sciences	Trg Dositeja Obradovića 6 21000 Novi Sad	http://www.ftn.uns.ac.rs/
38.	University of Belgrade-Faculty of Physics	Studentski trg 12 11000 Belgrade	www.ff.bg.ac.rs/
39.	University of Belgrade-Faculty of Chemistry	Studentski trg 12-16 11000 Belgrade	http://www.chem.bg.ac.rs/
40.	University of Belgrade-Faculty of Forestry	Kneza Višeslava 1 11000 Belgrade	http://www.sfb.rs/
41.	Innovation Center, Faculty of Mechanical Engineering, University of Belgrade	Kraljice Marije 16 11120 Belgrade 35	http://www.inovacionicentar.rs/
42.	The Faculty of Management F@M, Novi Sad	Njegoševa 1A 21205 Sremski Karlovci	http://www.famns.edu.rs/
43.	Megatrend University in Belgrade, Faculty of Management in Zajecar	Park šuma Kraljevica bb 19000 Zaječar	http://www.fmz.edu.rs/
44.	University Union in Belgrade, Faculty of Ecology and Environmental protection	Cara Dušana 62-64 11000 Belgrade	http://unionnikolatesla.edu.rs/

2.3 Key drivers of Energy research

2.3.1 Main Energy trends in Serbia

The main strategic interests of Serbia in the energy sector are safe supplies of energy, rational consumption and reduction of important dependence and expansion of domestic manufacturing of energy equipment and equipment for the protection of the environment, contributing to the reduction of unemployment rate.

Despite enormous effort and considerable funds invested into revitalization of plants within the energy generation sector in Serbia, particularly electricity, the situation in Serbia is unfavorable and there is no sufficiently safe infrastructure for its economic development.

Serbia is unavoidably facing the introduction of new, efficient ecologically friendly energy technologies, technology for dislocated energy generation, technology for the protection of environment, technology of use of low quality fuels, biomass, off balance coal reserves, coals from underground exploitation, technologies for the use of renewable sources of energy (RSE): biomass, small hydro power plants, wind energy, geothermal energy, energy of the sun, household and industrial wastes. On the one hand it would require an investment effort but on the other a challenge for science and technological development and the opening of new production.

Priorities in science and technology development must be adjusted to the energy generation priorities. Still, in the period to come the focus will be on the revitalization of power plants, primarily in electricity generation, starting from the equipment on open pits, thermal and hydro power plants, to the transmission and distribution network, distance heating industrial plants. But, no doubt technological upgrading of energy generating facilities will be needed, improvement of technological and operating performances of the facilities under exploitation, by means of introduction of modern technologies when building replacement capacities and adding equipment for the protection of the environment. Harmonization of legislation will be necessary in the energy generation and ecology with the EU regulations and standards and international conventions and obligations due to tightened ecological standards - with the view to approximation to EU, preservation of natural environment and public health.

The stated objectives could be hardly achieved without active and organized participation of science, fundamental, applied and development research, which should be upgraded in all the segments (development and introduction of modern energy generating technologies, processes, coal technologies and exploitation equipment, lignite and coal in small mines, processes, technologies and equipment for gas exploitation, primarily in households; etc.) but clearly the general priority is energy efficiency: higher efficiency of energy transformation from the generation of primary and secondary energy to the final consumption in the industry and utilities and households, substitution of electrical energy for distance heating in households and public and commercial facilities, reduction of loses in electricity and heating distribution. Within higher energy efficiency, there is a need to do research and apply energy sources with gas-steam cycle, for coupled generation of electrical and heating power (cogeneration), and an increased share of co-generation of electrical and heating power in utility and industrial consumption.

Although the use of RES in absolute terms shall not contribute in the short run and to a significant extent to the energy audit (particularly electricity audit), or the reduction of the import dependence on the whole, the science research strategy must devote considerable attention to those activities. For quite some time the fallacies prevailed about available energy potentials of renewable energy sources in Serbia. Favored were the sun and geothermal energy despite the obvious fact that Serbia disposes of big quantities of biomass, primarily waste biomass, forestry and agriculture and timber industrial waste. Overestimated were the possibilities of substitution of fossil fuels by renewable sources. Only the studies under the National program of energy efficiency, the Strategy of economic development of Serbia till 2010 and finally the Program for implementation of the Development Strategy of energy generation of Serbia till 2015, defined approximate volumes of those energy generating potentials and established realistic proportions. The achievement of strategic goal of higher use of RES, both electrical and heating, must rely on the energy sources with the highest potential, and those are: biomass, small water flows, and to a lesser extent, winds energy.

2.3.2 Main socio-economic challenges in Serbia

Serbia is a middle-income country with a great potential for fast economic development, as the country is endowed with natural and mineral resources and fertile and arable agricultural land. Serbia is also well positioned for development of transportation infrastructure, given its strategic location at the crossroads of major road and rail routes in South-Eastern Europe. Most economic activity is concentrated in services (about 65% of GDP), industry (24%), and agriculture (11%).

After the turmoil of the 1990s, Serbia has made significant progress with a wide ranging program of democratic and economic reforms which started in 2001. Macroeconomic stability has been restored which provided basis for fast growth of the economy, and incomes have risen considerately. GDP per capita, estimated at $2,100 in 2002, has reached $5,400 in 2007. During the same period, poverty has fallen from 14% of the population to about 6.6% (according to last year's Living Standards Measurement Survey).

Recent economic developments

During the 1990s, Serbia was exposed to wars and economic sanctions. The political changes since 2000 have laid the foundation for making a clean break with the past decade of economic decline. The changes have created the basis for economic and social reforms as well as for the increased donor support.

Strong economic progress has been achieved since 2001, particularly in expanding private sector participation in the economy. The macroeconomic stability, achieved swiftly in the first years of transition, has been broadly maintained. During the first seven years of transition the economy grew on average 5.6% per annum, peaking in 2004 with 9.4% GDP growth, one of the highest growth rates among transition economies. In 2007, the growth remained strong at an estimated 7.5%. There have also been major improvements in the business environment that saw Serbia ranked as the top reformer globally in Doing Business 2006 report (for reforms carried out in 2004-2005). Still, further reforms to strengthen the environment for sustained private sector led growth, including continued structural reforms and privatization. They are vital in ensuring that living standards continue to converge with those in Europe.

However, despite Serbia’s strong growth performance, significant challenges remain. External weaknesses are apparent in double-digit and expanding current account deficit. Despite the significant decline of the public debt, external debt remains about 60% of GDP as private external liabilities continue to grow quickly. Although policy action and fiscal restraint will be required to address external weaknesses, Serbia’s position as far as reserves are concerned is currently comfortable as a result of strong private sector inflows including foreign direct investments (FDI). The FDI average has 7.2% of GDP over the last 5 years placed Serbia among the top countries in Europe and Central Asia. The FDI was especially strong in 2006, as a result of several large privatization deals, including the sale of a mobile telephone operator.

At over 40% of GDP, public expenditures remain high. While a fiscal adjustment occurred between 2003 and 2005, with expenditures falling from almost 44% of GDP to just over 40%, those gains have been reversed with recent wage rises and spending pressures as a result of election promises in run-up to the series of parliamentary elections, and a deficit has again emerged. Fiscal loosening has also created inflationary pressures and pushed the annual average inflation rate close to 7%. Rising inflation in Serbia has also been the result of the global increase in oil and food prices.

Unemployment, poverty, and poor inclusion of the vulnerable still remain concerns in Serbia. During the past decade, a long period of instability, international isolation, and economic turmoil

adversely affected the living standards of the vast majority of the population. The country's poor economic performance over that period led to a decrease in real earnings and was accompanied by deterioration in social protection and health services. As a result, poverty rose sharply in the 1990s. Although currently around 6.6% of the population falls below the poverty line (according to Living Standard Measurement Survey), one third of the country's people are barely above the poverty line and remain in danger of slipping into poverty if any adverse economic developments occur. The unemployment rate (as per internationally comparable Labour Force Survey) is still high at 14% of the labor force despite the significant decline from a year ago. Unemployment is affecting young people and minority groups in particular.

Challenges ahead

- Harmonizing the fragmented political scene. Despite major improvements, the fragmented political scene hinders the development of a more stable political environment.
- Accelerating EU integration. The Stabilization and Association Agreement with the European Union has been signed, but is still not effective.
- Maintaining macroeconomic stability. Due to fiscal deficit and high current account deficit, macroeconomic stability remains vulnerable, particularly to external shocks.
- Improving governance and building effective state institutions. Building effective state institutions to improve governance and transparency, and implementing comprehensive legal and judicial reform are essential to improve government performance, increase foreign investment, and ensure sustainable growth.
- Improving the well being of the most vulnerable and building human capacity. The political sustainability of the reform efforts will depend to a large extent on the government's success in shielding the vulnerable and building human capital. Improving social protection mechanisms and boosting the quality and efficiency of health services and educational system are the key challenges. Particular efforts will also be required to alleviate poverty among minority groups, the rural poor, and in depressed regions formerly home to large industrial and mining industries.
- Addressing environmental problems and mitigating disaster risks. Significant environmental issues associated with the legacies from heavy mining and manufacturing industries will have to be addressed and managed. Also, recent floods, droughts, and fires have highlighted the need for effective regional disaster preparedness and response capabilities. These issues are also thrown into focus by the increasing need for climate change mitigation and adaptation measures.

3 Integration of Serbia in the European Research Area in the field of Energy Sector

3.1 Thessaloniki Agenda for the Western Balkans: Moving towards European integration

At the European Summit in Thessalonica held on 21 June 2003, the European Union offered European Partnership to the Western Balkans countries as one of the key instruments of the EU pre-accession strategy for the potential EU membership candidates. The EU Council of Ministers adopted the Decision on the principles, priorities and conditions contained in the European Partnership with Serbia-Montenegro including Kosovo, in compliance with the UN Security Council Resolution 1244 of 10 June 1999.

The Partnership lists short term (12-24 months) and mid-term (3-4 years) priorities for the preparations for further integration in the EU. This mechanism shall determine the relations between the EU and Serbia until the Stabilisation and Association Agreement has been signed.

One of the most important facts regarding European Partnership is that the financial assistance is conditioned by the implementation of the priorities (Annex to the document, Article 5). In other words, the document shall exclusively arrange relations between the EU and our country all the way through to the signing of in the Stabilisation and Association Agreement-it is a new framework for defining relations between the EU and the Western Balkans. Financial assistance is also conditioned by the progress achieved in meeting the Copenhagen criteria, although these are the criteria set to be met for the membership, not for the association.

On the publication of this document, Serbian Government adopted Information of European Partnership and the need to adopt the Action Plan in order to meet the priorities set in the European Partnership.

Source: The EU Integration Office of the Government of Serbia.

3.2 The Stabilization and Association Agreement between EU and Serbia

On 9 September 2008, National Assembly of the Republic of Serbia ratified the Stabilisation and Association Agreement (SAA) and Interim Trade Agreement. This formally marked the end of the process initiated on 10 October 2005, when negotiations for conclusion of this agreement were started between the Republic of Serbia on one side and the European Communities and their member states the other. SAA and Interim Agreement were initiated on 7 November 2007, and they were signed on 29 April 2008. SAA will enter into force after its ratification by the EU Council of Ministers and the European Parliament and after it is ratified by all signatories i.e. Member States of the EU. The Interim Agreement will enter into force after it is ratified by the EU Council of Ministers and the European Parliament.

Serbia is an associated country to the EU's Framework Programmes for research and technological development, making all legal entities established in Serbia eligible for funding on the same footing as legal entities from the Member States.

Source: European Union's Framework Programmes for research and technological development.

3.3 European Union's Framework Programmes for research and technological development

Serbia is an associated country to the EU's Framework Programmes for research and technological development, making all legal entities established in Serbia eligible for funding on the same footing as legal entities from the Member States.

Source: FP7 Third Country Agreements, International instruments associating Third Countries to FP7

4 SWOT analysis of the Energy Sector research capacity in Serbia

4.1 Strengths

- Energy recognized among national priorities
- Great number of researchers (young and senior researchers)
- Number of realized projects
- Institutional support for research in energy by the MES
- Number of institutions participating in energy research
- Increasing performance of researchers as measured by the number of publications in SCI journals
- Presence in EU research programmes
- Presence of sound EU policy in energy research actions
- Cooperation between research energy institutions in the region

4.2 Weaknesses

- Insufficient application of projects results in industry
- Lack of modern and sophisticated equipment
- No clear focus on areas that might provide most benefits for energy sector
- Lack of skills for the preparation of proposals for EU-funded research programmes
- Uneven research infrastructure among and within research institutions
- Complicated procedures for assuring the financial support for visiting EU research institutions or for participation on the conferences/symposiums

4.3 Opportunities

- Energy research among one of the priorities
- National strategy for science and technological development
- Energy Sector Development Strategy
- Presence in EU research programmes.
- Special WBC calls
- EU accession process in perspective

4.4 Threats

- Economic crisis – endangered research funding.
- Unstable economic situation
- Possible lack of institutional support for acquisition of latest technologies
- Brain drain. Loss of energy researchers to both foreign research institutions and to the private sector.

5 Energy research priorities for Serbia

The basic premise in determining the Priority programs of the Serbian Energy Development Strategy and Scientific and technological development strategy rests upon the position that the development of energy sectors has to be considered from the standpoint of a harmonized operation and development of the energy system as a whole. The energy system comprises the energy production sectors (of oil, gas, coal and power sources, including transmission and distribution systems) and energy consumption sectors (Industry, Transport, Household, Public and Commercial Activities, and Agriculture). Moreover, each development, including the harmonized development of these two sectors, has to recognize the socioeconomic and technological/environmental objectives of the development of the country. These objectives are integrated by a sustainable socioeconomic development of the country.

Renewable energy has a strong potential in Serbia estimated at about 4.2 Mtoe. Biomass contributes with about 2.7 Mtoe and represents the most important RES in Serbia (63% of total renewable potential) followed by hydro potential, solar, wind and geothermal energy. Since 2003, Serbia has developed its energy strategy and established a market-based regulatory framework, enforced by an independent regulator. Therefore, the use of RES is the special priority of the energy sector according to Serbian Energy Sector Development Strategy. Beside that, new Energy Law (adopted in 2011) has set the development and promotion of renewable as a target. Serbia has also ratified the Kyoto Protocol as a non-Annex 1 Country since 2007. The law entered into force on January 17, 2008, meaning that Serbia is eligible for CDM projects.

Government has put in place policies and measures to reduce emissions, which important part are energy efficiency measures and use of renewable energy sources. Furthermore, Serbia is also very likely to receive a target for its share on RES when the EU membership negotiations on energy issues will start. These targets raise the demands for a more efficient policy implementation in Serbia, and it also provides big investment opportunities for the private sector in RES in Serbia.

5.1 Energy Sector research priorities on the basis of the country's readiness

The priorities in energy sector research are identified as following:

- Energy security improvement
- Environmentally friendly Thermal Power Plants
    - Co-combustion of selected renewable fuel SRF (selected industrial and municipal waste) and biomass in coal fired Thermal Power Plants
    - Energy efficiency and environmental impact improvement of the existing low quality coal fired TPP by co-combustion of pre-dried lignite
- Sustainable renewable energy - Developing new technologies in using renewable energy sources and clean technologies with zero emission
    - Small hydropower plants
    - Biofuels
    - Renewables for heating and cooling
- Increasing the efficiency of energy production, distribution and usage, with special focus on the efficiency of buildings
    - Energy efficiency improvement in the manufacturing industry
    - Energy Systems Optimization in Smart Cities
    - Zero net energy building
- Smart grids and Information technologies implementation in energy sector

5.1.1 Priority 1: Energy security improvement

Serbia and WBC are vulnerable to energy supply disruptions from outside the EU (in winter 2009 due to gas crisis, in 2011 due to drought and in 2012 due to very cold winter and electricity shortage in the region), to volatility in energy prices and to climate change. To overcome these problems and to improve regional energy market toward sustainable system it is necessary:

- To build scientific capacities for multi criteria assessment of sustainable energy policy development and its systematic monitoring and improvement
- To analyze and define the measures and project which will improve WBC energy network and energy security supply.

Proposed Project 1: Capacity building for sustainable energy policy and measures development and its implementation systematic monitoring and improvement,

Proposed Project 2: Technical/feasibility Study for the new/improvement of the existing gas/electricity network and interconnections and measures for improvement of energy supply security.

5.1.2 Priority 2: Environmentally friendly Thermal Power Plants – Implementation of the European Large Combustion Plants Directive LCPD Directive 2001/80/EC and national norms concerning environmental pollution reduction and mitigation measures for GHG emission reduction

In the WBC there are 65 TPP units, with unit capacity ranging from 6 MW up to 620 MW with total installed capacity of 10,805 MW. The analysis of their age shows that the average weighted operation time, by the end of 2010, is 30 years (while the arithmetic average is 32 years). As the designed technical life of TPP equipment is usually 25 years for the first operation period and 15 years after rehabilitation, the majority of units are close to retirement. Besides, some of the units passed the designed technical life and still operates as there are no alternative sources at present.
The power and heat generation facilities located in the WBC are, generally speaking, in a bad condition, particularly because of maintenance delay and chronically lack of investment over the last two decades. Rehabilitation efforts in the power and heat generation have been made by the European Union and International Financial Institutions (WB, EBRD, and EIB), as well as by bilateral support and cooperation. In the last decade, interventions have been directed to keep the major plants in operation and to restore the transmission system in the region. One of the major current tasks in the TPP rehabilitation is compliance with the environmental regulation of the EU. Regarding the **SO_2 emissions** 23 TPP units are in compliance with the recommended environmental standards (some of them use natural gas) with the installed capacity of 1,814 MW. The remaining 43 units, with installed capacity of 9,091 MW, would have to reduce sulfur dioxide emissions. The implementation of desulfurization process is rather expensive and increases the unit generation costs, especially if the remaining operation life is less than 15 years.

The situation with **NOx emissions** is somehow better, as due to lower combustion temperature in lignite fired boilers the nitrogen oxides concentrations are much lower, and it is usually enough to installed primary reduction measures. Therefore, 40 TPP units, with installed capacity of 7,219 MW have full compliance with emission standards. The remaining 25 units, with 3,586 MW would have to implement some denitrification processes.

As far as **particulates emission** is concerned 25 TPP units, with capacity of 2,051 MW, have no fly ash emissions (natural gas or oil fired plants) and 16 TPP units with capacity of 3,431 MW have particulates emission according to ELV. Therefore, 41 TPP units, with installed capacity of 5,482 MW (50% of total capacity in WBC) satisfy particulates emission standards. The remaining of TPP units would have to implement particulates emission reduction technology, except for a number of

units which are candidates for retirements in short period of time. This in particular applicable to 5 TPP units, with total installed capacity of 800 MW, with particulates emission exceeds up 40 times ELV, for which the age of units vary from 35 to 48 years.

5.1.2.1 Co-combustion of selected renewable fuel SRF (selected industrial and municipal waste) and biomass in coal fired Thermal Power Plants

It is feasible to consider co-firing SRF and biomass in the form of agriculture waste biomass, wood waste biomass or saw dust with lignite in Bosnia and Herzegovina, Serbia, UNMIK/Kosovo, FYR Macedonia and Montenegro due to the significant biomass potential as well as the condition and number of thermal plants in these countries (Table 2 and 3). Implementation of this measure will increase share of renewable in the energy mix, share of renewable in power generation, decrease emission of SO_x and GHG, improve rural development and employment.

Table 2: WBC Power generation by fuel in 2007.

Country/ fuel	Coal (%)	Oil+Natural gas (%)	Renewable – Hydro (%)
Albania		2.5	97.5
Bosnia and Herzegovina	64.9	1.3	33.8
Croatia	20.0	19.0 + 26.0	35.0
Montenegro	63.0		37.0
FYR Macedonia	78.0	7.0	15.0
Serbia	70.0	1.0 + 1.0	28.0
UNMIK	98.0		2.0

Table 3: Characteristics of the coal used in WBC for power generation in TPP

	Installed Gross capacity (MW)	Fuel type	Moisture content in the coal (%)	Lower Heating Value (kJ/kg)
TPP Tuzla	715	lignite	42	10000
TPP Kakanj	450	brown coal	15	13500
TPP Gacko	300	lignite	40	8000
TPP Ugljevik	300	lignite	33	10500
TPP Plomin	330	imported coal		
TPP Pljevlja	210	lignite	34	10000
TPP Bitolj	630	lignite	45-52	7300
TPP Oslomej	125	lignite	48	6500
TPP TENT	3287	lignite	48-52	7850
TPP Kostolac	1010	lignite	43	8000
TPP Kosovo	1478	lignite	43	7800

Proposed Project: Technical and cost feasibility study of potential SRF and biomass (quality, quantity, energy, transport distance and cost, possible local market, impact on rural development and employment in the coal fired TPP nearby region) for co-combustion in existing Thermal Power Plants in the WBC.

5.1.2.2 Energy efficiency and environmental impact improvement of the existing low quality coal fired TPP by co-combustion of pre-dried lignite

Low quality (with high moister content) local mined coal - lignite is used for power generation in Bosnia and Herzegovina, Serbia, UNMIK/Kosovo, FYR Macedonia and Montenegro (table 2). Besides classical measures for energy efficiency improvement of TPP, new European technology (developed by RWE) for pre-drying high moister coal – lignite offers additional possibilities. It is expected that since 2015 energy efficiency of new advanced TPP will be increased from currently best 43% to 47% based on new steam boilers with completely pre-dried lignite. Same technology

could be applied for the old TPP but with pre-drying only the part (25%) of the coal quantity, proportionally increasing energy efficiency of the TPP.

Proposed Project: Technical and cost feasibility study of potential for Energy efficiency and environmental impact improvement of the existing WBC low quality coal fired TPP by implementing new European technology (developed by RWE) for pre-drying high moister coal – lignite.

5.1.3 Priority 3: Sustainable renewable energy - Developing new technologies in using renewable energy sources and clean technologies with zero emission

There is a significant potential for renewable energy development in all WBC, due mainly to the abundance of hydro and solar resources in most of the countries. Also, biomass, wind, and geothermal energy can be developed in some of the countries. In last few years almost all WBC have a fairly good understanding of the potential for developing their large hydro power plants and wind resources, but less feasibility studies have been done for other renewables, such as small hydro plants, biomass, solar, and geothermal energy. More studies of these potential resources, particularly in countries such as Bosnia and Herzegovina, Serbia, FYR Macedonia, Montenegro, and UNMIK/Kosovo, would be useful to help develop such kind of implementation projects there.

5.1.3.1 Small hydropower plants

All the WB countries except UNMIK/Kosovo have significant potential for hydro power development. Bosnia and Herzegovina, Serbia and Montenegro have the highest estimated hydro energy potential followed by Albania, Croatia and Macedonia. Albania is only using 35 percent of its hydro potential although 97 percent of the country's electricity comes from hydro power. Serbia, Bosnia and Herzegovina, and Montenegro have extensive potential and plans for large/small hydro plants development.

Proposed Project: Technical, ecological and cost feasibility study of potential locations for small (less than 10 MW) hydropower plants in the WBC

5.1.3.2 Biofuels

WBC have the considerable amounts of biomass which could be used in different sectors of energy production (electricity, heat and transport). Several regional studies have been carried out in last few years with the intention to define the technical potential of biomass (estimated around 245 PJ), as well as, the barriers and problems in the process of biomass utilization. All WBC have practically the similar present situation in biomass utilization:

- biomass is mainly used for heat production (dominant utilization of fuelwood for household heating, wood residues utilization in industry, insufficient utilization of agricultural biomass)
- biomass utilization for electricity generation is negligible
- small production and utilization of biofuels in transport (less than 1%)
- biofuels market undeveloped.

All these countries are obliged to prepare the National Renewable Energy Action Plan (NREAP) for the period till 2020. As biomass can play the important role in the future energy mix, it is necessary to define the biomass supply, sustainability criteria and technologies for biomass utilization. Biomass utilization could have the important role not only in the energy sector, but also in social sector with job creation in the whole supply chain (collection, transport, conversion).

Different research and innovation projects could be the subject of the future research:

- Research cooperation and knowledge exchange in the area of renewable energy should be carried out within partnership of South-East EU partner countries (for example Biofuels in Danube region);
- Primary, the research should be focused on new types of biofuels, as for their use in transport and for generation/co-generation of electricity/electricity and heat, so for the new production. Also, storage and distribution routes for existing biofuels should be investigated.
- For example, co-generation may save up to 30% of energy, but there is always a question of potential to utilize the heat energy produced in such a system.
- The performances of small scale biomass boilers/stoves and their exhaust systems should be improved in order to achieve very low levels of pollutant's emissions at highest efficiencies and lowest cost;
- The performances of small-to-medium scale combined heat-and-power plants or combined cooling-heat-and-power plants on the base of a wide range of biomass and waste feed-stocks, should be improved through focus on the maximization of total energy exploitation.
- Existing industrial oil and gas boilers should be cost-effectively converted into biomass-fired ones. It enables significant improvement in efficiency of boilers.
- Novel solid biomass fuels (e.g. energy crops or mixed pellets based on a variety of organic feedstock such as agricultural or forest based by-products) should be produced and used in existing biomass heating installations.
- The utilisation of biomass in food and pharmaceutical industry should be favorite, as well as the use of biomass waste as fuel for production of energy;
- The new technologies for electricity production from renewable resources, which takes into account specific regional conditions, are developing and new industrial facilities should be built. A new economic and technical potential should be identified. Overall conversion efficiency and cost efficiency should be re-examined in order to significantly reduce the cost of electricity production from renewable energy resources.

Proposed project: Technical, environmental, sustainability and cost feasibility study on biofuels production and utilization in WBC countries

5.1.3.3 Renewables for heating and cooling

The greatest contribution to sustainability of energy consumption is realized through research, development and demonstration of technologies and devices including energy storage technologies, which increase the potential of active and passive heating and cooling from renewable energy sources. This enables cost reductions, increased efficiencies, further reduction of environmental impacts and optimization of the use of technologies in different regional conditions, where sufficient economic and technical potential is identified.

a) Geothermal energy for heating and cooling:

The project will investigate all accessible information from resource location, structural geology and estimation of the in-situ stresses, to geophysical and geochemical data. Particular attention will be paid to the processes and technical systems for utilization of geothermal resources for heating and cooling in housing and industry along with the concept of enhancing energy efficiency in building management. It should be stressed that in case of utilization of geothermal energy systems the awarded energy effects are supplemented by substantial environmental based on decreased usage of fossil fuel energy sources.

The potential of low temperature geothermal energy sources should also be investigated. Of all forms of geothermal energy, low temperature geothermal energy or sub-geothermal energy, is the most available, the cheapest and the easiest to exploit. In case of availability of sub-geothermal ground water resources energy efficiency of the appropriate heat pump systems used for its

utilization are expected to be even higher. The largest amounts of this form of energy are related to the alluvion of major rivers, which makes this concept of thermal energy production especially interesting for the towns they flow through.
According to development plans in the field of energy and energy efficiency of Serbia, sub-geothermal groundwater resources are among the renewable energy sources with the implementation, use and verification of reserves at an early stage. Potentials and reserves are untested, thus the research of renewable sub-geothermal energy has become more important in recent years. The research should be also related to the development of integrated systems where the heat pumps in addition to their heating function will be observed as systems with the possibility of cooling (energy and economically more profitable, and more environmental- friendly), and to the research and development activities connected to energy efficiency improvement measures and systems (for example thermal energy storages for heat pump heating/cooling utilities etc)

b) The future plan is to develop a hybrid system for heating/cooling, that will use solar, PV and/or wind energy as a primary source and, as additional energy source, it will use biomass and/or geothermal energy, to compensate heat load intermittence. It should be investigated heat pumps for central heating that use the heat of the air, ground and surface water, or heat accumulated in the earth and stone masses.

Proposed project: Technical, environmental, sustainability and cost feasibility study on renewables using for heating and cooling in WBC countries

5.1.4 Priority 4: Energy Sector – Increasing the efficiency of energy production, distribution and usage, with special focus on the efficiency of buildings

The Serbia's energy sector has immense potential for primary and final energy savings and for improvements in energy efficiency. This potential should be harnessed through the research into optimization, validation and demonstration of proved and new concepts and technologies for buildings, transport, services, and industry. The local community energy system optimization should be achieved by bringing into balance a significant reduction in energy demand, with the most affordable and sustainable supply solution, including the use of new fuels in dedicated fleets.

5.1.4.1 Energy efficiency improvement in the manufacturing industry

In the sector of industry, there are large reserves to increase the overall energy efficiency at the country level.
Large amounts of energy (electricity, fuels, heat, etc.) for the production of industrial and consumer goods are consumed every day. Even the smallest increase of energy efficiency in the manufacturing processes will reduce green house gases emissions, deliver significant benefits on security of energy supply and lower the price of the manufactured goods. This is the main reason why is this area of research very important for the future development of the Republic of Serbia. Consequently, new solutions for significant improvement of energy intensity and CO_2 intensity of the processes or reduction of energy embedded in products in the energy intensive manufacturing industry should be proposed.
Reduction of specific energy consumption per unit of product in such processes in the economy, increase the thermal efficiency of large consumers of energy and economy.

5.1.4.2 Energy Systems Optimization in Smart Cities

The final energy consumption of the residential buildings from the household sector is major part of the final energy consumption of households and includes the energy consumption of the residential buildings (single houses and multifamily buildings).

The purpose of the proposed problem is an innovative integrated energy system at the level of cities or districts. Some significant reduction of energy consumption and CO_2 emissions should be expected. It should be investigated heat pumps for central heating that use the heat of the air, ground and surface water, or heat accumulated in the earth and stone masses.

5.1.4.3 Zero net energy building

Zero-net energy house (ZNEHs) are characterized by high energy efficiency and a connection to the electrical grid. Their energy production is equal to their energy consumption. The energy is produced from renewable energy sources, often from sun (electrical energy and heat) and geothermal energy (heat). Electrical energy is sent to the electrical grid when there is an energy surplus or taken from the electrical grid when there is an energy shortage.
The integration and optimization of joint use of these technologies will be studied during their life cycle. Also, for analysis, several characteristics are taken into account: maximum of energy and exergy efficiency, minimum emission of CO_2 and other pollutants, and maximum economy effects. The investigated economic parameters of sustainability of the optimal solution will be the investment payback time, the price of the generated electrical energy, and the economic benefit when using the ZNEH.

5.1.5 Priority 5: Smart grids and Information technologies implementation in energy sector

5.2 Energy Sector research priorities on the basis of future potential

In the near future, a major R&D policy issue in the energy field will be investigation and development of a new technologies using renewable energy sources, clean technologies with zero emissions primarily in the field of mini hydro power plants, cogeneration and biomass, increase of energy efficiency of existing power facilities, power plants and energy plants without air pollution by combustion products etc.

5.2.1 Priority 1: Energy efficiency

5.2.2 Priority 2: Renewable energy

a) Bio-energy Demonstration programme of different bio-energy pathways at a scale appropriate to the level of their maturity – pilot plants, pre-commercial demonstration or full industrial scale. Up to about 3 such plants should be built and operated in Serbia to take full account of differing geographical and climate conditions and logistical constraints. A longer term research programme will support the bio-energy industry development beyond 2020.

b) Photovoltaic and thermal power generation/conversion
The project will demonstrate efficient and cost-effective approaches for solar tower systems combining high-performance concentrated photovoltaic and thermal power generation/conversion. The main focus of proposed research is expected to be on the development the thermodynamic optimization of the system.

5.2.3 Priority 3: Smart grids and Information technologies implementation in energy sector

The objective of the European Industrial Initiative on electricity grid is to enable the transmission and distribution of up to 35% of electricity from dispersed and concentrated renewable sources by 2020 and a completely decarbonised electricity production by 2050; to integrate further national networks into a market-based truly pan-European network, to guarantee a high quality of electricity

supply to all customers and to engage them as active participants in energy efficiency; and to anticipate new developments such as the electrification of transport.
As a response, it is proposed a strongly integrated R&D and demonstration programme to identify and implement the most suitable grid architectures. The research part concentrates on the development of new technologies to improve flexibility and security of the network and to mitigate future capital and operational expenditure, but also on developing the necessary modeling and planning tools for designing and testing innovative pan-European grid architectures. In parallel, up to 2 demonstration projects covering diversified geographical, social and climate conditions are proposed to validate solutions before their market roll-out, in all sectors from home energy efficiency through smart meters to the system integration of variable energy sources to the automation and control of whole networks.

5.2.4 Priority 4 Environmentally friendly Power Plants

5.2.4.1 Towards Low Carbon Power Generation in WBC

Technical feasibility study of potential locations and their capacity for underground storage of captured CO_2 from WBC TPP and high capacity fossil fuel combustion plants.

5.2.5 Priority 5: Energy storage systems

5.2.6 Priority 6: Power generation in the low temperature range

Annex I – Classification of the Energy fields

There is no classification of the energy fields.

Annex II – List of Energy R&D institutions

- University of Belgrade – Faculty of Mechanical Engineering
- University of Belgrade – School of Electrical Engineering
- University of Belgrade – Faculty of Civil Engineering
- University of Belgrade – Faculty of Mining and Geology

- Vinca Institute of Nuclear Sciences

- Electro-technical Institute Nikola Tesla

- Institute Mihailo Pupin

- Institute for Technology of Nuclear and Other Mineral Raw Materials

- University of Novi Sad – Faculty of Technical Sciences

- University of Nis – Faculty of Mechanical Engineering
- University of Nis – Faculty of Electronic
- University of Nis – Faculty of Science

- University of Kragujevac – Faculty of Mechanical Engineering

- University of Kraljevo - Faculty of Mechanical Engineering

- Technical Sciences – Cacak

- Institute of Mining and Metallurgy – Bor
- Technical Faculty in Bor

- Faculty of Technology – Leskovac

- Faculty of Technical sciences, Kosovska Mitrovica

Annex III – Ongoing Ministry of Education and Science – funded research projects in the Energy research field

Integrated and Interdisciplinary research projects Energy and Energy Efficiency			
	Project title	**Project leader**	**Research organization**
1.	Smart Electricity Distribution Grids Based on Distribution Management System and Distributed Generation	Dragan Popovic dpopov@uns.ac.rs	Faculty of Technical Sciences
2.	Research and development of energy efficient and environment friendly polygeneration systems based on renewable energy sources utilization	Velimir Stefanovic veljas@masfak.ni.ac.rs	Faculty of Mechanical Engineering
3.	System for Optimization of Thermal Power Plant Blocks Operation over 300 MW capacity	Dragan Radojevic dragan.radojevic@pupin.rs	Institute "Mihajlo Pupin"
4.	Evaluation of energy performances and indoor environment quality of educational buildings in Serbia with impact to health	Zarko Stevanovic zare@vinca.rs	Institute of Nuclear Sciences VINCA
5.	Smart grids	Nikola Rajakovic rajakovic@etf.rs	University of Belgrade, Faculty of Electrical Engineering
6.	Pollution Reduction from Thermal Power Plants of the Public Enterprise “Electric Power Industry of Serbia”	Predrag Stefanovic pstefan@vinca.rs	Institute of Nuclear Sciences VINCA
7.	Development and improvement of technologies for energy efficient and environmentally sound use of several types of agricultural and forest biomass and possible utilization for cogeneration	Branislav Repic brepic@vinca.rs	Institute of Nuclear Sciences VINCA
8.	Energy efficiency enhancement of buildings in Serbia and improvement of national regulative capacity for they are certification	Dragoslav Sumarac sumi@eunet.rs	Civil Engineering
9.	Research on cogeneration potential in municipal and industrial power plants in Republic of Serbia and technical and technological possibilities for the revitalization of existing and construction of new cogeneration plants	Milun Babic nastasija@kg.ac.rs	Faculty of Mechanical Engineering

TECHNOLOGY DEVELOPMENT Energy, Mines and Energy Efficiency			
	Project title	**Project leader**	**Research organization**
1.	Researching the possibilities of energy efficiency improvement by using energy resources potentials examplified by Oil Industry of Serbia-Naftagas	Dusan Danilovic danilovic@rgf.bg.ac.rs	Faculty of Mining and Geology
2.	The information system for thermal power plant energy efficiency and operational effectiveness monitoring and improvement support	Ninel Cukalevski ninelc@afrodita.rcub.bg.ac.rs	"Mihailo Pupin" Institute in Belgrade
3.	Autonomous system for remote monitoring the state parameters in the mines and the environment	Lazar Krichak kricak@rgf.bg.ac.rs	Faculty of Mining and Geology
4.	Implementation of new technical, technological and environmental solutions in the mining and metallurgical operations RBB and RBM	Vladan Milosevic v.milosevic@itnms.ac.rs	Institute for Technology of Nuclear and Other Mineral Raw Materials
5.	A new approach to modeling of cable accessories in order to increase the efficiency of power transmission lines	Slavoljub Aleksic slavoljub.aleksic@elfak.ni.ac.rs	Faculty of Electronic
6.	Examination of energy efficiency of PV solar 2 kW power plant	Tomislav Pavlovic pavlovic@pmf.ni.ac.rs	Faculty of Science
7.	Development of intelligent monitoring control system to increase energy efficiency in buildings	Filip Kulic kulic@uns.ac.rs	Faculty of Technical Sciences
8.	Research and development of a Serbian net-zero energy house	Milorad Bojic bojic@kg.ac.rs	Faculty of Mechanical Engineering
9.	Research, development and implementation of programs and procedures Energy efficiency of electric drives	Miroslav Bjekic mbjekic@tfc.kg.ac.rs	Faculty of Technical Sciences
10.	Increase of energy efficiency in selected industrial sector through implementation of energy management system in small and medium-sized enterprises	Aleksandar Nikolic anikolic@ieent.org	Institute of Electrical Engineering "Nikola Tesla"

11.	Increase in energy and ecology efficiency of processes in pulverized coal-fired furnace and optimization of utility steam boiler air preheater by using in-house developed software tools	Srdjan Belosevic v1belose@vinca.rs	Institute of Nuclear Sciences Vinca
12.	Energy efficiency Improvement of Hydro and Thermal power plants in EPS by development and implementation of power electronics based regulation and automation equipment	Zarko Janda janda@ieent.org	EE institute Nikola Tesla
13.	Researching and monitoring changes in stress-deformation condition of rock massif “in-situ” around underground facilities with development of model with special emphasis on Krivelj river tunnel and Bor pit	Milenko Ljubojev milenko.ljubojev@irmbor.co.rs	Institute of Mining and Metallurgy
14.	Integrated systems for flue gas cleansing and development of technologies for zero pollution power plants	Slobodan Vukosavic boban@etf.rs	School of Electrical Engineering University of Belgrade
15.	Development of Technologies for the Flotation Processing of Copper and Precious Metal Ores with the Aim to Increase the Technological Results	Dragan Milanovic dragan.milanovic@irmbor.co.rs	Mining and Metallurgy Institute
16.	Increase of power efficiency, reliability and availability of EPS power plants by asserting capability curves of generators and by applying new methods of testing and remote monitoring	Sasa Milic s-milic@ieent.org	EE institute Nikola Tesla
17.	Research on possibility of AT (Advanced Technology) rockbolting application in mines for the purpose of work safety increase and production efficiency	Vojin Cokorilo cokorilo@rgf.bg.ac.rs	Faculty of Mining and Geology
18.	Increasing the energy efficiency of heat generating plants by automatic control	Novak Nedic nedic.n@mfkv.kg.ac.rs	Faculty of Mechanical Engineering Kraljevo
19.	Development of the energy efficient plant of gasification and cogeneration of biowasters	Vladan Karamarkovic karamarkovic.v@mfkv.kg.ac.rs	Faculty of Mechanical Engineering Kraljevo

20.	Study of Possibilities for Valorization of the Remaining Coal Reserves to Provide Stability of the Energy Sector of Republic of Serbia	Nebojsa Vidanovic vidanovic@rgf.bg.ac.rs	Faculty of Mining and Geology
21.	Possibilities of use of geothermal water potential in Jablanica and Pcinja districts	Dragan Stojiljkovic dragansto24@yahoo.com	Faculty of Technology
22.	Development, realization, optimization and monitoring of a 5kWp grid-connected modular Sun-tracking photovoltaic system	Dragan Mancic dragan.mancic@elfak.ni.ac.rs	Faculty of Electronic
23.	Development of new meteorological mast for turbulence parameters characterization	Vukman Bakic bakicv@vinca.rs	Institute of Nuclear Sciences VINCA
24.	Development and application of distributed system for monitoring and control of electrical energy consumption for large consumers	Dragan Milivojevic dragan.milivojevic@irmbor.co.rs	Mining and metallurgy institute Bor
25.	Improvements of the copper ore extraction and processing with environmental monitoring in RTB Bor Group	Nenad Vusovic nvusovic@tf.bor.ac.rs	Technical Faculty in Bor
26.	Improvement Of Lignite Opencast Mining Technology In Order To Increase Energy Efficiency And Occupational Safety	Nikola Lilic lilic@rgf.bg.ac.rs	Faculty of Mining and Geology
27.	The revitalization of existing and designing of new micro and mini hydro power plants (from 100 up to 1000 kW) on the territory of south and southeastern Serbia	Dragica Milenkovic bminja@masfak.ni.ac.rs	Faculty of mechanical Engineering NIS
28.	Fluidized bed combustion facility improvements as a step forward in developing energy efficient and environmentally sound waste combustion technology in fluidized bed combustors	Stevan Nemoda snemoda@vinca.rs	Institute of Nuclear Sciences VINCA
29.	Monitoring and adaptive risk management in opencast mineral-raw material mining	Slobodan Vujic vujic@rgf.bg.ac.rs	Faculty of Mining and Geology
30.	Optimization of open pit Prlovi Ore Preparation Process at Mine Rudnik	Predrag Lazic plazic@rgf.bg.ac.rs	Faculty of Mining and Geology

31.	Development of a model of the micro hydro power plant for isolated energy supply of the fishery, and micro grid with various renewable energy sources	Miroljub Jevtic miroljub.jevtic@gmail.com	Faculty of Technical sciences, Kosovska Mitrovica
32.	Intelligent Control Systems of the Air-conditioning for the Purpose of Achieving Energy Efficient Exploitation Regimes in the Complex Operating Conditions	Dragan Lazic dragan.lazic@gmail.com	Faculty of Mechanical Engineering
33.	Research on use of solar energy by vacuum collectors with heat pipes and construction of a demonstration facility	Milan Gojak mgojak@mas.bg.ac.rs	Faculty of Mechanical Engineering
34.	Development of CHP demo facility with biomass gasification	Goran Jankes gjankes@mas.bg.ac.rs	Faculty of Mechanical Engineering
35.	Domestic Lignite Quality and Combustion Technology Enhancement for Energy Efficiency Increase and Reduction of Harmful Gases and Particulate Matter Emissions from Thermal Power Plants of Public Enterprise ”Electric Power Industry of Serbia”	Milan Stakic mstakic@vinca.rs	Institute of Nuclear Sciences VINCA
36.	The concept of sustainable energy supply of settlements with energy efficient buildings	Branislav Stojanovic banes@masfak.ni.ac.rs	Faculty of Mechanical Engineering
37.	The research and development of renewable subgeothermal groundwater resources in the concept of enhancing energy efficiency in building management	Dejan Milenic dmilenic@yahoo.ie	Faculty of Mining and Geology
38.	Energy systems in public buildings	Jovan Petrovic jovanpet@uns.ac.rs	200156 Faculty of technical Sciences

Annex IV – Involvement of Serbian researchers in European Energy and Energy research projects

FP7 PROJECTS			
	Project	**Title**	**Research area**
1.	C-ENERGY +	Connecting Energy NCPs Plus A Pro-Active Network of National Contact Points in the Seventh Framework Programme under the Energy Theme	ENERGY.2009.10.1.1 Trans-national co-operation among NCPs
2.	CGS EUROPE	Pan-European coordination action on CO_2 Geological Storage	ENERGY.2010.5.2-2 Trans-national cooperation and networking in the field of geological storage of CO_2
3.	SUSPLAN	Development of regional and Pan-European guidelines for more efficient integration of renewable energy into future infrastructures	ENERGY-2007-7.3-05 More efficient integration of renewable energy into future infrastructures
4.	GEOCOM	Geothermal Communities demonstrating the cascading use of geothermal energy for district heating with small scale RES integration and retrofitting measures	ENERGY.2008.8.4.1 CONCERTO communities: the way to the future
5.	SEETSOC	South-East European TSO Challenges	ENERGY.2008.7.2.3 Diagnostics, Surveillance, Maintenance and Control of Power Transmission and Grid Connections
6.	C-ENERGY	Connecting energy NCPs A pro-active network of national contact points in the Seventh Framework Programme under the Energy Theme	ENERGY.2008.10.1.3 Trans-national co-operation among NCPs
7.	ENEXAL	Novel technologies for enhanced energy and exergy efficiencies in primary aluminium production industry	ENERGY.2009.8.1.1 Energy efficiency in energy intensive industry

COST actions			
	COST type	**COST action code**	**Action title**
1.	*ESSEM*	*ES1005*	Towards a more complete assessment of the impact of solar variability on the Earth's climate
2.	*ESSEM*	*ES1002*	Weather Intelligence for Renewable Energies (WIRE)
3.	*ICT*	*IC0804*	Energy efficiency in large scale distributed systems
4.	*MPNS*	*MP1104*	Polarization as a tool to study the Solar System and beyond
5.	*MPNS*	*MP1004*	Hybrid Energy Storage Devices and Systems for Mobile and Stationary Applications
6.	*TUD*	*TU1104*	Smart Energy Regions
7.	*TUD*	*TU0802*	Next generation cost effective phase change materials for increased energy efficiency in renewable energy systems in buildings (NeCoE-PCM)
8.	*ISCH*	*A27*	Understanding pre-industrial structures in rural and mining landscapes

EUREKA - CURRENT PROJECTS				
	Acronym	**Project title**	**Project goal**	**Research organization/Coordinator**
1.	**E! 5779 eEnergyMon**	Real-time end-user energy efficiency monitoring in facilities	The project is aiming at developing environment prompt, easy to access and transparent to use energy efficiency monitoring system used for energy consumption and efficiency monitoring.	University of Novi Sad - Faculty of Economics Subotica Prof. dr Sasa Bosnjak
2.	**E!5851 FeVal**	Sustainable Materials and Products from Poultry Feather Wastes	The main objective of this project is, to perform a wide study of the possibilities of achieving "zero waste" concept in feather wastes of poultry industry, i.e. use of waste feather in development and production of various types of side products of higher added value.	University of Belgrade – Faculty of Technology and Metallurgy Prof. dr Petar Uskokovic
3.	**E!5786 GGH PIPE**	Geothermal Gravity Heat Pipe for Exploitation of Geothermal Energy from Unproductive wells	With this project we will develop a geothermal gravity heat pipe for the exploitation of geothermal energy from unproductive wells 3,000 meters deep and at a temperature of 155 degrees Celsius.	University of Belgrade – Faculty of Mechanical Engineering, Prof. dr Alexander Saljnikov
4.	**E!5832 DTBSF**	Development of technology for efficient and economical production of bio-ethanol fuel at small farms	To develop an efficient technology and equipment which is suitable to small farms for economical production of bio-ethanol fuel for own need including production of electrical energy and for sales of surplus to local/regional distributors, industries, farmers, etc.	University of Novi Sad – Faculty of Technology Prof. dr Sinisa Dodić

Annex V – Principal results of recent Energy and energy research projects in Serbia

The results of recent Energy and energy research projects are presented in the following Table, as a list of the journals in which the papers have been published.

Energy					
Journal Title	**2008**	**2009**	**2010**	**2011**	**Total Of SifCat**
FUEL	3	4	4	1	12
ENERGY	1	7	4	2	14
OIL & GAS JOURNAL	1				1
APPLIED THERMAL ENGINEERING	2	1		1	4
BIORESOURCE TECHNOLOGY	6	5	2	2	15
FUEL PROCEESING TECHNOLOGY	1		2		3
INTERNATIONAL JOURNAL OF HYDROGEN ENERGY	2	5	5	14	26
JOURNAL OF POWER SOURCES	3	5	3	1	12
INTERNATIONAL JOURNAL OF COAL GEOLOGY	1		1		2
ENERGY AND BUILDINGS	1	1	2	4	8
PROCEEDINGS OF THE 1ST WSEAS INTERNATIONAL CONFERENCE ON ENVIRONMENTAL AND GEOLOGICAL SCIENCE AND ENGINEERING (EG'08): ENVIRONMENT AND GEOSCIENCE	1				1
PROCEEDINGS OF THE 3RD IASME/WSEAS INTERNATIONAL CONFERENCE ON ENERGY & ENVIRONMENT: ENERGY AND ENVIRONMENT III	1				1
IEEE TRANSACTIONS ON ENERGY CONVERSION		1		1	2
RENEWABLE & SUSTAINABLE ENERGY REVIEWS		3	9	10	22
ENERGY & FUELS		2	2	2	6
ENERGY CONVERSION AND MANAGEMENT		1	1		2
GEOTHERMICS		1			1
APPLIED ENERGY		1	3	2	6
ENERGY POLICY		1	2	3	6
BIOMASS & BIOENERGY		1	2	1	4
UTILITIES POLICY		1			1
ENERGY SOURCES PART A-RECOVERY UTILIZATION AND ENVIRONMENTAL EFFECTS		5	1	2	8
OIL SHALE		1			1
INTERNATIONAL JOURNAL OF PHOTOENERGY		1			1
RECENT ADVANCES IN ENERGY AND ENVIRONMENT		1	2		3
RECENT ADVANCES IN ENVIRONMENT, ECOSYSTEMS AND DEVELOPMENT		1			1
RENEWABLE ENERGY			2		2
INTERNATIONAL JOURNAL OF VENTILATION			1		1
PETROLEUM SCIENCE AND TECHNOLOGY			1	3	4
PROCEEDINGS OF THE ASME 10TH BIENNIAL CONFERENCE ON ENGINEERING SYSTEMS DESIGN AND ANALYSIS, 2010, VOL 1			1		1
PROCEEDINGS OF THE 5TH IASME/WSEAS INT CONF ON			1		1

WATER RESOURCES, HYDRAULICS & HYDROLOGY/PROCEEDINGS OF THE 4TH IASME/WSEAS INT CONF ON GEOLOGY AND SEISMOLOGY: WATER AND GEOSCIENCE					
JOURNAL OF RENEWABLE AND SUSTAINABLE ENERG				2	2
PETROLEUM CHEMISTRY				1	1
CHEMICAL ENGINEERING AND PROCESSING				1	1
FUEL CELLS				1	1
INTERNATIONAL JOURNAL OF COAL PREPARATION AND UTILIZATION				1	1
THERMAL SCIENCE	2	10	15	12	39
INTERNATIONAL JOURNAL OF HEAT AND MASS TRANSFER	6	4		8	
	31	**63**	**66**	**75**	**235**

References

[1] SSTDRS, 2010: “Strategy of Scientific and Technological Development of the Republic of Serbia 2010-2015”, adopted by the Government of the Republic of Serbia on February 25, 2010, (Official Gazette of the RS No 13/10) http://www.nauka.gov.rs/eng/images/stories/vesti/Strategy/serbian_rd_strategy.pdf

[2] Energy Sector Development Strategy of Republic of Serbia by 2015. (Official Gazette of the RS, No. 44/2005)

[3] MSTD, 2009: Nedović Viktor, "Serbian Science in International Cooperation“, presentation prepared for EU Research Information Event: Toward Integration into the European Research Area, Serbian Ministry of Science and Technological development and European Commission, Belgrade, 29.06.2009.

[4] Amendments to the Program for Implementation of Energy Sector Development Strategy 2007-2012 (Official Gazette of the RS, No. 99/2009)

[5] National Strategy of Sustainable Development (Official Gazette of the RS, No. 55/05, 71/05-correction and 101/07)

[6] Law on Ratification of the SEE Energy Community Treaty between the European Union and the Republic of Albania, the Republic of Bulgaria, Bosnia and Herzegovina, the Republic of Croatia, the FYR of Macedonia, the Republic of Montenegro, Romania, and the Republic of Serbia and Kosovo, through the United Nations Interim Administration Mission in Kosovo, pursuant to the United Nations Security Council Resolution 1244 (Official Gazette of the RS, No. 62/2006)