Project logo:

Priority logo:

Project No: **INCO – CT – 2004 – 509205**
Project acronym: **VBPC – RES**
Project title: **Virtual Balkan Power Centre for Advance of Renewable Energy Sources in Western Balkans**

Instrument: Coordination Action

Thematic priority:
International Cooperation (INCO)

D20: Report from Local Conference in Serbia and Montenegro

Due date of deliverable: 08. June 2007
Actual submission date: 31. December 2007

Start date of the project: 01.01.2005 Duration: 36 months

Organisation name:
DMS power engineering group LTD

Revision:

Project co-funded by the European Commission within the Sixth Framework Programme (2002 – 2006)

Dissemination level

PU	Public

VIRTUAL BALKAN POWER CENTRE FOR ADVANCE OF RENEWABLE ENERGY SOURCES IN WESTERN BALKANS

Local Conference in Serbia and Montenegro

Task leader: DMSG

The Local workshop in Novi Sad entitled “Promotion of Renewable Energy Sources” was held on the 08th of June 2007, in the University of Novi Sad, Faculty of Technical Sciences, Conference room FTN, Serbia. The conference belongs to the project “Virtual Balkan Power Centre for Advance of Renewable Energy Sources in Western Balkans”, project acronym: VBPC-RES, Contract INCO-CT-2004-509205, under the Sixth Framework Programme, Priority 6, Sustainable Development, Global Change and Ecosystems. This local conference is a part of Work Package 3 (WP3) of the VBPC-RES project. It was attended by 31 participants from 4 countries from the Western Balkans Region and the rest of Europe.

During this local conference, the project partners presented 3 contributions, which are included in the report. The local workshop aimed at presenting the results of VBPC-RES project to the Serbian public. Partners and experts from Serbia, Bosnia & Herzegovina, Norway and Romania have presented the VBPC-RES project and situation regarding RES use in their countries. The targeted audience are key actors for implementation of RES in Serbia and Montenegro: governmental officials and officials from interested local communities, business sector and experts. The goal was through information exchange and discussion to draw conclusions that will help in overcoming existing barriers for stronger RES penetration in Serbia and Montenegro.

Sixth Framework Programme, DG Research, International Cooperation

Contract: INCO-CT-2004-509205

AGENDA

University of Novi Sad, Faculty of Technical Sciences,
Conference room FTN
08. June 2007

$8^{30} – 9^{00}$	Registration	
$9^{00} – 9^{05}$	Welcome and introduction	Prof. dr Vladimir Strezoski, Faculty of Technical Sciences/ DMS Group
$9^{05} – 9^{15}$	Program of strategic development in power industry and renewable sources until year 2012	Mr. Tomislav Papić, Dept. Provincial Secretary for Energy of Vojvodina
$9^{15} – 9^{45}$	Review and presentation of VBPC-RES project: previously gathered experiences, activities and achieved results	Ms. Elena Boškov, DMS Group
9^{45} - 10^{15}	RES in Serbia – strategic and regulatory framework	Ms. Antonela Solujić, Ministry of Energy and Mining of Serbia
$10^{15} – 10^{30}$	RES in Serbia – ongoing projects	Mr. Rastislav Kragić, Serbian Energy Efficiency Agency, advisor for new and renewable energy sources
$10^{30} – 10^{45}$	Research and development at FTN	Prof. dr Vojin Šenk, University Science Park – Novi Sad Innovation Centre
$10^{45} – 11^{15}$	Experience in RES project implementation in Balkan countries	Prof. dr Nikola Rajaković, Faculty of Electrical Engineering, Belgrade
$11^{15} – 11^{45}$	Coffee break and refreshments	
$12^{15} – 12^{25}$	Small domestic programs of agriculture biomass utilisation as the energy source in Serbia	Prof. dr Miloš Tešić, Faculty of Technical Sciences
$12^{25} – 12^{45}$	RES in local community development – experiences from Scandinavia	Dr. Nenad Keserić, Statkraft Western Balkans (Norway)
$12^{45} – 13^{15}$	Steps toward greater penetration of renewable energy sources in Romania	Dr. Lucian Toma, University ”Politehnica” of Bucharest (Romania)
$13^{15} – 13^{45}$	Chances and barriers in small HPP development in B&H	Mr. Dženan Malović , INTRADE (BiH)
$13^{45} – 14^{15}$	Discussion	
14^{15}	Lunch for VBPC partners and workshop guests	

6. Framework Programme, Priority: International Cooperation (INCO),
Contract: INCO – CT – 2004 – 509205

Virtual Balkan Power Centre for Advance of
Renewable Energy Sources in Western Balkans

Balkan Power Centre Report

LOCAL CONFERENCE IN SERBIA AND MONTENEGRO

University of Novi Sad, Faculty of Technical Sciences,
Conference room FTN
08. June 2007

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LOCAL CONFERENCE IN SERBIA AND MONTENEGRO

Novi Sad, 08th of June 2007





VIRTUAL BALKAN POWER CENTRE FOR ADVANCE OF RENEWABLE ENERGY SOURCES IN WESTERN BALKANS (VBPC-RES)

Local workshop: PROMOTION OF RENEWABLE ENERGY SOURCES
Lokalna konferencija: PROMOCIJA OBNOVLJIVIH IZVORA ENERGIJE
08th of June 2007
Univerzitet u Novom Sadu, Fakultet Tehničkih Nauka, Svečana sala FTN

Učesnici lokalne konferencije

Ime	Organizacija	Kontakt
Vladimir Strezoski	Fakultet tehničkih nauka	vstr@uns.ns.ac.yu
Elena Boškov	DMS Grupa d.o.o. Novi Sad	elena.boskov@dmsgroup.co.yu
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Sixth Framework Programme, DG Research, International Cooperation
Contract: INCO-CT-2004-509205

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Marko Topo	**Studentska Asocijacija Fakulteta tehničkih nauka**	**markotopo@yahoo.com** **063/549 607**
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IZVRŠNO VEĆE AUTONOMNE POKRAJINE VOJVODINE
POKRAJINSKI SEKRETARIJAT ZA ENERGETIKU I MINERALNE SIROVINE

PROGRAM OSTVARIVANJA STRATEGIJE RAZVOJA ENERGETIKE REPUBLIKE SRBIJE U AP VOJVODINI

u periodu od 2007.do 2012.

Jun 2007.

ENERGETSKA POLITIKA

- **Zakon o energetici –** avgust 2004.
- **Strategija razvoja energetike Republike Srbije do** 2015. - maj 2005.
- **Potpisan Ugovor o energetskoj zajednici zemalja jugoistočne Evrope –** oktobar 2005.
- **Program ostvarivanja Strategije (POS) razvoja energetike Republike Srbije -** januar 2006.
- **Program ostvarivanja Strategije (POS) razvoja energetike republike Srbije u AP Vojvodini –** za period 2007. do 2012.

RAZVOJNI DOKUMENTI U AP VOJVODINI

1. **PROGRAM PRIVREDNOG RAZVOJA AP VOJVODINE** – 2006.g.

2. **OSNOVNI PRAVCI TEHNOLOŠKOG RAZVOJA AP VOJVODINE** – 2006.g.

STRATEGIJA RAZVOJA ENERGETIKE REPUBLIKE SRBIJE do 2015. g.

- Dugoročni ciljevi
- Prioriteti razvoja
- Izvori i način obezbeđivanja energenata
- Podsticajne mere za ulaganja u obnovljive izvore energije
- Podsticajne mere za povećanje energetske efikasnosti
- Mere za sprovođenje zaštite životne sredine

PROGRAM OSTVARIVANJA STRATEGIJE
za period 2007. do 2012.

- **Programom se utvrđuju:**
- planovi realizacije, uslovi, način i dinamika ostvarivanja Strategije
- energetski objekti koje je neophodno izgraditi
- potrebna sredstva i izvori finansiranja

- **POS se donosi za period od 6 godina i usklađuje se svake druge godine.**
- **Nadležni organ autonomne pokrajine predlaže deo Programa na svojoj teritoriji koji čini deo Programa Republike Srbije**

PROGRAM OSTVARIVANJA STRATEGIJE RAZVOJA ENERGETIKE REPUBLIKE SRBIJE U AP VOJVODINI od 2007. do 2012.

- **Moduli:**

1. Gasna privreda
2. Transnafta
3. Ad NIS
4. Površinska eksploatacija uglja
5. Hidroelektrane
6. Termoelektrane i termoelektrane-toplane
7. Elektrodistributivni sistem
8. Elektroprenosni sistem
9. Podzemna eksploatacija uglja
10. Gradske toplane i individualne kotlarnice
11. Industrijska energetika
12. Energetska efikasnost
13. Obnovljivi izvori energije
14. Fond za energetsku efikasnost
15. Zaštita životne sredine

SADRŽAJ

KOORDINATOR PROJEKTA POS APV: Dragan Surdučki, pokrajinski sekretar za energetiku i mineralne sirovine

RUKOVODILAC PROJEKTA POS APV: Tomislav Papić, pomoćnik pokrajinskog sekretara za energetiku

№	Naziv modula	Sektorski koordinator	Koordinator Pokrajinsko sekterarijata	Spoljni koordinator	Rukovodilac
M1	Gasna privreda	Tomislav Papić	Branislava Zubić	Aleksandar Popadić	Nikola Šibulov
M2	Transnafta	Tomislav Papić	Branislava Zubić	Nebojša Lemajić	Nedučin Aleksandar
M3	AD NIS	Lajoš Seke	Dragan Kostić	Slavko Popović	Bogdan Mavrenski
M4	Površinska eksploatacija uglja	Lajoš Seke	Branislava Vasić	-	Doc. dr Čedomir Belić
M5	Hidroelektrane	Tomislav Papić	Dragan Bilbija	Prof. dr Ljubomir Gerić	Budislav Likić
M6	Termoelektrane i termoelektrane - toplane	Tomislav Papić	Dragan Bilbija	Vitomir Kravarušić	Krešimir Štajner
M7	Elektrodistributivni sistemi	Tomislav Papić	Dragan Bilbija	Dušan Mutić	Dr Dragoslav Jovanović
M8	Elektroprenosni sistemi	Tomislav Papić	Dragan Bilbija	Borislav Azlen	Vladimir Krnajski
M9	Podzemna eksploatacija uglja	Lajoš Seke	Dušan Jovanović	-	Prof. dr Dušan Gagić
M10	Gradske toplane i individualne kotlarnice	Tomislav Papić	Katica Dragutinović	Miodrag Šefer	Pera Rikić
M11	Industrijska energetika	Tomislav Papić	Miomir Stojić	Mr Jovan Petrović	Branka Gvozdenac
M12	Energetska efikasnost	Tomislav Papić	Katica Dragutinović	Prof. dr Dušan Gvozdenac	Mr. Jovan Petrović
M13	Obnovljivi izvori energije	Tomislav Papić	Katica Dragutinović	Prof. dr Miloš Tešić	Dobrica Filipović
M14	Fond energetske efikasnosti	Milan Čežek	Dragana Miljkov	Vasić Goran	Nenad Simić
M15	Zaštita životne sredine u energetici	Milan Čežek	Klara Balog - Aranjoš	Nada Lazić	Svetlana Marušić

⇨**Izrada celine dokumenta poverena je Fakultetu tehničkih nauka iz Novog Sada, Pokrajinskog centra za energetsku efikasnost, pod rukovodstvom prof. dr Dušana Gvozdenca**

PRIORITETI RAZVOJA ENERGETIKE AP VOJVODINE DO 2012. I PREDLOG MERA ZA OSTVARIVANJE PROGRAMA

1. Poboljšanje tehnoloških i operativnih performansi energetskih objekata
2. Povećanje energetske efikasnosti
3. Korišćenje obnovljivih izvora energije
4. Gradnja novih i kapitalno intenzivnih energetskih kapaciteta

1. PRIORITET: Poboljšanje tehnoloških i operativnih performansi energetskih objekata

- Tehnološka modernizacija energetskog sistema i revitalizacija postojećih energetskih izvora/objekata u okviru pojedinačnih proizvodnih energetskih sektora

- Rekonstrukcija i modernizacija distributivnih mreža – automatizacija distribucije, zamena starih mernih uređaja, razvoj informacionog sistema i unapređenje telekomunikacione infrastrukture

- Postupno uvođenje odgovarajućih mera za zaštitu životne sredine od štetnih emisija

POTREBNA FINANSIJSKA SREDSTVA za realizaciju 1. PRIORITETA – Poboljšanje tehnoloških i operativnih performansi energetskih objekata

- Kogeneraciona postrojenja: od 95,0 mil € do 236,0 mil €
- Revitalizacija i modernizacija gasovodnog sistema: 5,0 mil €
- Izgradnja distributivnih gasnih mreža: 140,0 mil €
- Panonske elektrane
- revitalizacija postojećih TE-TO: 33,3 mil €
- dogradnja novih gasnih postrojenja i izgradnja
- na 5 novih lokacija uk.snage 315 MWe: 327,5 mil €
- zaštita životne sredine: 6,0 mil €
- Razvoj elektroprenosne mreže i telekomunikacionog sistema: 70,0 mil €
- Izgradnja i revitalizacija elektrodistributivne mreže: 98,3 mil €

Ukupno: 775,1 mil €

2. PRIORITET: Programi za povećanje energetske efikasnosti i Fond za energetsku efikasnost

- *Za sve sektore*
  - → Uvođenje energetskog menadžmenta
  - → Smanjenje komercijalnih gubitaka el.energije
  - → Zamena postojećih elektromotora niske efikasnosti
- *Sektor industrije*
  - → Kompenzacija reaktivne snage i energije u distribuciji
  - → Smanjenje potrošnje energije i energenata u industriji
- *Sektor zgradarstva*
  - → Prelazak sa grejanja na električnu energiju na druge energente
  - → Zamena sijalica štedljivim sijalicama u domaćinstvima i posl. prostorima
  - → Prelazak sa paušalnog plaćanja grejanja i pripreme TPV na plaćanje po
  - → merenom utrošku
  - → Osnivanje podsticajnog fonda za poboljšanje izolacije stambenih zgrada
- *Sektor saobraćaja*
  - → Podmlađivanje voznog parka u svim sektorima
  - → Donošenje nacionalne strategije za razvoj saobraćajnih sistema

POTREBNA FINANSIJSKA SREDSTVA za realizaciju 2. PRIORITETA – Povećanje energetske efikasnosti i Fond za energetsku efikasnost

- Kompenzacija reaktivne snage i energije u distr. mrežama : 1,0 mil €
- Smanjenje potrošnje energenata i energije u industriji: 100,0 mil €
- Zamena sijalica štedljivim sijalicama u domaćinstvima
- i poslovnim prostorima: 5,2 mil €
- Zamena postojećih elektromotora niske efikasnosti: 75,0 mil €
- Osnivanje podsticajnog fonda za poboljšanje izolacije
- stambenih zgrada: 235 mil €

Ukupno: 416,2 mil €

3. PRIORITET: Korišćenje obnovljivih izvora energije

- Korišćenje **biomase** (ostaci ratarske i šumske proizvodnje) za zadovoljenje toplotnih potreba ukupne snage - 5MW i 10 - tak malih kogeneracija
- Proizvodnja **biogoriva** - 200 000 t/god.
- Izgradnja **malih hidroelektrana** ukupne snage - 20,2 MW
- Korišćenje **geotermalne energije** - 51,35 MWt
- Korišćenje **eneregije vetra** - 26 MW do 2012.g.
- Korišćenje **sunčeve energije**

POTREBNA FINANSIJSKA SREDSTVA za realizaciju 3. PRIORITETA – Korišćenje obnovljivih izvora

- **KORIŠĆENJE BIOMASE:**
- za toplotne potrebe: 36,0 mil €
- za kogeneraciju: 14,0 mil €
- **PROIZVODNJA BIOGORIVA:** 100,0 mil €
- **ULAGANJE U DOKUMENTACIJU I IZGRADNJU MHE:** 19,5 mil €
- **KORIŠĆENJE ENERGIJE VETRA:** 20,0 mil €

Ukupno: 189,5 mil €

4. PRIORITET: Gradnja novih i kapitalno intenzivnih energetskih kapaciteta

- Izgradnja podzemnog skladišta gasa kapaciteta 850 000 000 m^3
- Izgradnja produktovoda za povezivanje rafinerije nafte u Novom Sadu i Pančevu
- Izgradnja ogranaka produktovoda Novi Sad-Sombor, Pančevo-Beograd i Pančevo-Smederevo
- Gradnja Panevropskog naftovoda, deonice od Bele Crkve do Sotina u ukupnoj dužini 195km
- Pripreme za gradnju HE na Dunavu snage do 131 MW
- Pripreme za gradnju HE na Savi snage oko 52 MW
- Gradnja potencijalnih kogeneracijskih postrojenja sa gasnim blokovima u Industrijskim zonama: Novog Sada, Zrenjanina, Sremske Mitrovice, Subotice, Sombora i Pančeva

POTREBNA FINANSIJSKA SREDSTVA za realizaciju 4. PRIORITETA – Gradnja novih i kapitalno intenzivnih energetskih kapaciteta

• Nastavak realizacije podzemnog skladišta gasa	20,0 mil €
• Transport i skladištenje nafte i derivata	324,3 mil €
• Istraživanje nafte i gasa	
• nova ležišta	44,4 mil €
• nove tehnologije	29,6 mil €
• koncesiona istraživanja	192,4 mil €
• Modernizacija rafinerija	
• rafinerija Pančevo	257,0 mil €
• rafinerija Novi Sad	55,0 mil €
• Pripreme za gradnju HE na Dunavu i Savi	10,3 mil €
Ukupno:	933 mil €

UKUPNA POTREBNA SREDSTVA

- Poboljšanje tehnoloških i operativnih performansi energetskih objekata 775,1 mil €
- Povećanje energetske efikasnosti 416,2 mil €
- Korišćenje obnovljivih izvora energije 189,5 mil €
- Gradnja novih i kapitalno intenzivnih energetskih kapaciteta 933,0 mil €

UKUPNO 2 313,8 mil €

NAČIN OBEZBEĐIVANJA FINANSIJSKIH SREDSTAVA

- REPUBLIKA
- POKRAJINA
- LOKALNA SAMOUPRAVA
- POTENCIJALNI INVESTITORI
- KREDITI BANAKA
- DONACIJE

BARIJERE ZA REALIZACIJU PROGRAMA OSTVARIVANJA STRATEGIJE

- Nedefinisanost trasa za gradnju produktovoda za transport naftnih derivata
- Rešavanje imovinsko pravnih odnosa na trasi gradnje i lokalitetima terminala
- Obezbeđivanje namenskih finansijskih sredstava za realizaciju Programa istraživanja i proizvodnje nafte i gasa u zemlji
- Nepostojanje zakonske podrške gradnji objekata OIE (podzakonski akti)
- Nerealni pariteti cena električne energije, prirodnog gasa i uglja
- Smanjenje toplotnog konzuma iz sistema TE-TO

PRAVNI OKVIR ZA REALIZACIJU PROGRAMA

- Fondovi (državni, pokrajinski, lokalni) za energetsku efikasnost i obnovljive izvore energije
- Donošenje celovite regulative za korišišćenje obnovljivih izvora energije
- Stvoriti uslove za primenu Direktiva Evropskog Parlamenta o promociji i primeni obnovljivih vrsta goriva za transportni sektor

ZAKLJUČAK

- **AP Vojvodina je veliki energetski potencijal.**
- **Realizacija Programa ostvarivanja strategije razvoja energetike u AP Vojvodini do 2012. godine vodi ka stabilnosti u sferi energetike i stabilnom ekonomskom razvoju.**
- **Potrebni uslovi:**
  - **restrukturiranje energetskog sistema**
  - **reforma tržišta energije**
  - **privlačenje slobodnog investicionog kapitala**
  - **regulatorne dugoročne garancije za ostvarivanje očekivanih koristi**
  - **angažovanje svih činilaca vlasti u pripadajućim domenima**
- **Predloženi program je u svim svojim segmentima u skladu sa uhodanim razvojnim pravcima i inicijativma EU.**

VIRTUAL BALKAN POWER CENTRE

RENEWABLE ENERGY SOURCES IN WESTERN BALKANS

Predstavljanje VBPC-RES projekta: dosadašnje aktivnosti i rezultati

Elena Boškov

DMS Grupa
Fakultet tehničkih nauka, Novi Sad
08. Jun 2007

Sixth Framework Programme, DG Research, International Cooperation
Contract: INCO-CT-2004-509205

Sadržaj prezentacije

- Okvirni programi Evropske unije → FP6 i FP7
- Projekat VBPC –RES
  - Ideja i ciljevi
  - Aktivnosti
  - Partneri
  - Rezultati
- Još neke mogućnosti za saradnju u evropskim projektima

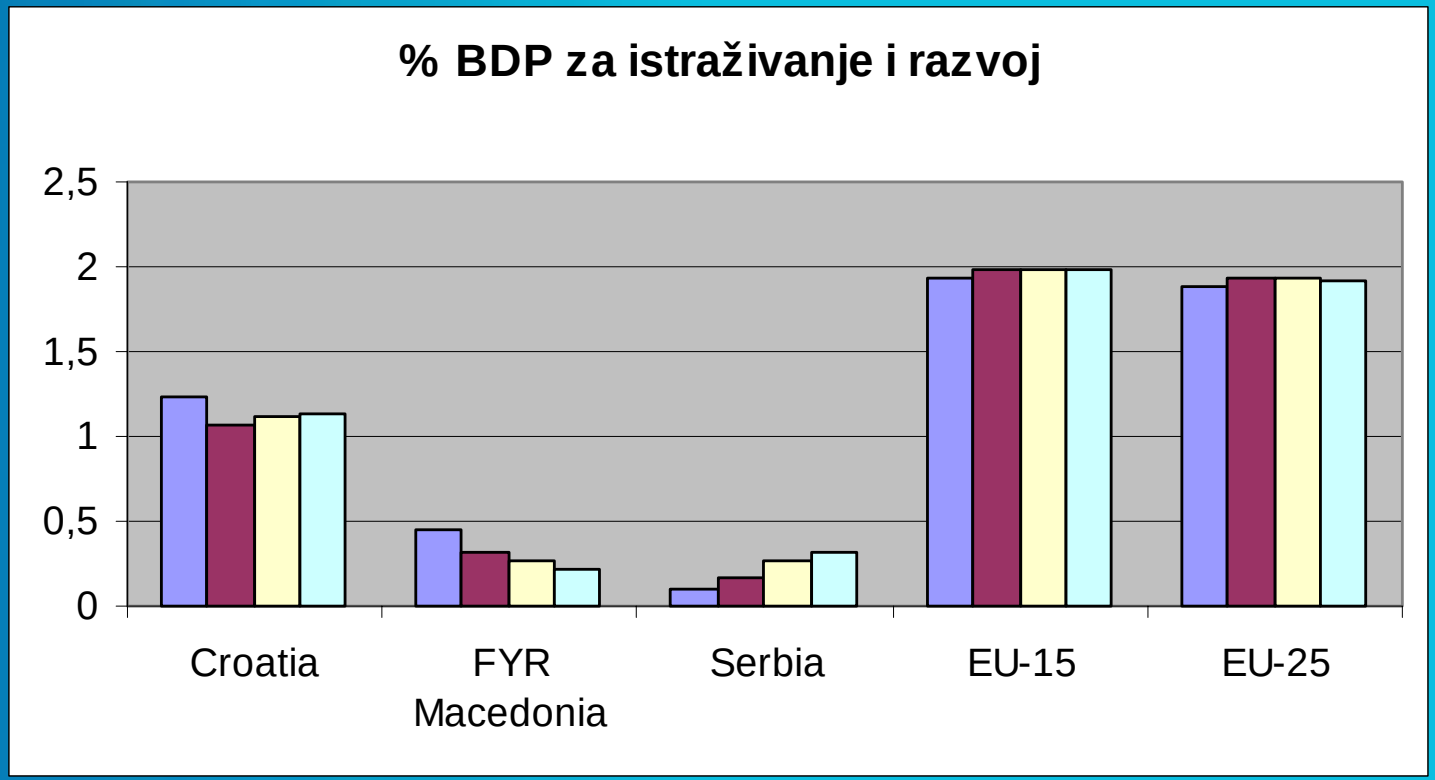
Sixth Framework Programme, DG Research, International Cooperation
Contract: INCO-CT-2004-509205

Okvirni programi Evropske unije

- Okvirni program (*Framework programme - FP*)
  - Instrument EU za finansiranje istraživanja u Evropi
- Šesti okvirni program (FP6)
  2003 – 2006
- Sedmi okvirni program (FP7)→ prijave u toku!!!
  2007 – 2013
  Budžet ~ 50,5 milijardi € → 2,3 milijarde € za energetiku!

Sixth Framework Programme, DG Research, International Cooperation
Contract: INCO-CT-2004-509205

Ulaganje u istraživanje i razvoj (2001 – 2004)



Izvor: Eurostat

Sixth Framework Programme, DG Research, International Cooperation
Contract: INCO-CT-2004-509205

Projekat VBPC – RES: osnovne informacije

- Projekat u sklopu Šestog okvirnog programa (FP6)
- Trajanje: 2005 – 2007
- Međunarodna saradnja: 17 institucija i kompanija iz 11 zemalja:
  - Univerzitet u Ljubljani, Elektrotehnički fakultet, Slovenija – koordinatori projekta
  - Joanneum Research, Graz, Austria
  - Tehnički fakultet u Atini, Grčka
  - Univerzitet u Tuzli, Elektrotehnički fakultet, Bosna i Hercegovina
  - Tehnički fakultet u Sofiji, Bugarska
  - Istrabenz, Slovenija
  - Kema Consulting, Nemačka
  - Univerzitet sv. Ćirila i Metodija u Skopju, Elektrotehnički fakultet, Makedonija
  - Universidad Pontificia Comillas, Madrid, Španjolska
  - DMS Group, Novi Sad, Srbija
  - Institut Jožef Štefan, Slovenija
  - Intrade Energy, Sarajevo, Bosna i Hercegovina
  - Univerzitet u Beogradu, Elektrotehnički fakultet, Srbija
  - Univerzitet u Mariboru, Slovenija
  - Politehnički Univerzitet u Bukureštu, Rumunija
  - Centar za obnovljive izvore energije, Grčka
  - Univerzitet u Zagrebu, Fakultet elektrotehnike i računarstva, Hrvatska

Sixth Framework Programme, DG Research, International Cooperation
Contract: INCO-CT-2004-509205

Projekt VBPC – RES: ideja i ciljevi

- Ideja projekta:
  - Zemlje regije Zapadnog Balkana imaju značajne ali nedovoljno iskorištene potencijale obnovljivih izvora energije
  - Posebnu pažnju treba posvetiti nerazvijenim i izolovanim područjima, gde OIE mogu biti i pokretač privrednog razvoja

- Ciljevi projekta:
  i. Kroz međunarodnu saradnju ostvariti **transfer znanja** o najboljim tehnologijama OIE i njihovim primenama
  ii. **Identifikacija glavnih ekonomskih i zakonskih faktora** koji utiču na donošenje odluka o investiranju u OIE → prepreke razvoju OIE i načini za uklanjanje tih prepreka
  iii. **Promocija, edukacija i podizanje svesti** široke javnosti o načinima upotrebe OIE i koristima koje iz toga proizlaze

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Projekt VBPC – RES: organizacija

- Organizacija projekta – četiri grupe aktivnosti

  - WP1. **Transfer znanja o tehnologijama OIE**
  - WP2. **Regulatorni i organizacioni okvir za OIE**: prepreke i potsticaji razvoja primene OIE
  - WP3. **Prenos i širenje** prikupljenih informacija i znanja ključnim grupama
  - WP4. Koordinacija i menadžment projekta

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Projekat VBPC – RES: tematske celine (II)

- WP3. **Prenos i širenje** prikupljenih informacija i znanja ključnim fokus grupama

  – Brošure na engleskom i nacionalnim jezicima
    - Tehnologije za iskorištavanje OIE
    - Regulatorni okviri za OIE

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Projekat VBPC – RES: detaljne informacije

- Web stranice projekta www.vbpc-res.org

Sixth Framework Programme, DG Research, International Cooperation
Contract: INCO-CT-2004-509205

FP7

Objective

- to adapt the current energy system into a more sustainable, competitive and secure one

What will be funded?

- ***Renewable electricity generation***
- ***Renewable fuel production***
- ***Renewables for heating and cooling***
- *Smart energy networks* **- increasing the efficiency, safety, reliability and quality of the European electricity and gas systems and networks in the context of a more integrated European energy market.**
- **Energy efficiency and savings**
- ***Knowledge for energy policy making***

Sixth Framework Programme, DG Research, International Cooperation
Contract: INCO-CT-2004-509205

Hvala na pažnji!

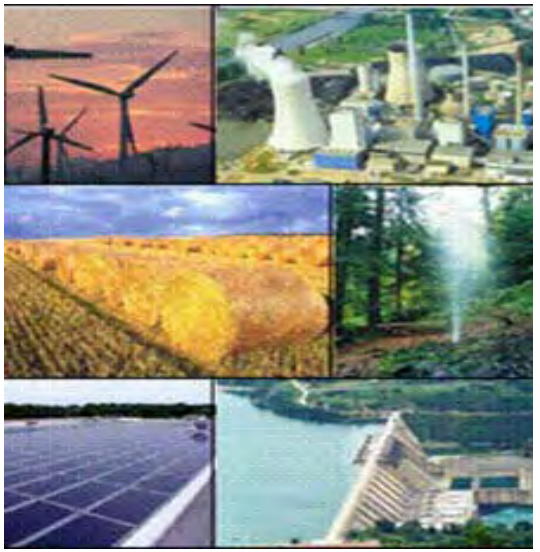
Kontakti:

elena.boskov@dmsgroup.co.yu
www.vbpc-res.org

Sixth Framework Programme, DG Research, International Cooperation
Contract: INCO-CT-2004-509205

RENEWABLE ENERGY SOURCES IN SERBIA

- Policy and Regulatory Framework -



Antonela Solujic,
Head of the office for energy efficiency and RES
Ministry of Mining and Energy
Republic of Serbia

Novi Sad, 08 Jun 2007

Regulatory framework

- Law On Planning and Construction
  - Construction permits
- ENERGY LAW
  - Energy permits and energy licenses (1 MW installed)
  - Status of priviledged power/heat producers (RES, Waste, CHP)
- Law on Concessions and Foreign Investments
- Regulation on Environmental Protection
  - Environmental Impact Assessment
- Law on Water
  - Permits for water utilization

Energy Law (2004)

ENERGY POLICY

… Creating conditions for stimulating RES, CHP and energy efficiency

INSTITUTIONAL FRAMEWORK

- Energy Agency (Regulator)
- Energy Efficiency Agency – SEEA
- TSMO – Transmission and Market System Operator

STRUCTURAL CHANGES

- Public Energy Companies restructuring

NEW ACTORS

- Individual Power/ Heat producers
  - PRIVILEDGED POWER/HEAT PRODUCERS
- Eligible customers

Energy Law
Privileged energy producers

- **Privileged Power Producers (PPP) – for electrical power generation process use RES, waste or CHP (that fulfills energy efficiency criteria)**
- **Privileged Heat producers (PHP) – for heat production use RES and waste and meet the energy efficiency criteria.**
- **Secondary legislation – conditions for granting the status of privileged energy producers and eligibility criteria under development (PPP – Ministry of Mining and Energy, PHP – Local Governments)**
- **Privileges**
  - **Entitled to : Subsidies, tax and custom relief, other incentives – *Study on Impact Analysis of Policies to Increase Renewable and Low Carbon Energy use* financed by WB under way**
  - **Priority on the organized electical power market over other producers who offer electrical power under equal conditions.**

Regulatory Framework
Biodiesel

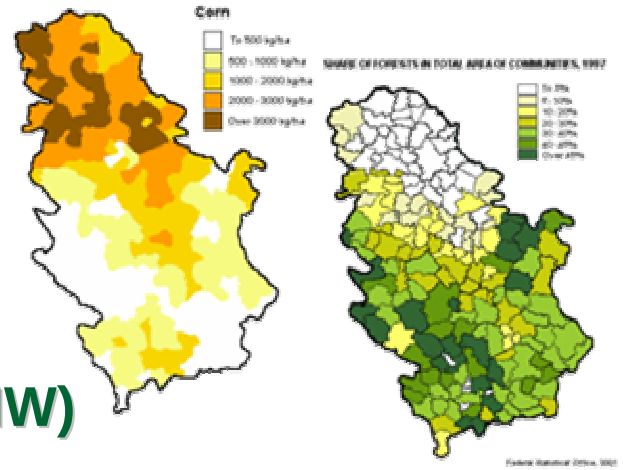
- **Regulation on technical and other requirements of liquid biofules** (OJ Serbia and Montenegro 23/2006)
- **EU stendards** on characteristics of Fatty Acid Methyl Esters for diesel engines and heating fuels (EN 14214 & EN 14213) transposed to Serbian system standards
- **Law on accise – no accise on biofuels**
- **Decree on subsidy for production of industrial plants (Ministry of Agriculture)**
  - **2006: 7000 din/ha**

- **Additional efforts to regulate this area needed**
- **National Strategy (Plan) for utilisation of liquid biofuels needed**
- **Other fiscal incentives**
  - **Further subsidies for production of rape seed oil**
  - **Subsidies for production of biofuels**

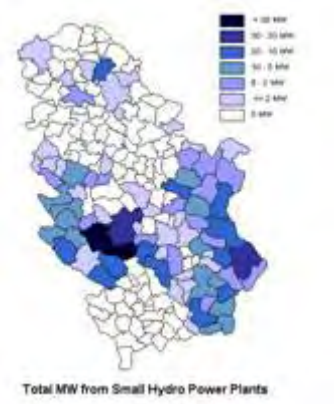
Energy Sector Development Strategy by 2015

- **II Priority of rational use of energy products and increase of energy efficiency (production, distribution and utilization)**
  - **Substitution of power for thermal services in Building sector with gas or DHS**
  - **Increased operating efficiency of thermal sources in industry and municipal services**
  - **Decrease losses of electrical (DS) and thermal energy in DHS, Industry and buildings**
  - **Introduction of new energy efficient electric appliances/equipment/systems**
- **III Priority of selective use of RES and new energy efficient technologies**
  - **Selective use of biomass, geothermal, wind – decentralized heat/power production**
  - **Constuction of SHPP**
  - **CHP in municipal/industrial energy sustem**
  - **Environmentaly acceptable coal combustion technologies**

RES Potential



- **BIOMASS - >2.4 Mtoe**
  - 1 Mtoe – wood biomass
  - >1,4 Mtoe – agricultural biomass
- **Remaining Hydropower potential (>10MW) - 7000GWh**
- **Small Hydro (SHPP <10MW) – 0,4 Mtoe (1600 GWh)**
  - 856 locations – 449MW (90% locations<1MW)
- **Geothermal – 0,2 Mtoe**
  - 100 geothermal wells (rarely over 60°C) - 160 MJ/s
  - real potential expected to be at least five times higher
- **Wind – 0,19 Mtoe**
  - estimates based on measurements at heights of 10m
- **Solar - 0,64 Mtoe (>2000h)**



POS 2007-2012
Module on RES

- Creation of a favorable regulatory framework (Improvement of existing and development of the new regulation)
- Introduction of stimulating financial measures for RES
  - Incentive mechanisms,
  - Energy Efficiency Fund,
  - Ratification of Kyoto Protocol, etc)
- Introduction of other stimulating measures for RES
  - Organizational and institutional
    - ✓ National coordination body,
    - ✓ Admin. Procedures,
    - ✓ Wind potential,
    - ✓ Acreditation of Laboratories,
    - ✓ Establishment of RES database and cadastre etc.
  - Rising awareness, promotion, education

International commitments

Treaty Establishing the Energy Community

- **Entered into force 1 July 2006**
- **Implementation of the Acquis on energy, competition, Environmental protection and RES**
- **Possibly obligation for implementation of EU EE Directives will be added**

Ratification of Kyoto Protocol

- **UNFCCC -** ratified on May 12, 2001
- **Kyoto Protocol - Ratification** in Parliamentary Procedure

  status: Non Annex 1 Country

  ➔ **Serbia eligible for CDM projects**
- **I National Communication** (with GHG Inventory) – under development

CDM - Framework

Institutional & Legal

- Establishment and strengthening of DNA
- Creating enabling legal framework for CDM
  - Responsible: MSEP, MoME, MIER
  - TA and financial Assistance: UNDP*

Strategic

- Strategy for Implementation of CDM projects
  - Strategy for CDM in energy sector (RES, EE, CHP, Fuel switching) - 2008
    - Responsible: MoME
    - Donation: Norwegian Government

* "Promoting investments for energy efficiency and renewable energy through carbon financing in the Republic of Serbia"

CDM Projects – Awareness

UNDP

- Assessment of **CDM potential** in Serbia
- Workshop to present and discuss the results of national CDM assessment
- In-depth study of CDM potential in one selected sector
- Support development of selected CDM project ideas up to PIN stage

Norwegian assistance – CBF for Serbian inst

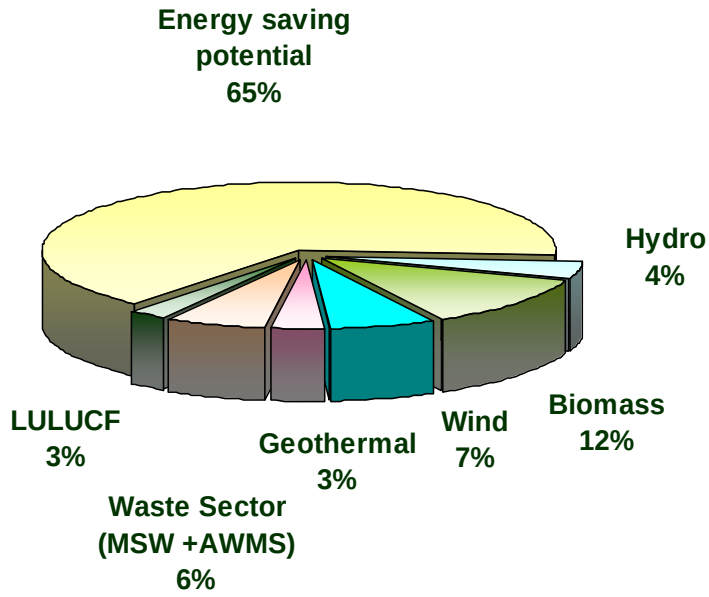
- Capacity building of Serbian institutions (MoME,SEEA, REECs, SIEN)– PIN development
- Raising awareness of industrial companies

Italian assitance

- Assessment of CDM potential in Serbia
- Capacity building of Serbian institutions

Carbon credits potential

Total estimated potential	CER [*ktCO2/year*]
Energy Sector	12 500
Renewable Energy	5 500
Waste Sector+ AWMS	1200
LULUCF	500
TOTAL	***~19 700***



*Source: Italian Ministry of lend, sea and environmental protection

THANK YOU FOR YOUR PATIENCE

www.mem.sr.gov.yu

antonela.popovic@mem.sr.gov.yu

POTENCIJALI OBNOVLJIVIH IZVORA ENERGIJE U SRBIJI I AKTIVNOSTI AGENCIJE ZA ENERGETSKU EFIKASNOST

Rastislav Kragić
savetnik za obnovljive izvore energije

Promocija obnovljivih izvora energije

Novi Sad, 08. jun 2007.

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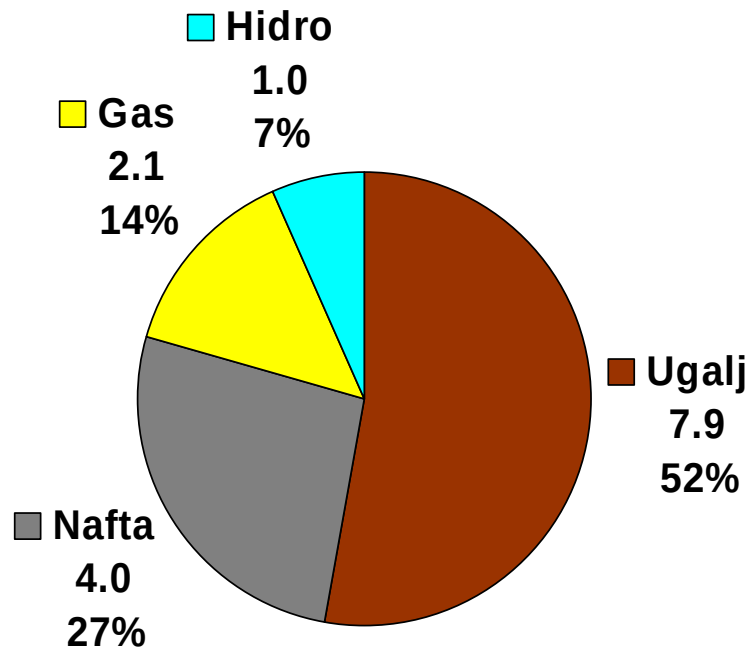
Establishment of EEA has been funded by the European Union through the European Agency for Reconstruction

POTROŠNJA ENERGIJE U SRBIJI

- Ukupna godišnja potrošnja primarne energije oko **15 Mten**
- Ukupna finalna potrošnja energije oko **7.4 Mten**
- Uvozna zavisnost oko **37%**
- Ukupna potrošnja električne energije oko **3 Mten**
- Udeo hidropotencijala u proizvodnji električne energije oko **34%**

Mten - **M**iliona **t**ona **e**kvivalenta **n**afte

1 Mten = 11.63 MWh



Učešće pojedinih energenata u ukupnoj primarnoj potrošnji energije (Mten, %)

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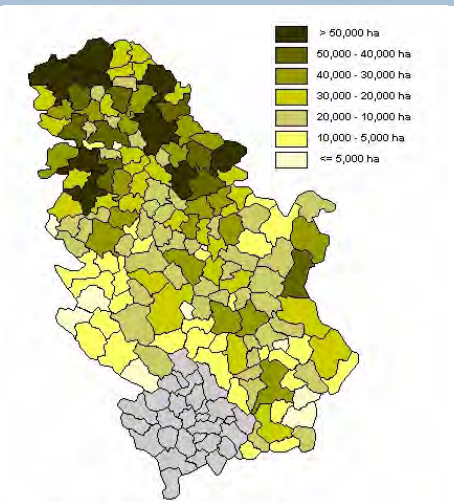
POTENCIJALI OIE U SRBIJI

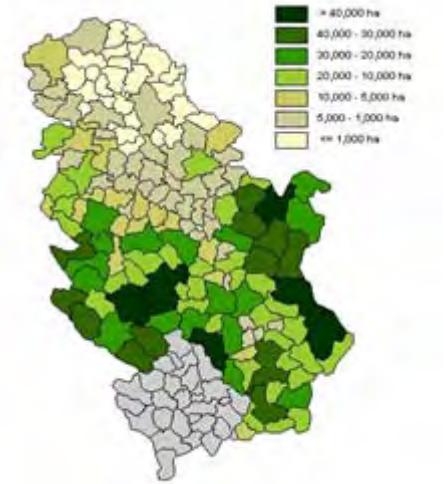
- Ukupan potencijal (bez energije sunca i velikih hidroelektrana) oko **3.4 Mten**, što čini oko **25% ukupne primarne potrošnje energije**
- Biomasa - 2.6 Mten
- Male hidroelektrane (MHE) - 0.15 Mten
- Geotermalni izvori - 0.18 Mten
- Energija vetra – oko 0.2 Mten
- Sunčeva energija - oko 0.1 ten/m^2

BIOMASA

- Potencijal **2.6 Mten**
  - 60% poljoprivredna proizvodnja
  - 40% šumska masa
- Trenutna upotreba
  - prva fabrika biodizela (100,000t godišnje)
  - za ogrev:
    - individualna i dosta široka
    - uglavnom nisko efikasna
    - nema preciznih podataka
- Mogućnosti
  - prvenstveno za grejanje (efikasnije)
  - biogoriva i kogeneracija



Обрадиво земљиште у Србији



Површина под шумом у Србији

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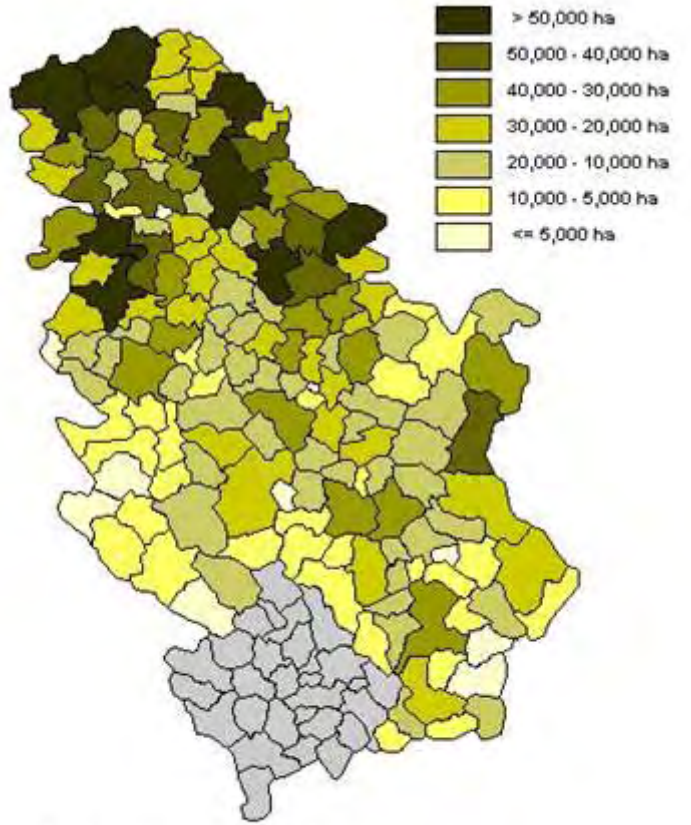
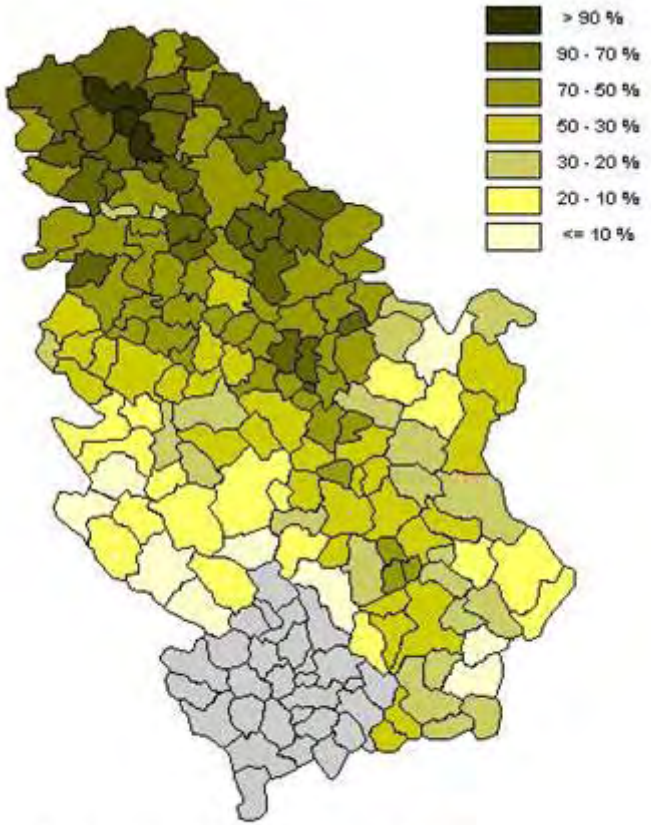
OBRADIVA POVRŠINA

- Ukupna obradiva površina **3,355,019 ha**



Arable Land in Serbia



Arable Land Percent in Serbia

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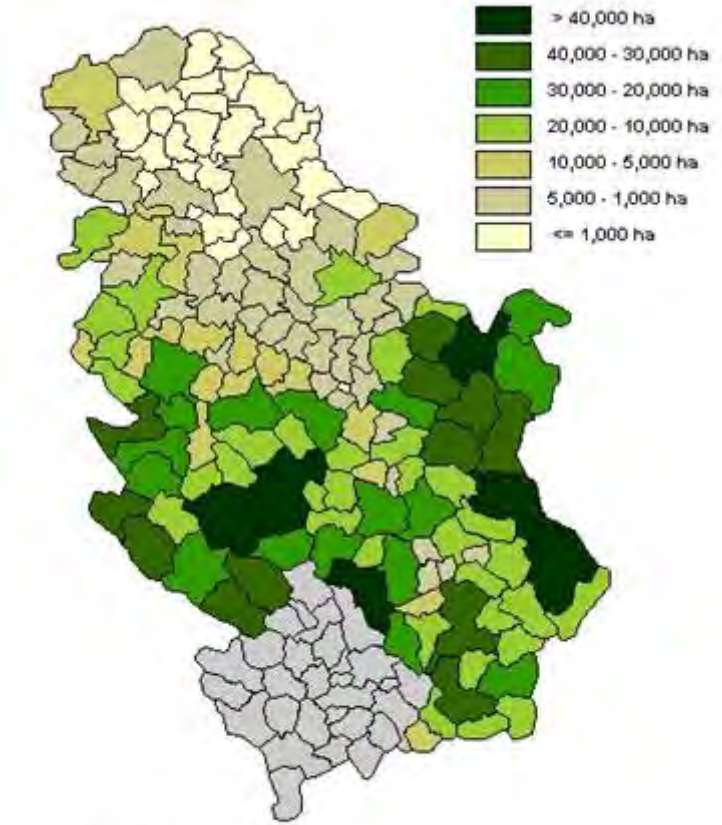
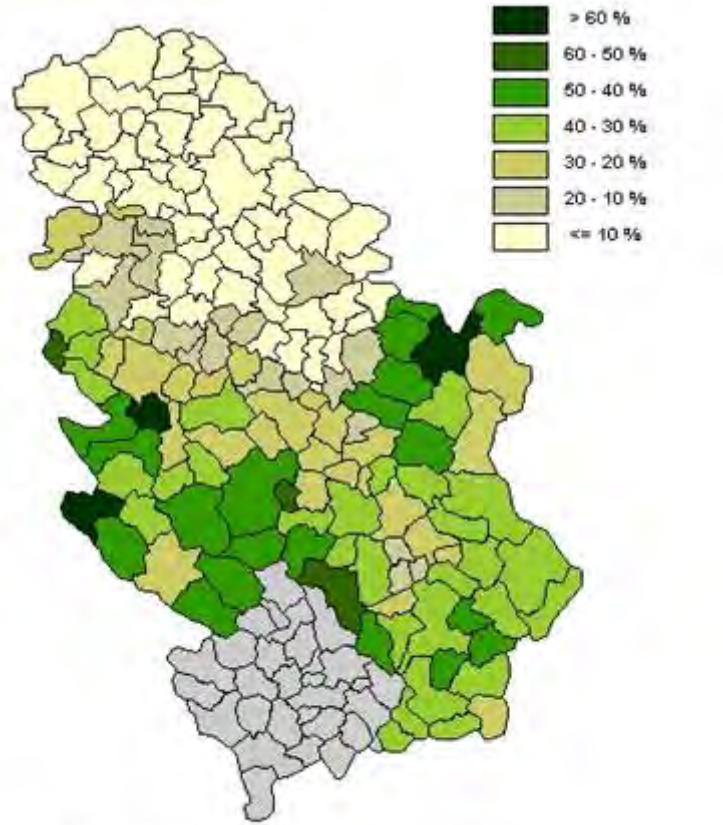
- Ukupno **1,893,695 ha** šume



Forests in Serbia



Forest Percent in Serbia

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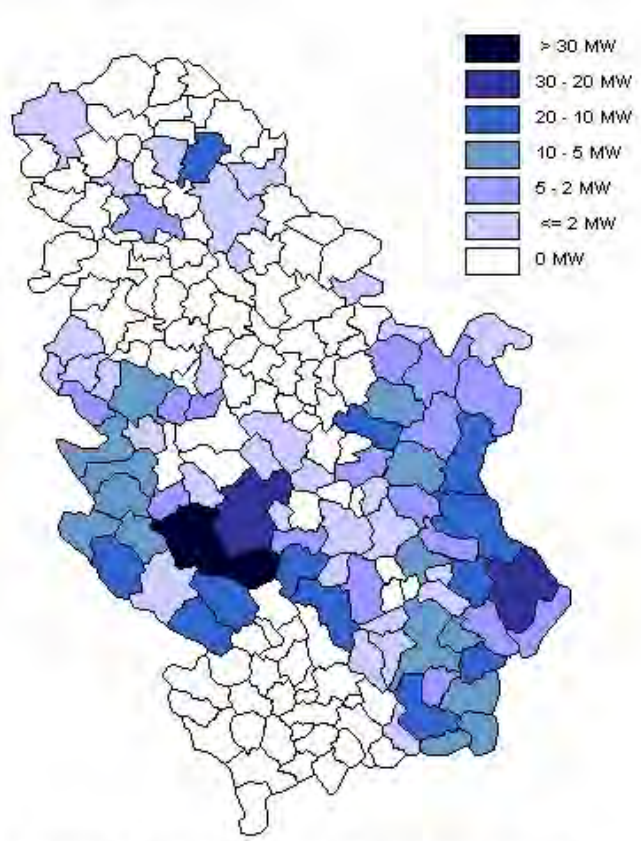
MALE HIDROELEKTRANE

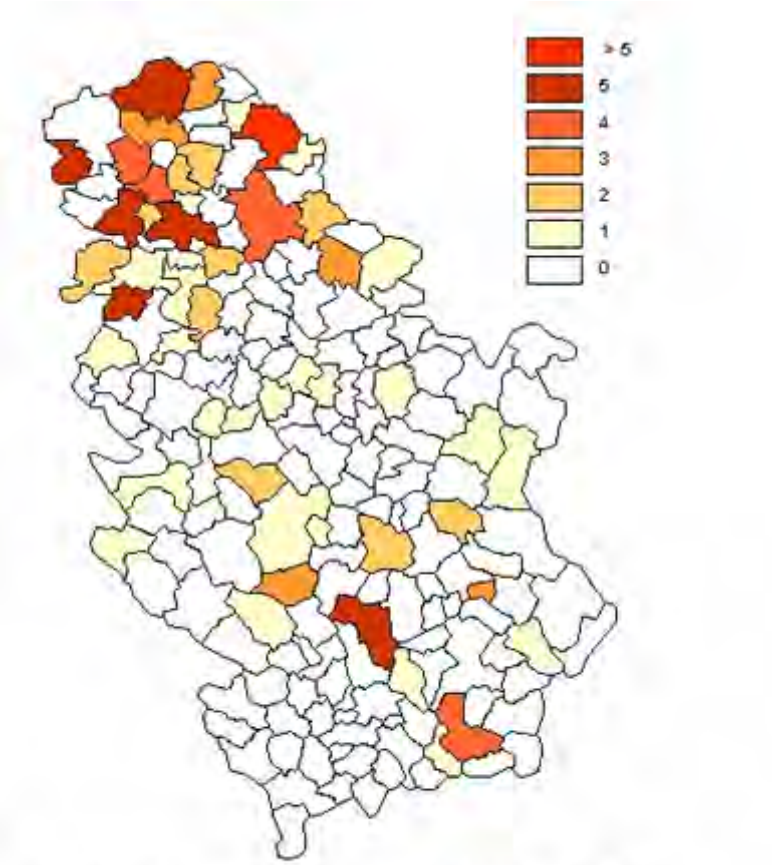
- Potencijal **0.15 Mten** ili oko 25% ukupno neizgrađenog hidropotencijala
  - izvor - katastar MHE
  - definisanih lokacija ima oko 870
- Trenutna iskorišćenost
  - izgrađenih oko 50
  - u funkciji oko 10
  - na postojećim zastarela oprema



Укупна снага од малих хидроелектрана

GEOTERMALNI IZVORI

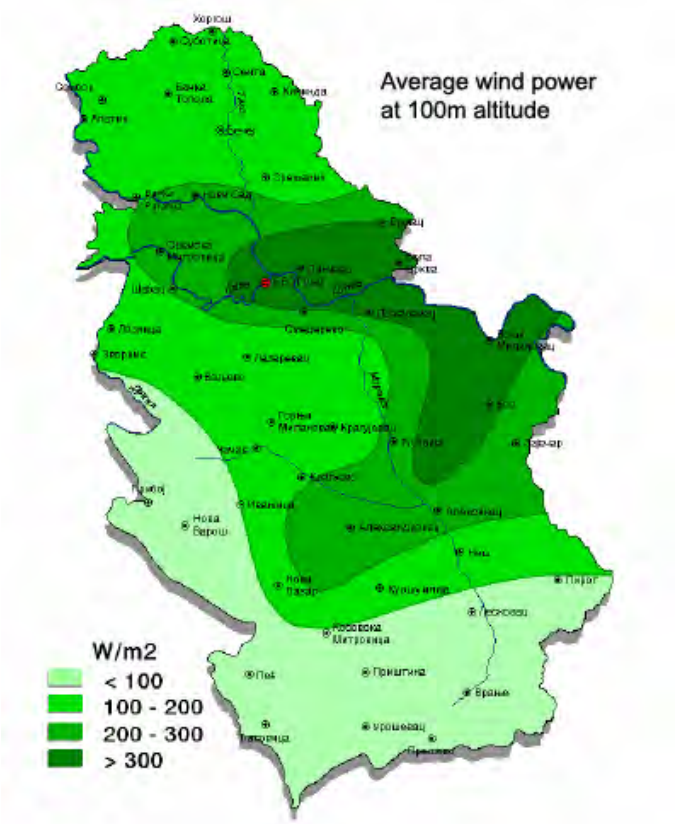
- Potencijal postojećih bušotina **0.18 Mten**
  - relativno dobra istraženost
  - preko 50 izvorišta kapaciteta >1MW
  - uglavnom niska temperatura (30-60°C, retko do 80 °C)
- Trenutna upotreba
  - veoma mala i to uglavnom u balneološke svrhe



Број геотермалних извора у општинама

ENERGIJA VETRA

- Tehnološki opravdan potencijal oko **0.2 Mten**
- Nijedna instalirana vetroelektrana velike snage u Srbiji
- Ima više privatnih merenja
- Zvanično raspoloživi podaci samo na osnovu merenja meteoroloških stanica na visini od 10m



ENERGY EFFICIENCY ЕНЕРГИЈА ЕНЕРГЕТСКА ЕФИКАСНОСТ

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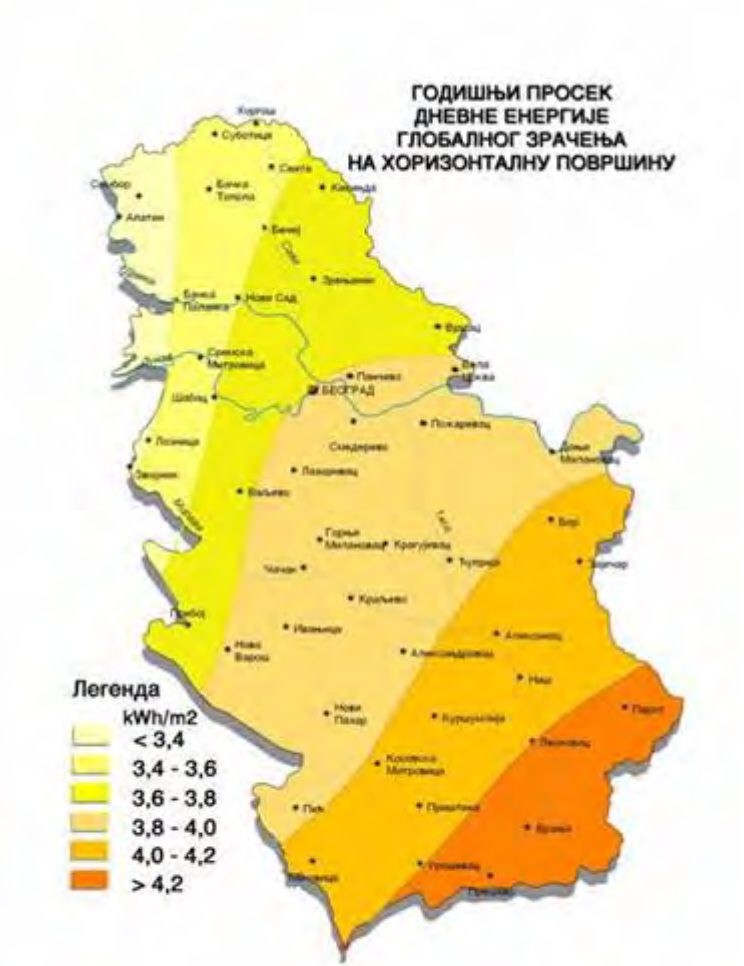
ENERGIJA SUNCA

- Potencijal **0.1 ten/m²** godišnje
- Tehnološko-ekonomski problemi:
  - kad je najviše ima - najmanje nam treba
  - još uvek je ekonomski neisplativa foto-naponska tehnika
- Trenutna upotreba:
  - inividualna
  - gotovo isključivo za grejanje sanitarne vode



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AKTIVNOSTI AEE U OBLASTI OIE

- Specialni fond EAR-a za razvoj OIE **200,000 EUR**
  - 2 seminara
  - 2 demonstraciona projekta
  - 4 studije opravdanosti
- Donacija Kraljevine Španije **204,000 EUR**
  - projekat "Jačanje sektora za OIE u okviru AEE Srbije"
- Baza podataka
- Saradnja na izradi regulative

- **Seminar "Biomasa za energergiju"**
  - održan marta 2005. u Vrnjačkoj banji

- **Forum "Geotermalna energija"**
  - održan novembra 2005. u Vrnjačkoj banji

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DEMONSTRACIONI PROJEKATI

- **2 Demonstraciona projekta**
  - "Zamena 2 kotla na mazut kotlovima na biomasu uz rekonstrukciju postojeće kotlarnice u O.Š. "Mićo Matović" u Katićima"
  - "Mala hidroelektrana na jezeru Gruža"
- Projekti završeni decembra 2006.

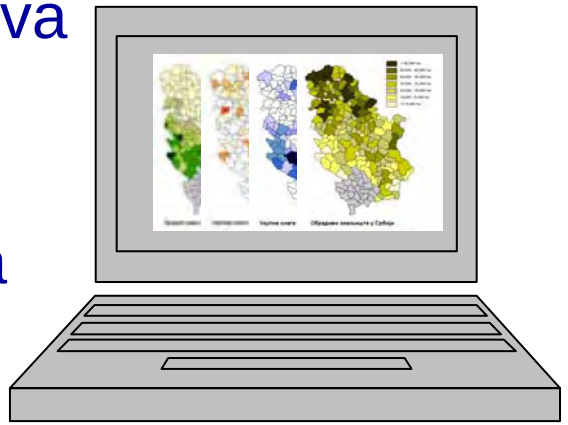
STUDIJE OPRAVDANOSTI

- **4 studije opravdanosti:**
  - "Korišćenje biomase u gradskim kotlarnicama Negotina"
  - "Mala hidroelektrana na jezeru Ćelije"
  - "Korišćenje solarne energije u banji Rusanda"
  - "Korišćenje geotermalne energije u banji Bujanovac"
- Studije završene novembra 2006.

DONACIJA ŠPANIJE

- **Energija vetra**
  - "Jačanje centra za OIE u okviru AEE Srbije"
  - iznos donacije **204,000. EVRA**
  - 3 stuba visine 50m za merenje parametara vetra na 3 lokacije
  - period merenja 12 meseci
  - analiza i obrada prikupljenih podataka
  - izrada studije opravdanosti i idejnog projekta za jednu lokaciju
  - saradnja na pripremi zakonske regulative iz oblasti energije vetra i OIE
  - planiran završetak projekta sredina 2008. godine

- **Potencijal Srbije u OIE**
  - mape potencijala biomase
  - mape geotermalnih izvora
  - mape potencijala MHE
  - mapa potencijala vetra (izvor podataka studija EPS-a i Ministarstva nauke i zaštite životne sredine)
  - mapa potencijala energije sunca (izvor podataka studija Ministarstva nauke i zaštite životne sredine)



PREPREKE ZA ŠIRU PRIMENU OIE

- **Niska cena električne energije**
- Slaba ekonomska moć privrede i građana
- Nedovoljan administrativno-stručni kapacitet
- Nedovoljno ulaganje države u razvoj OIE
- Nedovoljna informisanost stanovništva
- Nedostatak podsticajnih mera; podzakonska regulativa u izradi

ZAHVALJUJEMO SE NA PAŽNJI

AGENCIJA ZA ENERGETSKU EFIKASNOST

Omladinskih brigada 1

Novi Beograd 11070, Srbija

Tel +381 (0)11 3131-955

Fax +381 (0)11 311-1649

www.seea.sr.gov.yu

Rastislav Kragić, savetnik za NOIE

rastislav.kragic@seea.sr.gov.yu

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REPUBLIC OF SERBIA
ENERGY EFFICIENCY
AGENCY

Establishment of SEA has been funded by the European Union through the European Agency for Reconstruction

Naučno-istraživački rad na FTN

Prof. dr Vojin Šenk

08. jun 2007.

Iskustva FTN-a

- Od samih početaka povezivanje nastavnog i naučnog procesa sa saradnjom s privredom
- Metod zadržavanja ljudi da ne odu u inostranstvo
- Razvijeni su čitavi proizvodni programi
- Osnovan je niz preduzeća koja se u saradnji s Fakultetom bave razvojem u domenu visokih tehnologija
- Ovakav pristup se, i u najtežem periodu, negovao traženjem svake mogućnosti u inače restriktivnim i destimulativnim zakonima

Ciljevi

- Podsticanje preduzetništva
- Viši tehnološki nivo u preduzećima
- Povećanje kompetitivnosti kako preduzeća, tako i univerziteta
- Povećanje broja istraživačkih i obrazovnih projekata
- Podizanje nivoa obrazovanja i kvalitetnija istraživanja na univerzitetu, uz neprekidni razvoj nastavnog procesa
- Popravljanje finansijske situacije univerziteta bez opterećivanja države

Metod ubrzanog razvoja zemlje

- Jedna od najvažnijih poluga za pokretanje ubrzanog tehnološkog razvoja zemlje jeste namera Ministarstva nauke da u Republici Srbiji omogući izgradnju centara tehnološkog razvoja, a pre svega Naučno-tehnoloških parkova

Naučno-tehnološki park

Aglomeracija malih i srednjih preduzeća (MSP), koja ima sledeće osobine

- povezana je sa obrazovnim ili istraživačkim institucijama,
- obezbeđuje infrastrukturu i usluge za aktivnosti okupljenih MSP, prvenstveno nekretnine i poslovni prostor,
- olakšava proces transfera tehnologije,
- namenjena je podsticanju privrednog razvoja regiona u kom se nalazi.

Naučno-tehnološki park

- Osnova rada neprekidno generisanje novih istraživačkih kadrova s Univerziteta
- NT park predstavlja fleksibilnu strukturu formiranu u obliku malih relativno nezavisnih celina
- Sa razvojem NT parka ta se struktura dinamički menja i prilagodjava spoljnjim uslovima tržišta.

Strategija

- Stvaranje virtualnog parka od postojećih R/D kompanija (tridesetak)
- Osnivanje Centra za transfer tehnologije
- Osnivanje inkubacionog centra (NOSIC)
- Umrežavanje sa Venture kapital fondovima
- Izgradnja I faze, 2007/9, i smeštaj firmi u oko 4,000 m2, u novoj zgradi na mestu bivšeg TMD-a

Dugoročni cilj

Firme u virtuelnom NT parku

- ELEKTROMEDICAL
- CAM - Center for Automation and Mechatronics
- EL-MAX
- ENERGOBULL
- "ETA" Engineering
- FTN-IRAM-RT
- Micronas NIT D.O.O
- Neuron SCA d.o.o.
- Sprint NT - Sprint New Technologies
- TC Electronics
- **DMS Group Ltd**
- Arhel
- kuda.org
- Execom d.o.o.
- Alfanum
- Regional Energy Efficiency Centre Novi Sad
- ION Solutions
- ProZone d.o.o
- 4Expand
- TIAC group
- ZESIUM mobile d.o.o.
- Intens d.o.o.
- M & I Systems, Co.
- Protech d.o.o

Naredni koraci

- Obezbeđenje sredstava za izgradnju objekta na mestu bivšeg TMD-a (u toku)
- Izgradnja objekta

R I S E

RENEWABLES FOR ISOLATED SYSTEMS - ENERGY SUPPLY AND WASTE WATER TREATMENT

N. Rajaković, *Faculty of Electrical Engineering*

Workshop, Novi Sad 08.06. 2007.

WP4 - APPLICATION TO SELECTED TEST SITES

Objectives:

- Optimal Design of RES installations at the Selected Sites
- Assessment of economic benefits
- Assessment of environmental benefits
- Life cycle analysis of the proposed installations
- Comparison with other methods of electricity supply

Cases of Serbia:

Based on the measurement of wind potential at the region selected according the results of WP1, the developed DSS will be applied to give necessary data for the investment decisions in wind energy conversion to electricity.

T4.3 - Application to the study cases of Serbia

Realized activities:

- By using regional meteorological measurements and field measurements by 40m anemometer post, and by employing the WAsP, the map of wind potential is estimated (the map with the high resolution (200x200)m for the wider target region (35x35)km).

- Identification, GPS positioning and characterisation of isolated households has been done in the target region Deliblatska Peščara and data base is formed, and by using the WAsP and available data about wind speeds the wind resources are estimated at microlocations of identified households.

- The isolated household has been chosen (twopersons household - salash) for detailed analysis

- Load profile for household (connected to the public distribution network) of similar electricity needs has been measured in order to establish more realistic picture about the isolated household dayli and monthly electricity needs

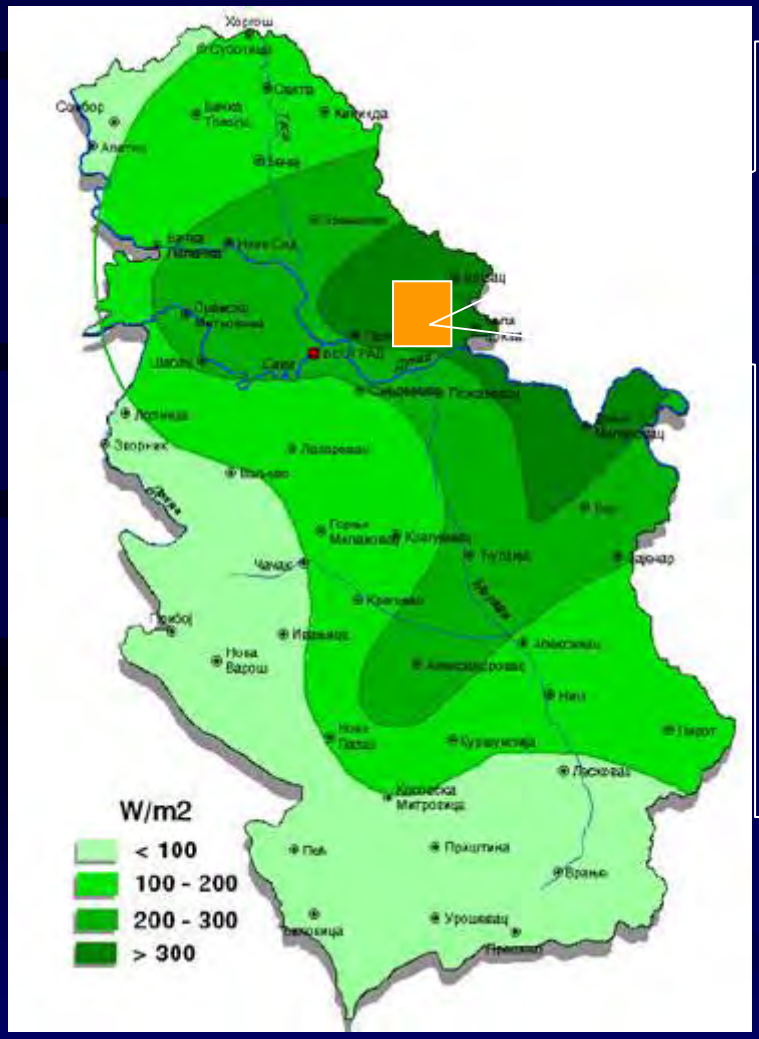
•Identifikovan je najkritičniji mesec (najveća razlika između raspoloživog potencijala vetra i zahteva za električnom energijom). Na osnovu realnog profila potrošnje u kritičnom periodu i realnih merenja brzine vetra izvršen je *optimal design of wind energy conversion system*

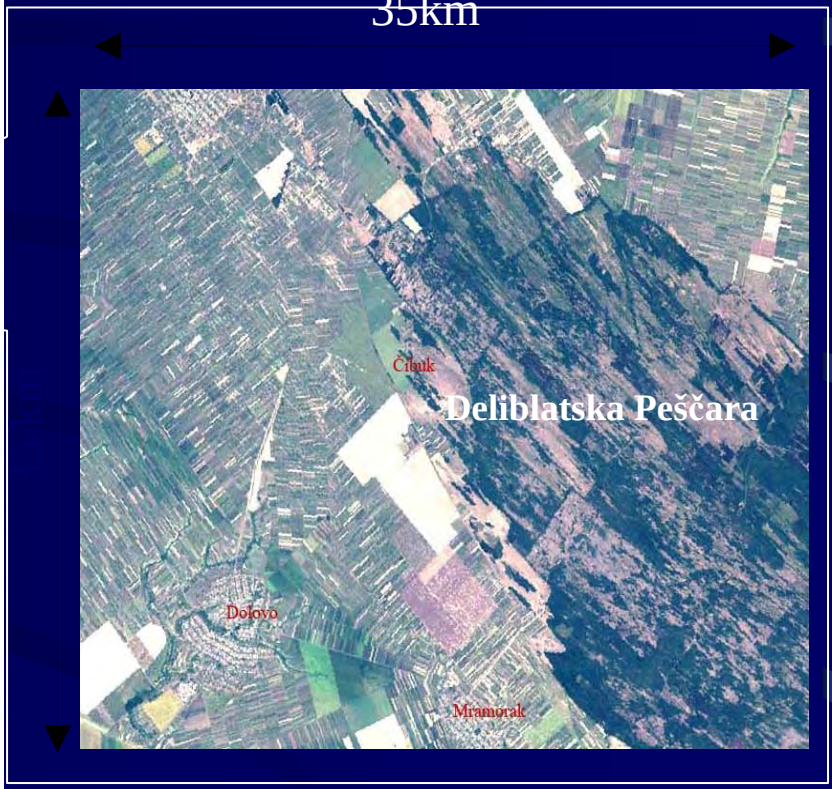
•Izvršena je analiza ekonomičnosti proizvodnje električne energije *of the proposed installations, kao i mogućnosti njenog poboljšanja kroz povećanje energetske efikasnosti i upravljanje potrošnjom.*

•Izvršena je analiza lokalnog i globalnog ekološkog uticaja razvijenog sistema

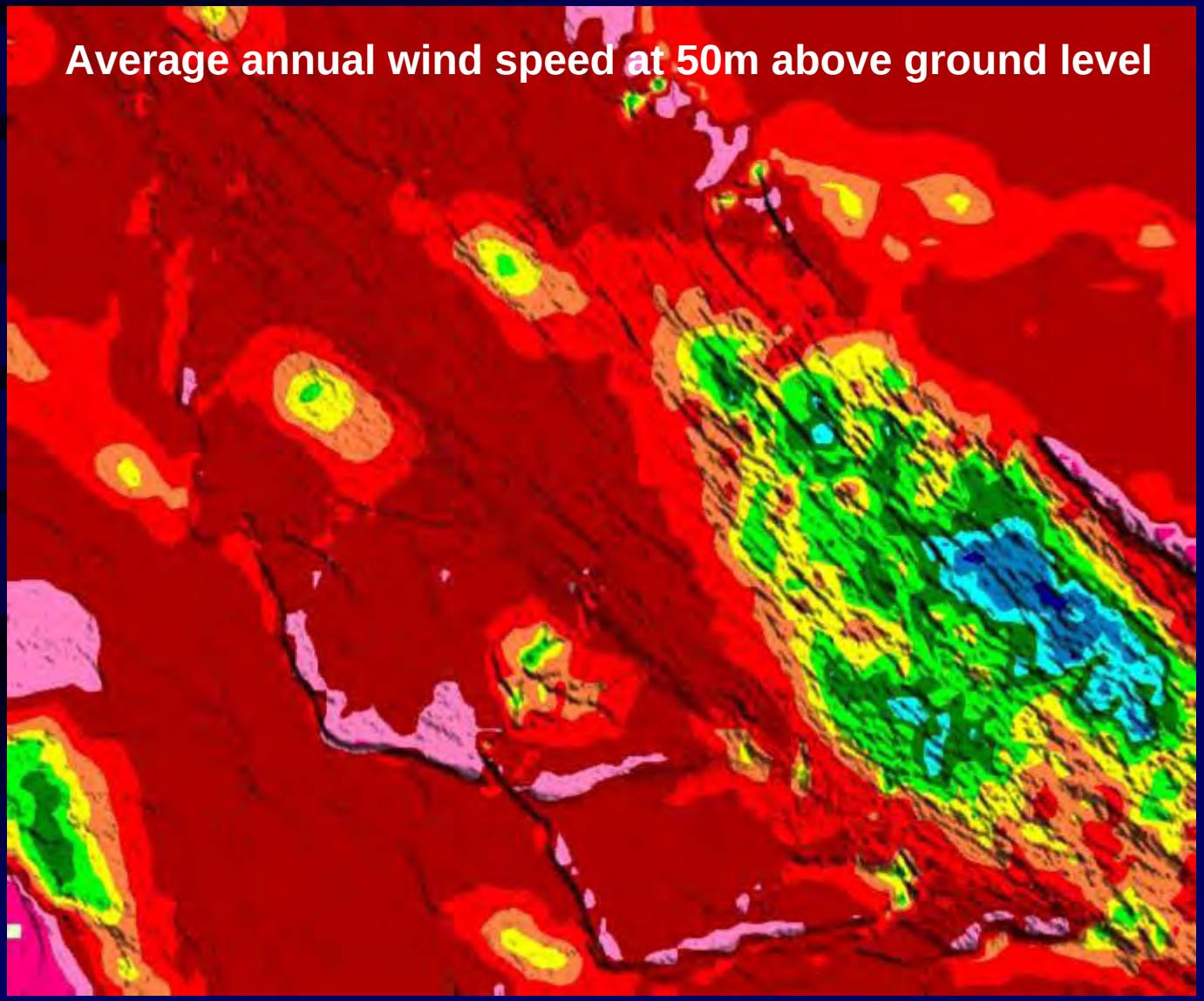
•Izvršena je uporedna ekonomska i ekološka analiza snabdevanja električnom energijom ciljnog potrošača pomoću predloženog sistema i priključenja na električnu mrežu

Position of target region Deliblatska Pescara





Climatologic corrected height resolution wind potential map at 50m height of target region Deliblatska Pescara (35x35) km



Odabrani ciljni region karakteriše veliki broj izolovanih potrošača i relativno dobar potencijal vetra

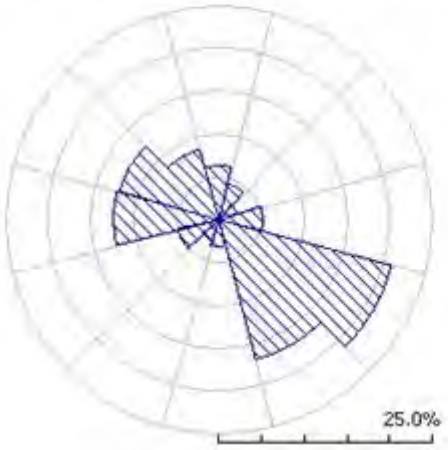
Neki od uočenih izolovanih potrošača u ciljnom regionu

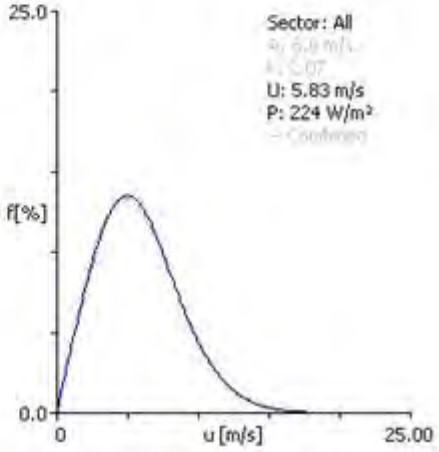
Odabrani izolovani potrošač u ciljnom regionu

Dvočlano domaćinstvo koje se bavi poljoprivrednom proizvodnjom →

The predicted wind climate at the turbine site

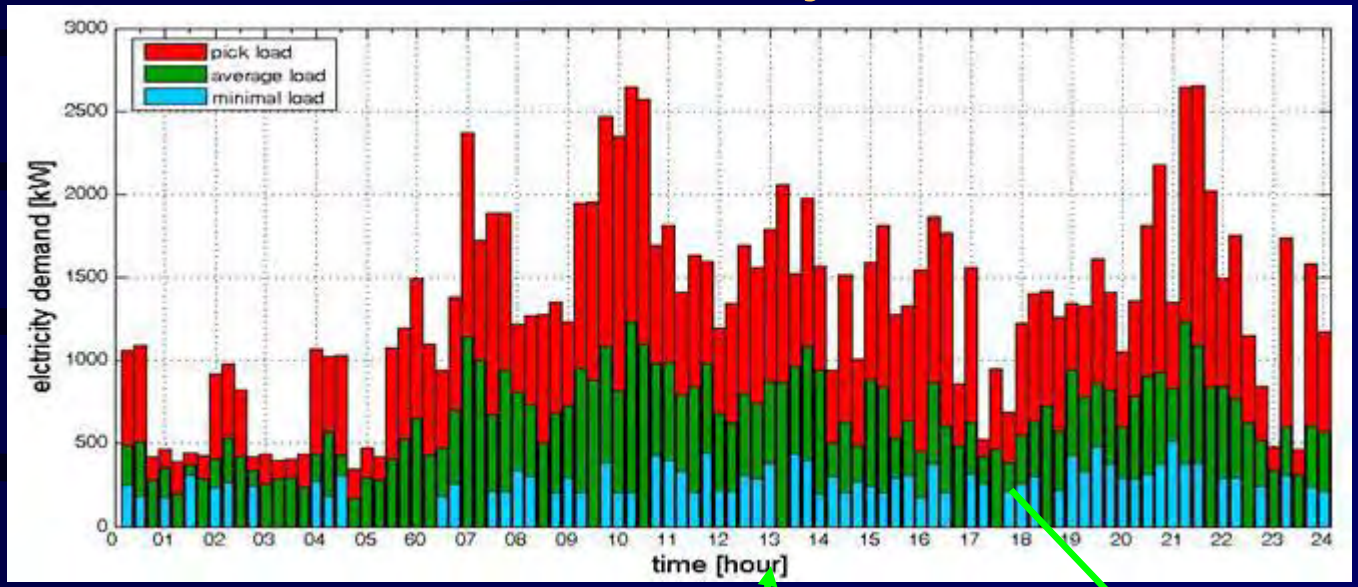
-	Total
Mean wind speed	5.83 m/s
Mean power density	224 W/m²





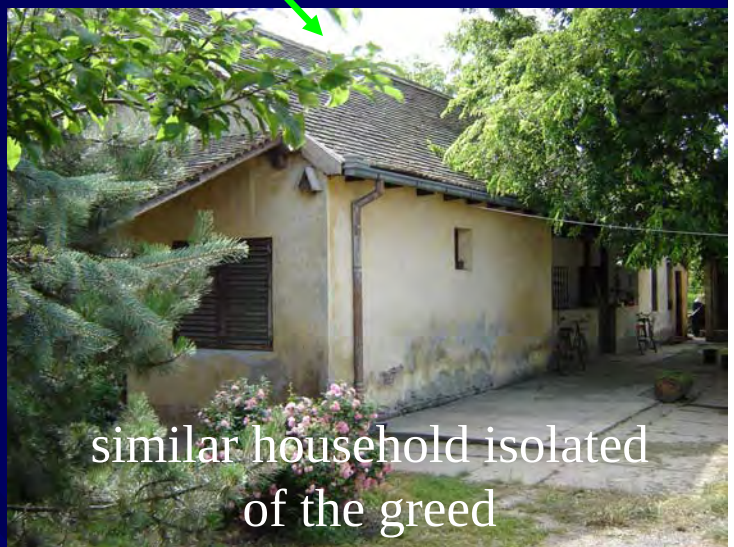
← Estimirani pokazatelji potencijala vetra na odabranoj lokaciji

Establish more realistic picture about the isolated household electricity needs



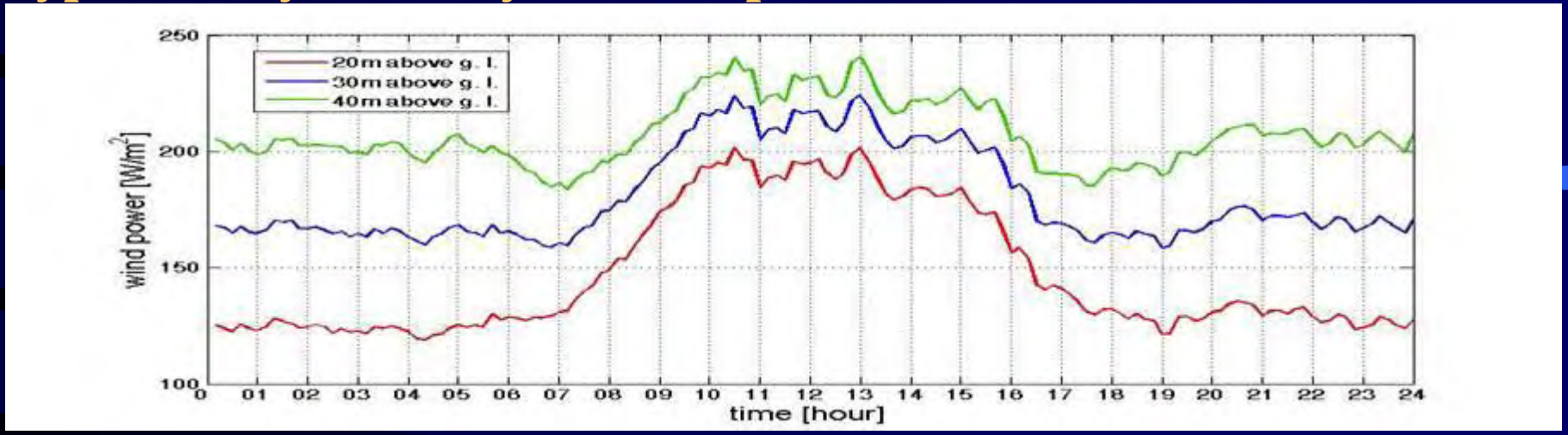
load profile measurement

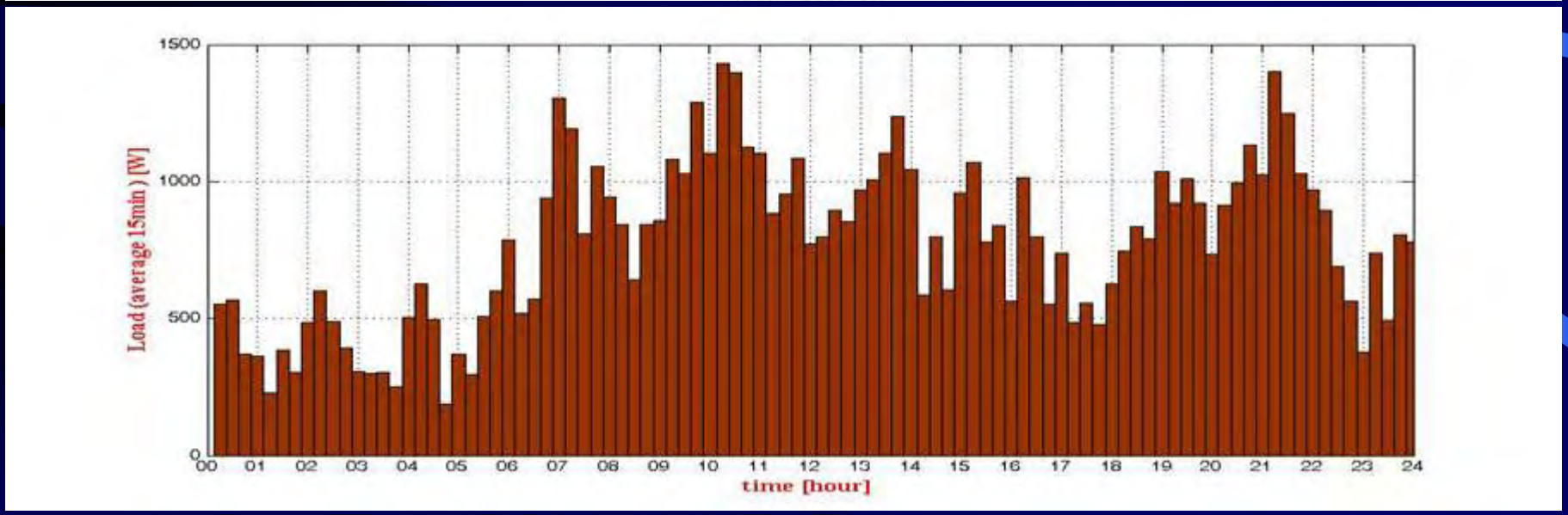
household conectid to the greed



similar household isolated of the greed

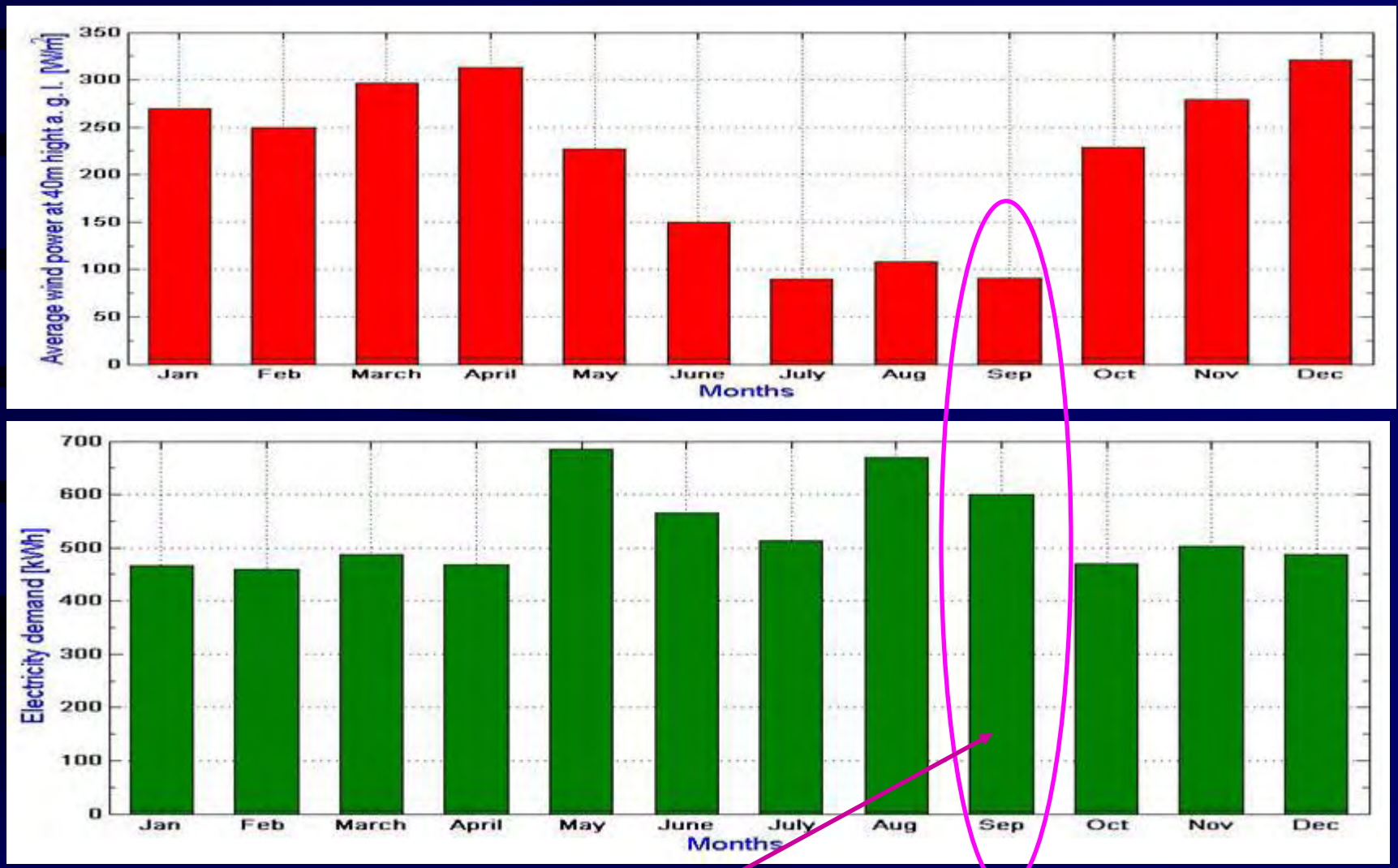
Typical daily wind power profile vs typical daily elctricity demand profile for isolated test consumer





Vetar ima u proseku karakter vršnog opterećanja

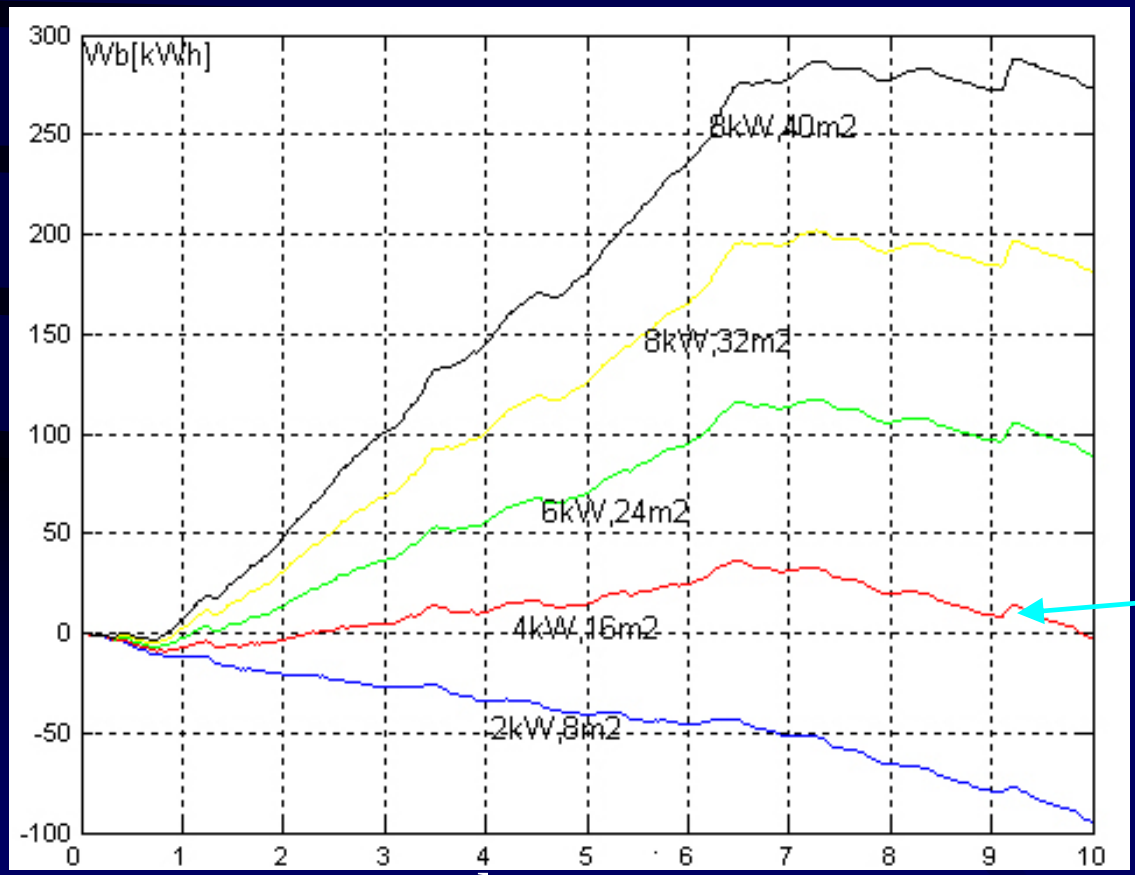
Average monthly wind power vs typical monthly elctricity demand for isolated test consumer



Kritični mesec: $W_{wind\ turbine\ genaration} - W_{consuption\ require}$ je maksimalno

Određivanje optimalne nazivne snage vetroagregata

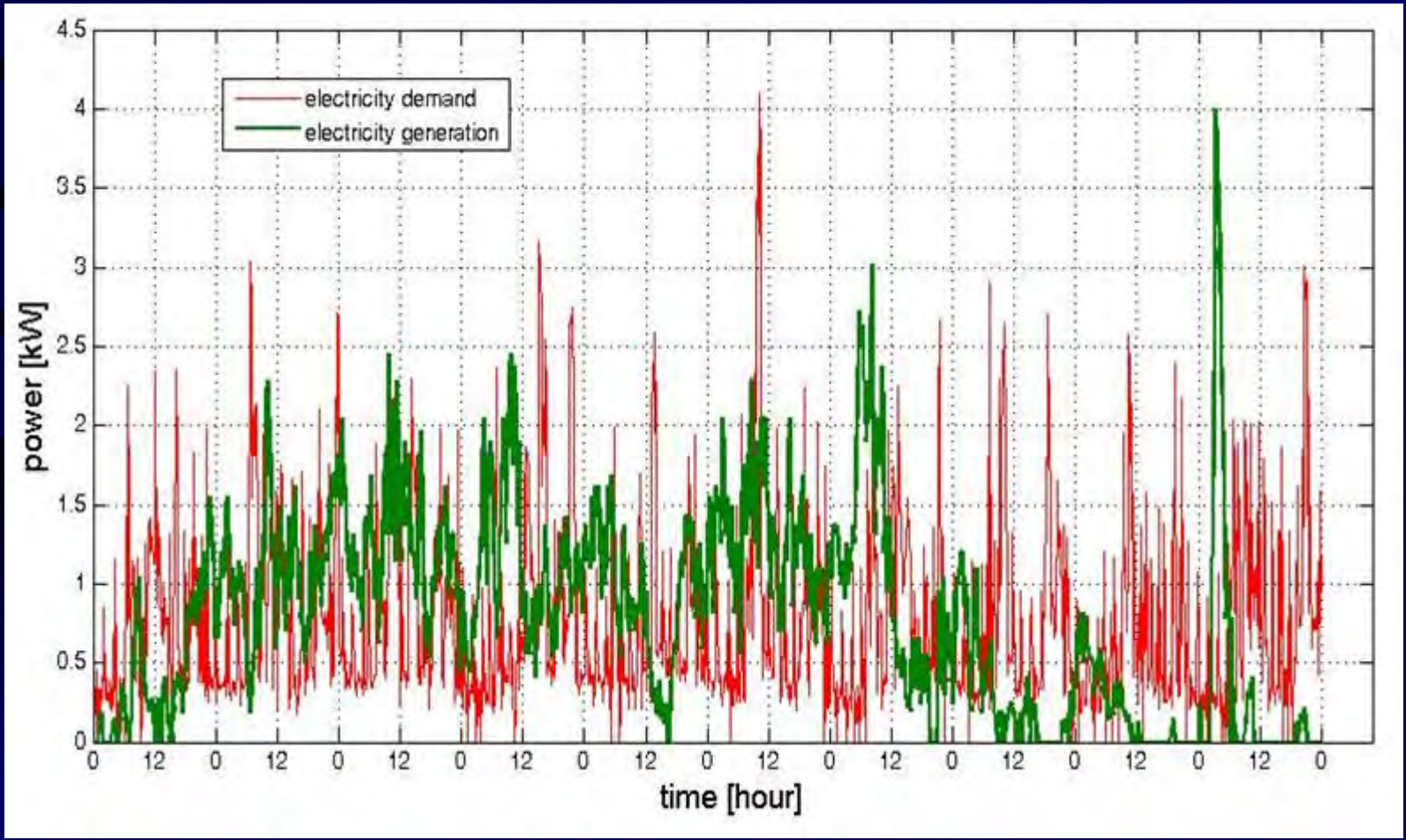
Cumulative energy generation – demand
for različite nazivne snage vetroturbina



Cumulative energy generation –demand

Wwind generation = Wconsuption

Uporedna analiza snage potrošnje i snage proizvodnje električne energije pomoću odabranog vetrogeneratora snage 4kW za kritični period od 10 dana. Dijagrami su bazirani na realnim merenjima snage potrošnje, brzine vetra i realnoj karakteristici snage generatora



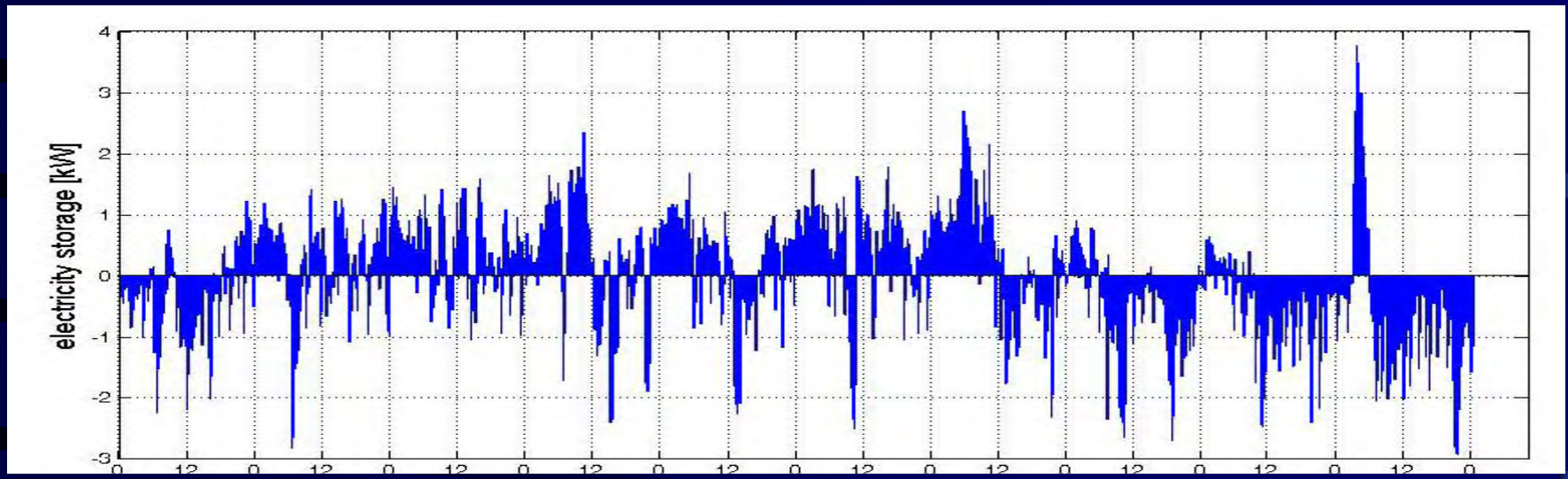
Uporedni pregled očekivane proizvodnje i potrošnje električne energije za analizirani wind energy conversion system

Months	Wind conversion system electricty generation W_{wg} [kWh]	Electricity consuption W_{ec}[kWh]	$W_{wg} - W_{ec}$ [kWh]
January	650	470	180
Februar	691	460	231
March	992	490	502
April	916	470	446
May	770	690	80
June	680	560	120
July	325	515	-190
August	440	660	-220
September	365	600	-235
October	865	470	395
November	810	505	305
December	746	490	256
Ukupno godišnje	**8210**	**6380**	**1830**

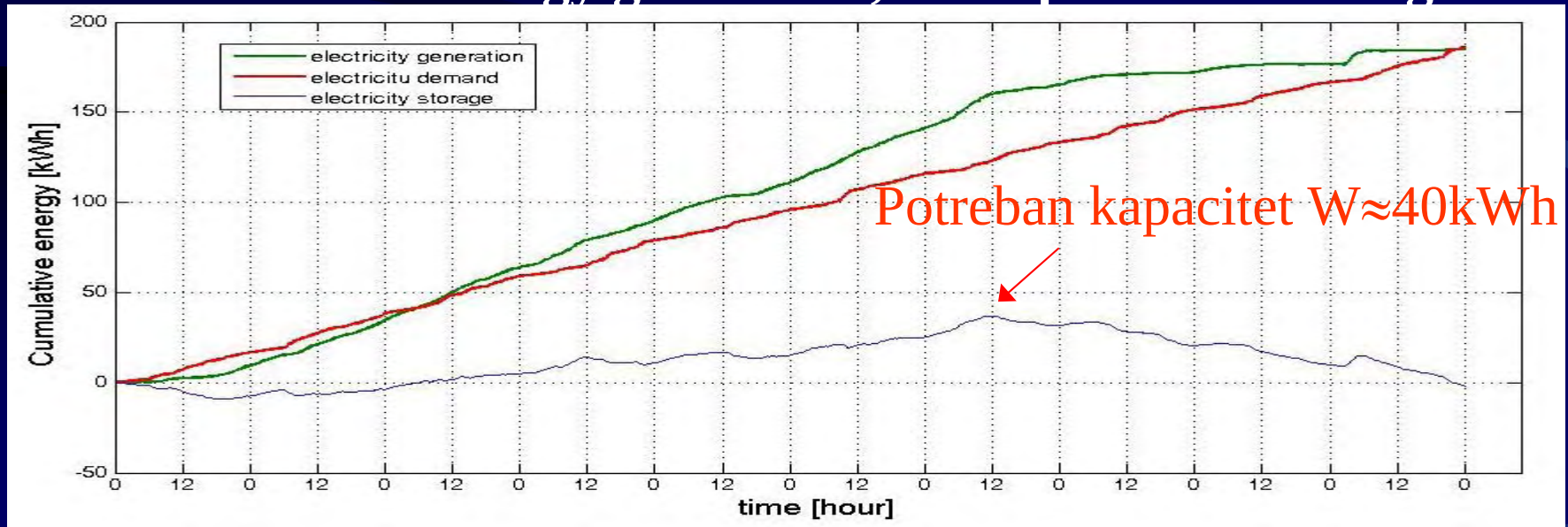
Annualy capacity usage factor for odabranu vetroturbinu

$$\tau = \frac{W_{wg\ yearly}}{8756 \cdot P_{wgn}} = \frac{8210}{8756 \cdot 4} = 23{,}44\%$$

Optimization of energy storage system



Cumulative energy generation, consuption and storage



Upravljanje potrošnjom u cilju smanjenja kapaciteta baterije akumulatora

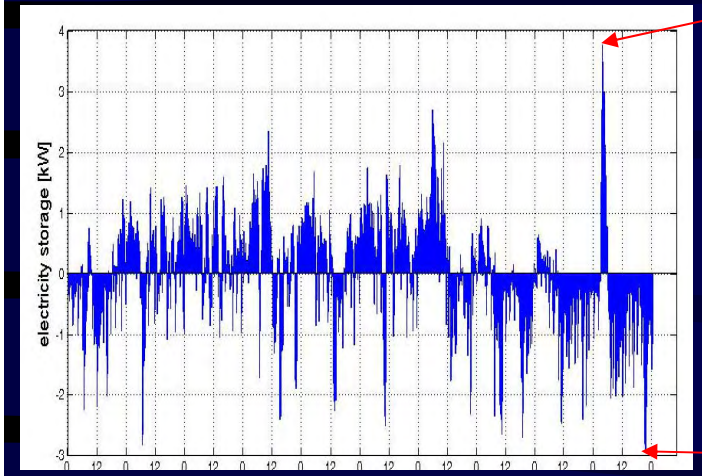
Karakteristike potrošača u analiziranom domaćinstvu

Potrošač	Broj i jedinična snaga [W]	Ukupna snaga [W]	prioritet
Osvetljenje	5x40	200	1
Frižider	1x200	200	1
Zamrzivač	2x300	600	1
Bojler	2x1000	1000	2
Pumpa za vodu	1x1100	1100	1
Veš mašina	1x2000	2000	2
TV	1x60	60	1
Pegla	1x1000	1000	2
Pekara	1x1500	1500	2
Šporet	2x1000	2000	2
Cirkular	1x1100	1100	2
Ukupna instalisana snaga		10360	

Odabrani potrošač (bojler) će biti uključivan u periodima dana kada je dobar vetar .

Efekat upravljanja radom bojlera na electricity storage system

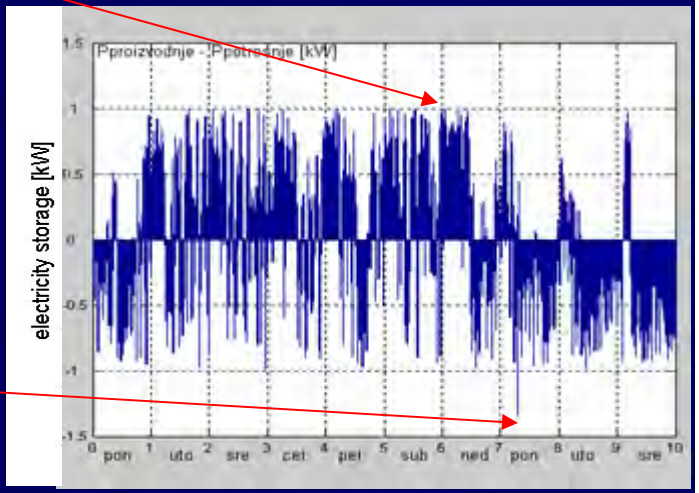
before

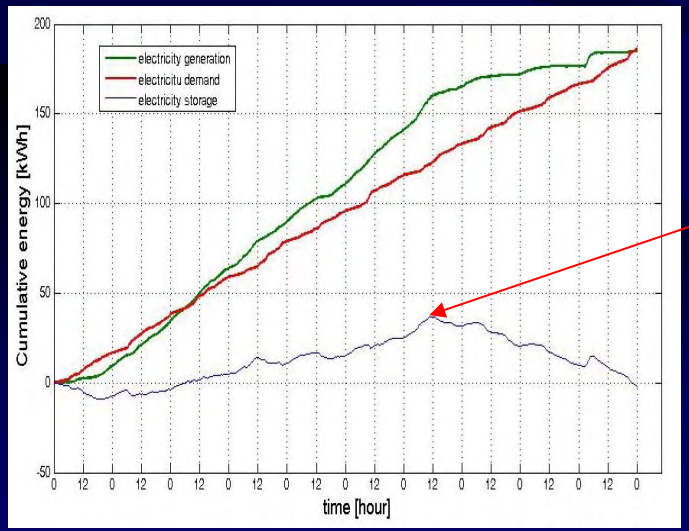


Maksimalna snaga punjenja baterije je smanjena za 75%

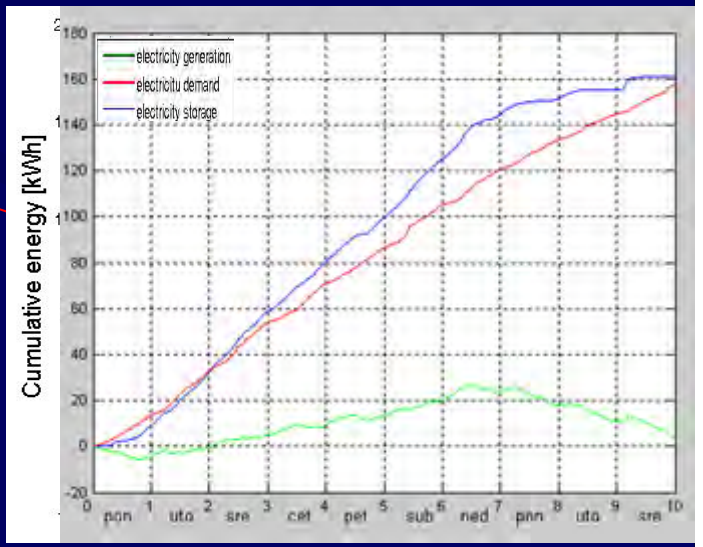
Maksimalna snaga pražnjenja baterije je smanjena za 50%

after





Potrebni kapacitet baterije je za 38% manji nego pre upravljanja potrošnjom



$m = m_{ws} + m_{fuel} + m_{batery}$

Assesment of economic benefits

- investicioni troškovi (kupovine, transporta i montiranja opreme)

Wind turbine 4kW FORTIS	18360 Euro
Storage battery 10x100Ah/12V PowerSafe VX	1300 Euro
Dizel agregat 4kW Honda	1100 Euro
	20760 Euro

- troškovi proizvodnje (operativni troškovi, remont)

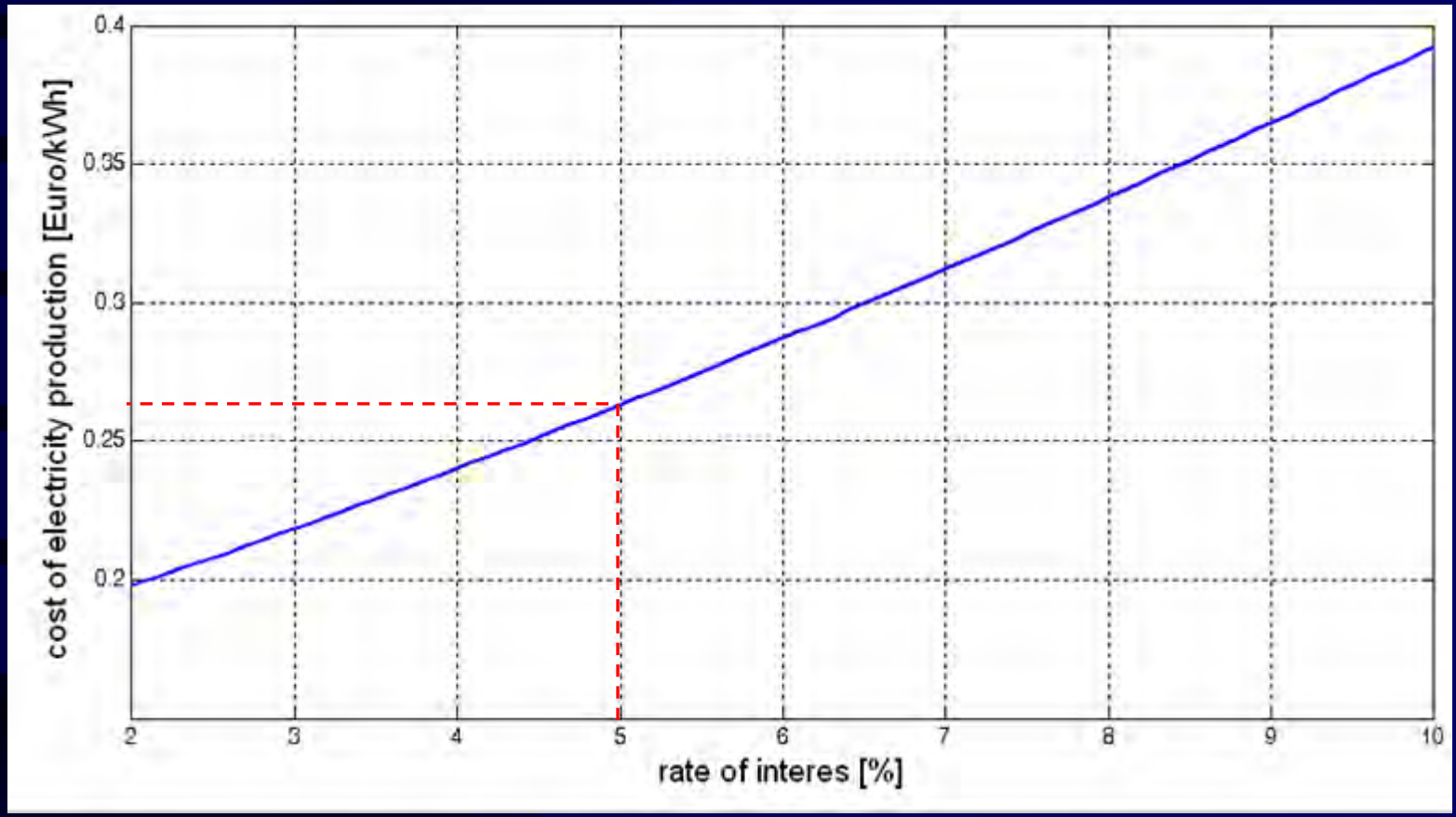
$$m = m_{ws} + m_{fuel} + m_{batery}$$

m_{wg} – troškovi održavanja wind energy conversion system
m_{fuel} – troškovi goriva za dizel agregat
m_{batery}- troškovi održavanja i zamene baterije akumulatora

$$m = m_{ws} + m_{fuel} + m_{batery} = 0{,}01 + 0{,}05 + 0{,}019 = 0{,}079\ Euro / kWh$$

- finansijski troškovi: varirana je kamatna stopa od 2% do 10%

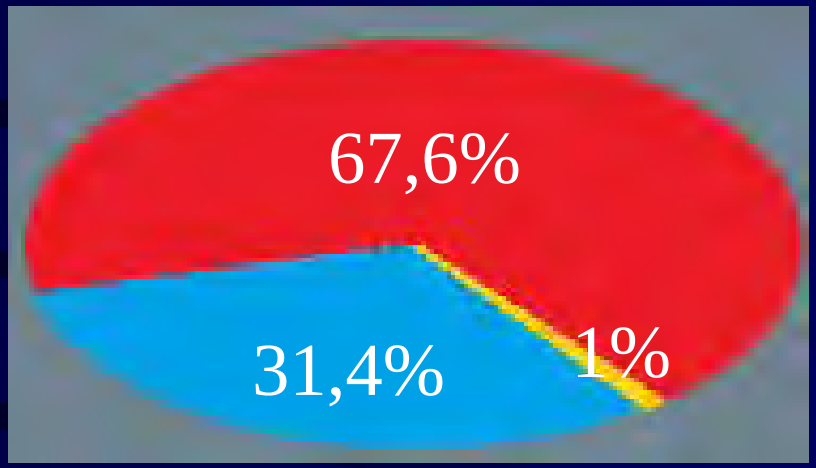
Cost of electricity production



Cena troškova proizvodnje električne energije jako zavisi od politike kreditiranja projakta.

Assessment of environmental benefits

Struktura primarnih izvora proizvodnje električne energije u Srbiji



coal (lignit)

gas and oil

large hydro

Tabela 3. Emisija CO_2 pri proizvodnji električne energije iz različitih primarnih izvora

EMISIJA CO_2 [kg/MWh]				
Tehnologija	**Konstrukcija**	**Priprema goriva**	**Konverzija**	**Ukupno**
Ugalj	1	1	962	964
Nafta	1	1	961	963
Gas	-	-	726	726
Nuklearna	1	2	5	8
Hidro (velike)	4	-	-	4
Hidro (male)	3	-	-	3
Vetar	7	-	-	7
Solarna (PV)	5	-	-	5
Geotermalna	1	<1	56	57
Biomasa (drvo)	3	-1509	1346	-160

Ukupna emisija CO_2 za wind energy conversion system:

700 kg/year

Ukupna emisija CO2 ako bi se potrošač snabdevao električnom energijom iz termoelektrana na ugalj (ako bi se priključio na elektroenergetski sistem):

6150 kg/year

ENVIROMENTAL BENEFITS:

- manje emitovano 5450 kg CO_2/year
- manje utrošeno 10 tona uglja/year
- manje stvorenog pepela 7 tona/year

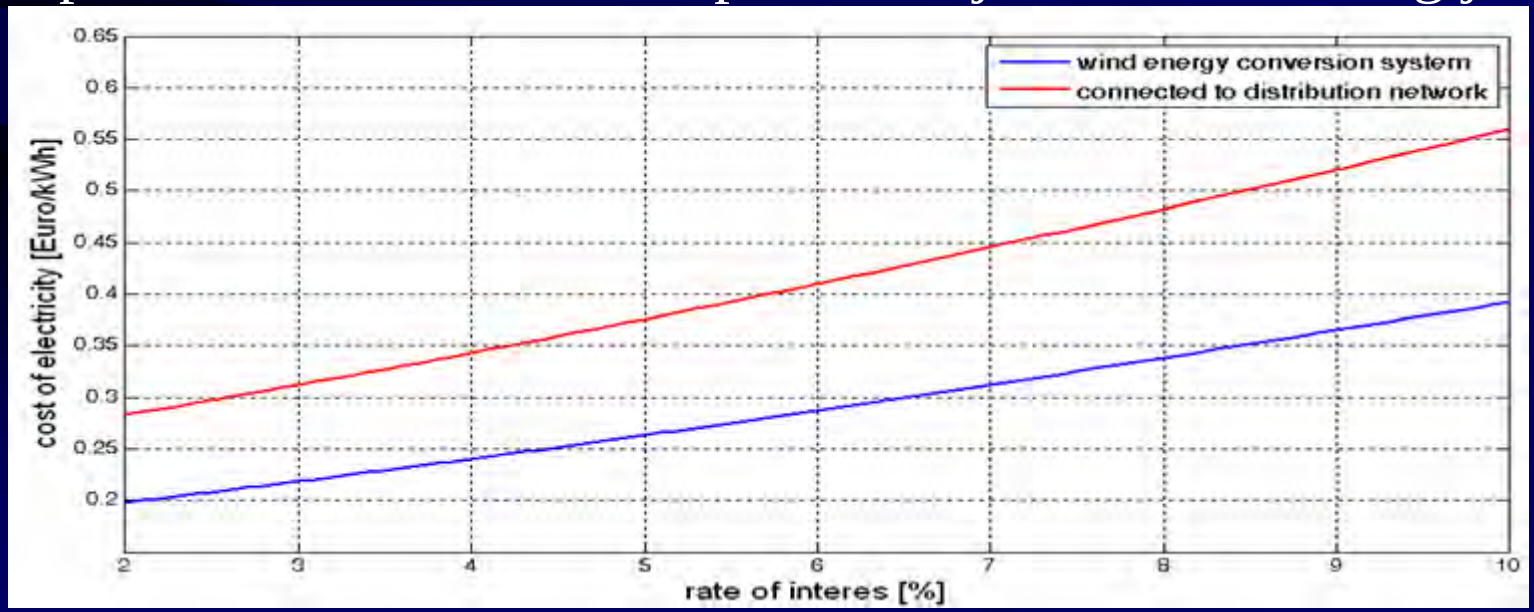
Comparison with other methods of electricity supply

Troškovi priključenja izolovanog test potrošača na 20kV elektrodistributivnu mrežu

IZRADA SREDNJENAPOSNKE 20kV MREŽE		17560 Euro
IZRADA TRAFOSTANICE 20/0.4 (kV/kV)		8900 Euro
IZRADA NISKONAPONSKE MREŽE		3520 Euro
	TOTAL	29980 Euro

Cena utrošene električne energije	0,042 Euro/kWh

Uporedna analiza troškova proizvodnje električne energije



Summary

- U ciljnom regionu Deliblatska Peščara je identifikovan relativno veliki broj različitih objekata koji su udaljeni od postojeće distributivne mreže.
- Merenja i proračuni ukazuju da ciljni region ima dobar tehnički iskoristiv potencijal vetra sa srednjim godišnjom snagom vetra od 250 do 300 W/m2 na visini od 50m.
- Godišnje i dnevne potrebe za električnom energijom ciljnog potrošača (dvočlano domaćinstvo) su procenjene na osnovu merenja karakteristika potrošnje referentnog potrošača sličnih karakteristika.
- Na osnovu kontinuiranih uporednih merenja potrošnje i brzine vetra u najkritičnijem desetodnevnom periodu određena je optimalna snaga vetroagregata (4kW) i procenjen kapacitet baterije akumulatora (12kWh)

- Učešće vetroagregata u ukupnom podmirivanju potreba za električnom energijom bi bilo oko 90%, a 10% bi bilo podmirivano iz dizel agregata snage 4kW.

- Predloženi sistem je jeftinije rešenje od priključenja ciljnog potrošača na električnu mrežu. Troškovi po kWh utrošene električne energije su za oko 40% jeftiniji ako se napajanje vrši pomoću predloženog hibridnog sistema.

- Predloženo rešenje vrlo malo zagađuje okolinu i njegovom izgradnjom bi se u odnosu na alternativno rešenje priključenja na mrežu uštedelo 5530 kg CO_2/god.

Planned vs realized activities within WP4 – T4.3

- Optimal Design of RES installations at the Selected Sites (100%)
- Assessment of economic benefits (90%)
- Assessment of environmental benefits (90%)
- Life cycle analysis of the proposed installations (90%)
- Comparison with other methods of electricity supply (100%)

Ministarstvo poljoprivrede, šumarstva i vodoprivrede R. Srbije
Međunarodna konferencija Green drop for the future –
“Bioenergija u poljorivredi – mogućnosti za Jugoistočnu Evropu”
Master centar Novosadskog sajma, Novi Sad 11.5.2007

MALI DOMAĆI PROGRAMI KORIŠĆENJA BIOMASE IZ POLJOPRIVREDE KAO ENERGENTA U SRBIJI

Miloš Tešić, Fakultet tehničkih nauka, Novi Sad
tesic@uns.ns.ac.yu

Situacija 2007.

Postupci savremenog korišćenja biomase u Vojvodini/Srbiji su već 25 godina dobro poznati

ali pri sadašnjim odnosima cena energenata i uslovima okruženja

NISU RENTABILNI

Nemamo odgovarajuće
PRAVNE I TEHNIČKE
propise, a
NI PODSTICAJE,
za proizvodnju i korišćenje
biomase i drugih
obnovljivih energenata

Situacija u Srbiji 2007.

- Pre 20 godina
  - 9 postrojenja u izgradnji od toga u Vojvodini 7
  - ni jedno nije potpuno završeno ni ekonomično eksploatisano

- 2007:
  - Ni jedno biogas postrojenje ne radi
  - Investicije u biogas postrojenja nisu ekonomski opravdane
  - Nema ekonomskog interesa
  - Nema povoljne, podsticajne klime

Situacija u Vojvodini 1985.

- 1.200 termičkih postrojenja za sagorevanje biomase ukupne snage

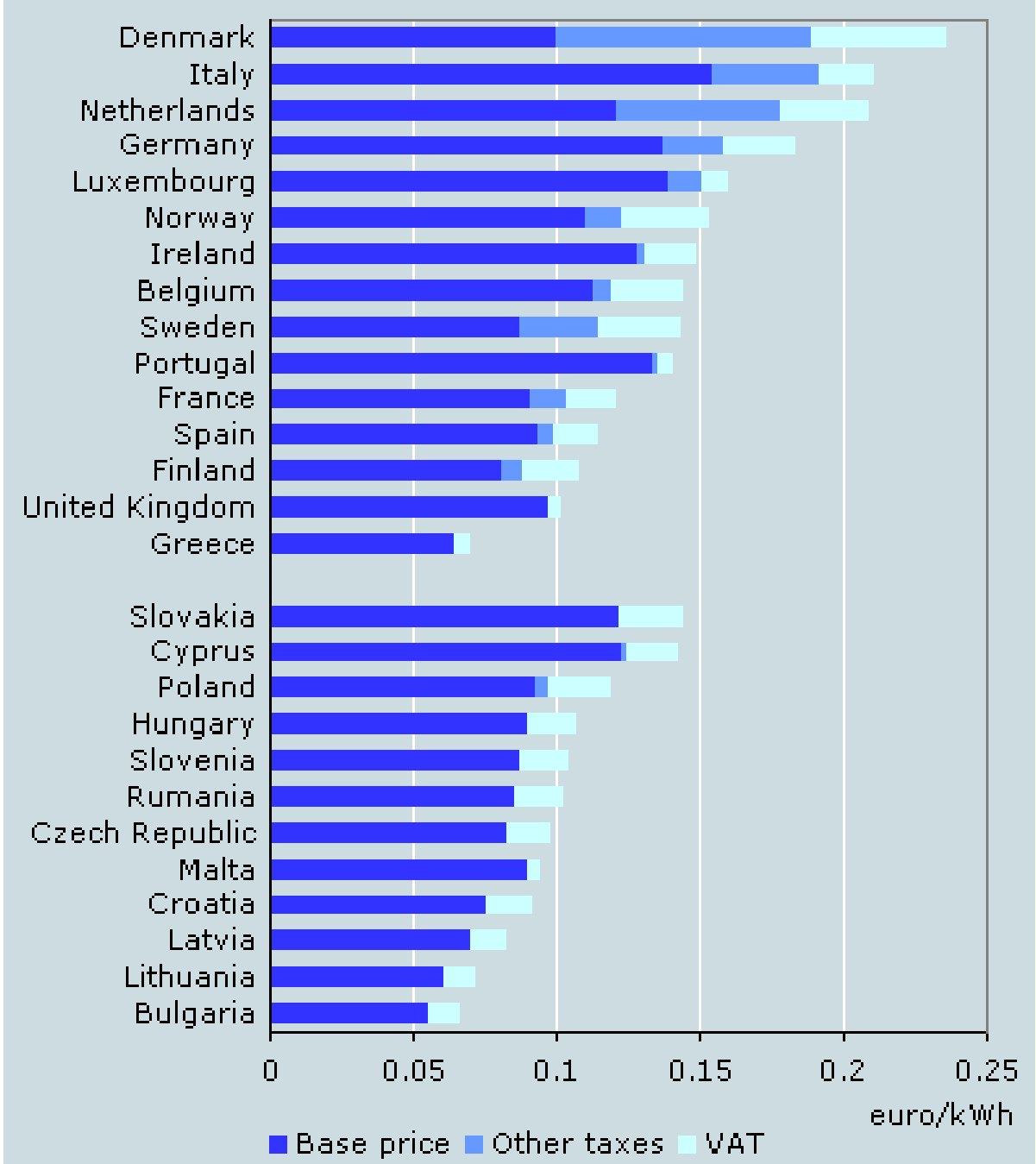
  140 MW

  (tada 1,5 % od klasičnih energenata)

U 6 naselja 10 velikih presa za briketiranje biomase

ПРЕПРЕКЕ

- Ниска цена електричне енергије
- Недостатак концепта коришћења ОИЕ и развоја опреме
- Недостатак подстицајних мера и повољне законске регулативе
- Неразвијеност институција, недовољно стручних капацитета
- Слаба економска моћ привреде и грађана
- Недовољна информисаност

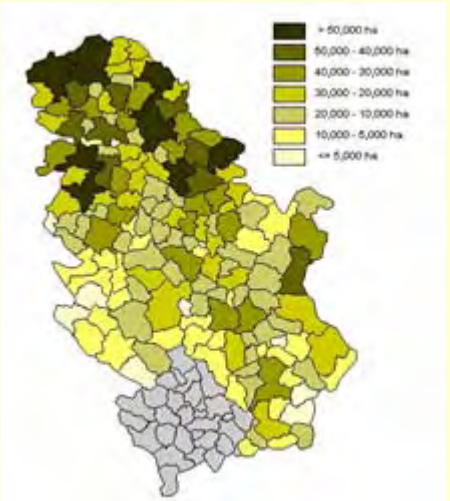


Source: Eurostat

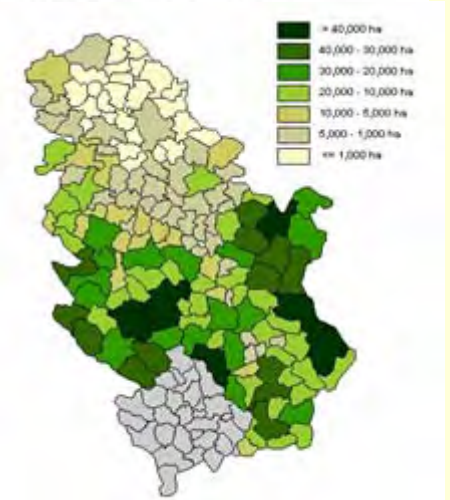
Electricity price standard consumer (3,500 kWh), 1 January 2006 (euro/kWh)

БИОМАСА

- Потенцијал **2,600,000 тен**
  - 60% пољопривредна производња
  - 40% шумска маса
- Тренутна употреба
  - искључиво за грејање
  - ниска ефикасност
- Могућности
  - првенствено за грејање
  - биодизел, биоетанол,
  - електрична енергија
  - биогас

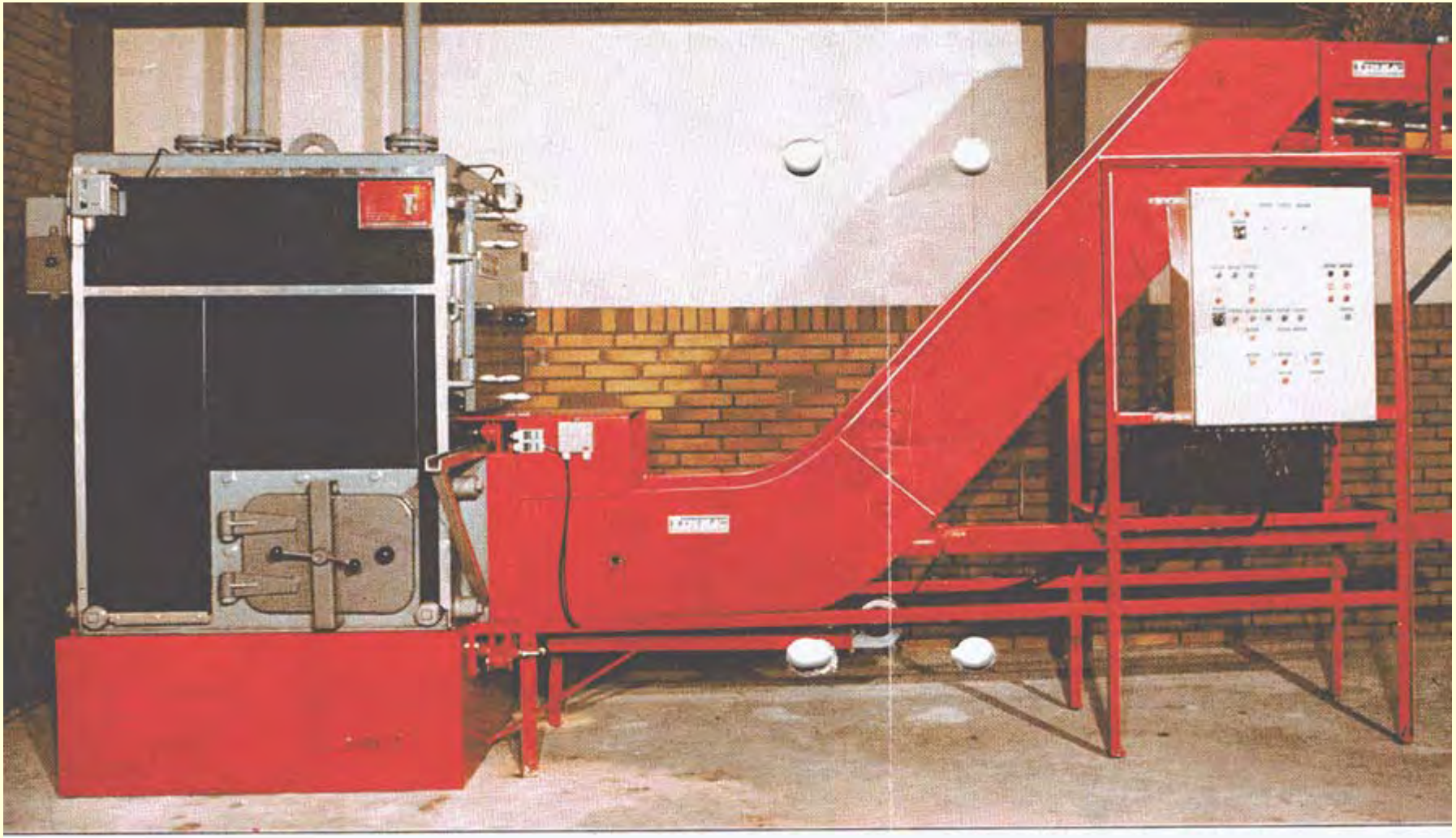


Обрадиво земљиште у Србији



Површина под шумом у Србији

POSTROJENJE (KOTAO) ZA SAGOREVANJE SLAME ‘BRATSTVO” – SUBOTICA, oko 1984, snaga 150/200 kW, prodato oko 130 kom



Biogas potential in Vojvodina

- "larger farms" (more than 150 cattle units) 30 000 CU_c +21 000 CU_s
- 900 000 m^3 animal manure
- $9 \cdot 10^6$ m^3 methane
- efficiency rate of 0,35 = 40 GWh of electrical power (equivalent to the annual electricity consumption of 8.000 households in Serbia)

NACIONALNI PRORAM ENERGETSKE EFIKASNOSTI (NPEE) SRBIJE

Program korišćenja alternativnih i obnovljivih izvora energije - studije i projekti

- **ZAKON O ENERGETICI**

  (Sl. glasnik R. Srbije, 24. jul 2004)

  - Povlašćeni proizvođači el. energije, čl. 84-86.

  - Agencija za energetsku efikasnost, čl. 146-147.

  - Agencija za energetiku, (regulatorna) čl. 10-24.

  - Prateći propisi

NPEE – **Povoljno okruženje?**

- **Odnosi cena goriva i energije**
- **Zakoni**
- **Propisi i standardi**
- **Podsticajne mere**
- **Kaznene mere**
- **Poreske olakšice**
- **Fondovi za sufinansiranje od strane države, institucija i privrednika**
- **Institucije, informisanje, obrazovanje**

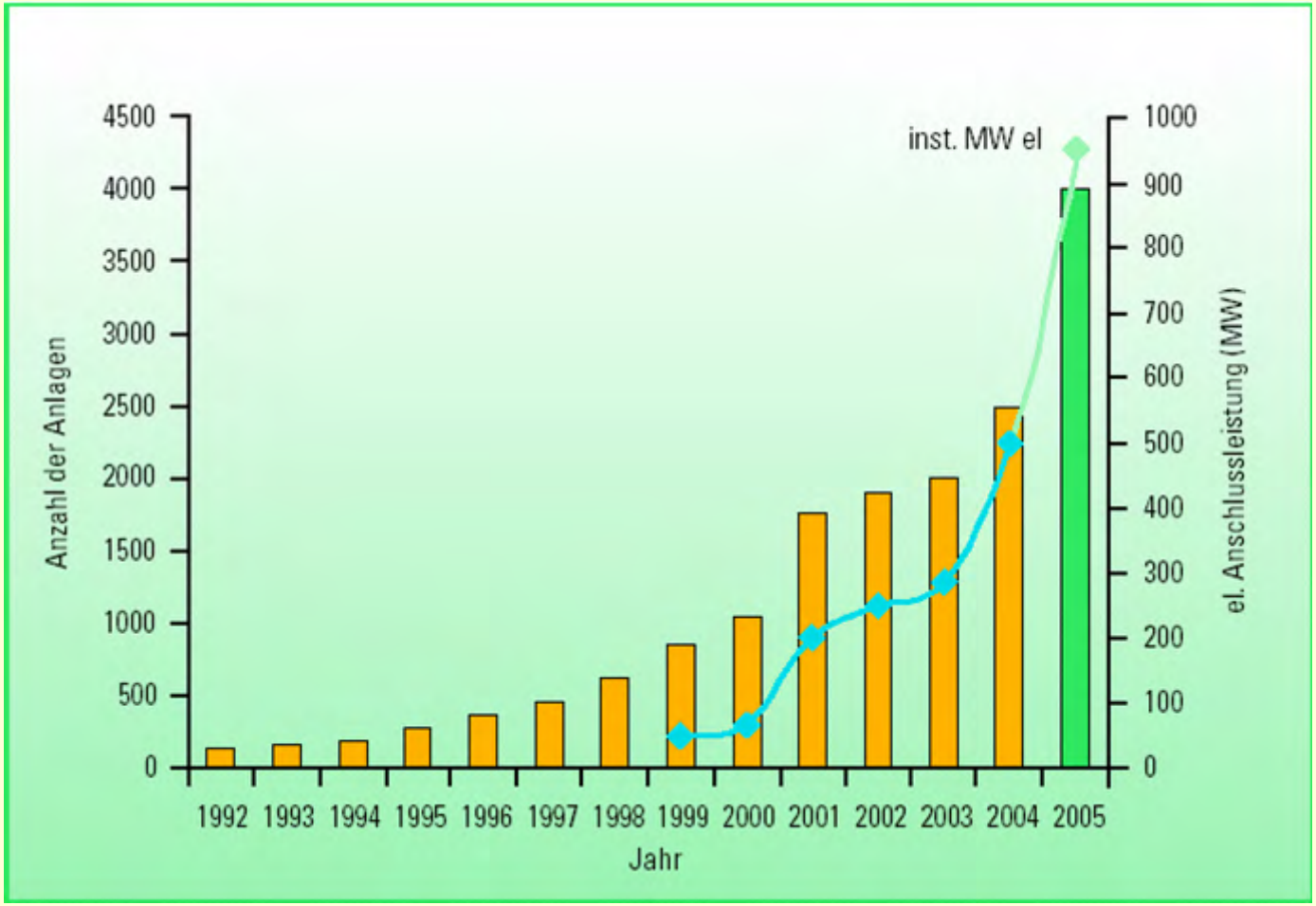
ODKUPNE CENE EL. ENERGIJE OD KVALIFIKOVANIH PROIZVOĐAČA U SLOVENIJI 2005. (1)

	SIT/kWh (100 SIT = 36 din)	Din/kWh
Hidroelektrane snage do 1 MW	14,75	6,39
Hidroelektrane snage preko 1 MW do 10 MW	14,23	5,123
Elektrane na biomasu do 1 MW	**16,69**	**6,01**
Elektrane na biomasu preko 1 MW	**16,17**	**5,82**
Elektrane na vetar do 1 MW	14,55	5,24
Elektrane na vetar preko 1 MW	14,05	5,06
Geotermalne elektrane	14,05	5,06

Tab. 1 Cene električne energije iz biomase u Hrvatskoj, snaga postrojenja do 1 MW, maj 2007.

	Tip postrojenja	Cena električne energije iz obnovljivih izvora		
		kn/kWh	€cent/kWh	din/kWh
4.	**Elektrane na biomasu**			
4.1.	**Čvrsta biomasa iz šumarstva i poljoprivrede (granjevina, slama, koštice...)**	**1,20**	**0,163**	**13,57**
4.2.	**Čvrsta biomasa iz drvno-prerađivačke industrije (kora piljevina...)**	**0,95**	**0,129**	**10,74**
6.	**Elektrane na biogas iz poljoprivrednih zasada (kukuruzna silaža...) kao i organskih ostatak i otpad iz poljoprivrede i prehrambeno-prerađivačke industrije (stajsko đubrivo, klanični otpad i otpad iz proizvodnje biogoriva...)**	**1,20**	**0,163**	**13,57**
7.	**Elektrane na tečna goriva**	**0,36**	**0,049**	**4,07**
8.	**Elektrane na deponijski gas i gas iz postrojenja za prečišćavanje otpadnih voda**	**0,36**	**0,049**	**4,07**

Broj i ukupna instalisana snaga biogas postrojenja u Nemačkoj 1991-2004. Izvor: Gronauer, A., Effenberger, M., Kissel R. i M. Tešić(2004): Savremeni sistemi za proizvodnju biogasa i struje – tehnički, ekonomski i ekološki aspekti. Poljoprivredna tehnika i energetika u poljoprivredi, 8:3-4,p.55



Razlog: Struja iz biomase se plaća 10-18 €cent/kWh tokom 20 godina

ZAKLJUČCI

Stručnjaci u Srbiji znaju da su postrojenja za proizvodnju električne i toplotne energije iz biomase

- proverena dobra praksa i dobra budućnost
- pozitivni efekti u ekologiji, poljoprivredi, nacionalnoj ekonomiji, energetici
- znatan potencijal
- internacionalna obaveza
- oblast za međunarodnu saradnju
- jedan od uslova za prijem u EU

SLEDEĆE POTEZE MORA DA UČINI DRŽAVA

BITNE NOVOSTI u Srbiji, odluke Vlade od 17.1.2007.

Izmene i dopune važećih zakona (početak 01.03.2007, rok 9 meseci)

- **Vrše se radi implementacije finansijskih i drugih olakšica**

  i podsticaja koji su detaljno opisani u programu

BITNE NOVOSTI u Srbiji

Izmene Zakona o energetici (početak 01.03.2007, rok 3 meseca)

Cilj:

Uspostavljanje Državnog fonda za finansijsko podsticanje nacionalnog programa energetske efikasnosti i proizvodnje energije iz OIE. Sredstva za Državni fond će se obezbeđivati sa računa za potrošenu električnu energiju, od prodaje nafte i naftnih derivata, uglja, registracije motornih vozila, poreza, od dobrotvora, međunarodnih donacija, fondova i sl;

BITNE NOVOSTI u Srbiji

Izmene Zakona o prevozu i drumskom saobraćaju (početak 01.03.2007, rok 9 meseci)

- **U čl. 10, posle stava 1. dodaje se stav 2. koji glasi: „Od 2010. godine javni prevoz putnika i stvari mogu vršiti prevoznici čija potrošnja tečnih i gasovitih biogoriva u ukupnoj potrošnji naftnih derivata u prethodnoj godini iznosi najmanje 15%”.**

BITNE NOVOSTI u Srbiji

Uspostavljanje subvencija za biogoriva koja koriste motorna vozila (početak 01.06.2007, rok 9 meseci)

cilj:

Državni fond OIE subvencionisaće sa po 2,5 €cent cenu svakog litra tečnog ili gasovitig biogoriva koje se posredstvom distributivne mreže isporuči za pogon motornih vozila

Ministarstvo nauke i zaštite životne sredine

- NACIONALNI PROGRAM ENERGETSKE EFIKASNOSTI

Direktor prof. Dr Simeon Oka

- **PROGRAM 1.7 ALTERNATIVNI I OBNOVLJIVI IZVORI ENERGIJE**
- PROJEKTI I STUDIJE

- Direktori programa
  - **– prof. dr Marija Todorović i**
    - **prof. dr. Miloš Tešić**

NEPOSREDNI CILJEVI PROJEKATA

- Razvoj sopstvenih konstrukcija,
- Razvoj postrojenja za ispitivanje modela,
- Optimizacija konstrukcije za date lokacije,
- Osposbljavanje domaćih proizvođača,
- Pokretanje domaće proizvodnje,
- Za DEMONSTRACIONE sisteme na izabranim lokacijama:
  - Studije opravdanosti
  - Projektovanje postrojenja
  - Izvođenje i ispitivanje postrojenja

VII JAVNI POZIV MNZŽS

- Sunčeva energija: **Projekti baza podataka, Prijemnici energije sunčevog zračenja i Korišćenje energije sunčevog zračenja za grejanje, prirodnu ventilaciju, hlađenje i osvetljenje**
- Energija vetra **i integrisani energetski sistemi: Projekti razvoja i širenja korišćenja energije vetra i integrisanih energetskih sistema**
- Geotermalna energija: **Razvoj i širenje korišćenja toplotne energije zemlje**
- Mini-hidroelektrane **i integrisani energetski sistemi: Istraživanje sprege rada više mini-hidroelektrana na jednom vodotoku**
- Energija biomase: **Namenska proizvodnja biomase za korišćenje kao gorivo, Korišćenje čvrstih, tečnih i gasovitih biogoriva, Biomasa za kogeneraciju**

U VII JAVNOM POZIVU (2006.) PRIJAVLJENO UKUPNO 79 PROJEKATA

- EE u proizvodnji električne energije 9
- EE u prenosu i distribuciji električne energije 11
- EE u industriji 3
- EE komunalnih sistema 9
- EE u domaćinstvima 6
- Osvajanje opreme i pripreme goriva radi zamene korišćenja el.energije za grejanje 5
- Korišćenje altermativnih i obnovljivih izvora energije 23
- EE građevinskih objekata 5
- EE u saobraćaju 6

PROJECT OPPORTUNITY

Republic of Serbia
Ministry of Science and
Environmental Protection
NPEE-Alternative and renewable energy sources

DEVELOPMENT OF ENERGY CONVERSION PLANT FOR BALED BIOMASS (CEREAL STRAW) FOR INDUSTRIAL USE IN RURAL VALLEY REGIONS

BACKGROUND

PROJECT BENEFITS

PROJECT SCHEDULE

PROJECT COST

CONTACT INFORMATION

LEADING INSTITUTION AND PROJECT HEAD

Faculty of Technical Sciences
Novi Sad
Prof. Ph.D. Ivan Pešenjanski

PROJECT OPPORTUNITY

Republic of Serbia
Ministry of Science and
Environmental Protection
NPEE-Alternative and renewable energy sources

DESIGN AND CONSTRUCTION OF DEMONSTRATIVE SYSTEM FOR USE GEOTHERMAL ENERGY OF JOSANICA SPA IN AGRICULTURE

BACKGROUND

PROJECT BENEFITS

PROJECT SCHEDULE

PROJECT COST

CONTACT INFORMATION

LEADING INSTITUTION AND PROJECT HEAD

Faculty of Technical Sciences
Kosovska Mitrovica
Prof. Prof. Dr. Milan Bara**ć**

PROJECT OPPORTUNITY

Republic of Serbia
Ministry of Science and
Environmental Protection
NPEE-Alternative and renewable energy sources

PLANING, BUILDING AND TESTING DEMO-SYSTEM FOR DRIP-BY-DRIP IRRIGATION USING SOLAR ENERGY IN THE ARILJE REGION RASPBERRY PRODUCTION.

BACKGROUND

PROJECT BENEFITS

PROJECT SCHEDULE

PROJECT COST

CONTACT INFORMATION

LEADING INSTITUTION AND PROJECT HEAD

Faculty of Agriculture, Belgrade
Prof. Dr. Jordan Milivojevic

ENERGETSKA EFIKASNOST I EMISIJA GASOVA TERMIČKIH POSTROJENJA NA BIOMASU

Miladin Brkić[1)],Milan Martinov [2)]

[1] Poljoprivredni fakultet, Departman za polj. tehniku, Novi Sad,

[2] Fakultet tehničkih nauka, Institut za mehanizaciju, Novi Sad,

•UTICAJ HEMIJSKO-FIZIČKIH KARAKTERISTIKA BALIRANE BIOMASE NA KONSTRUKCIJU KOTLOVSKIH POSTROJENJA

Dr Todor Janić, van. prof.
Dr Miladin Brkić, red.prof.
Mr Saša Igić

OPREDELJENJE KA FORMI BALE

- ***Forme biomase koja se sagoreva:***
  - ***Rinfuzna biomasa***
  - ***Konvencionalna, tkz. mala bala***
  - ***Velika rol bala***

- *ZA ŠTA SE OPREDELITI*

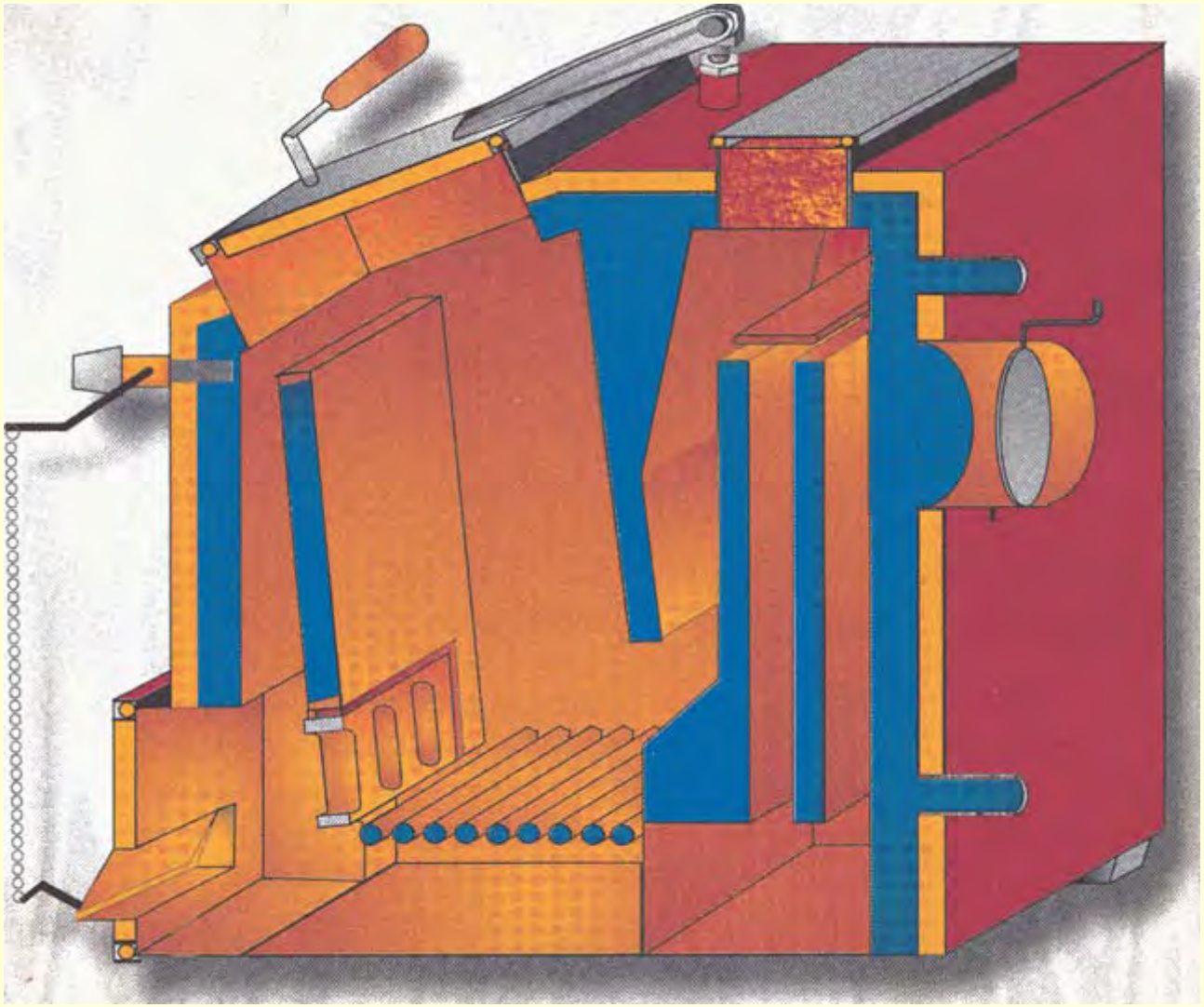
- ***Mora se posmatrati ceo lanac sagorevanja:***
- ***Prikupljanje, manipulacija, skladištenje, hranjenje ložišta, pogodnost za sagorevanje, gubici u sagorevanju***

CEPANICE OD DRVETA I OKLASAK OD KUKURUZA

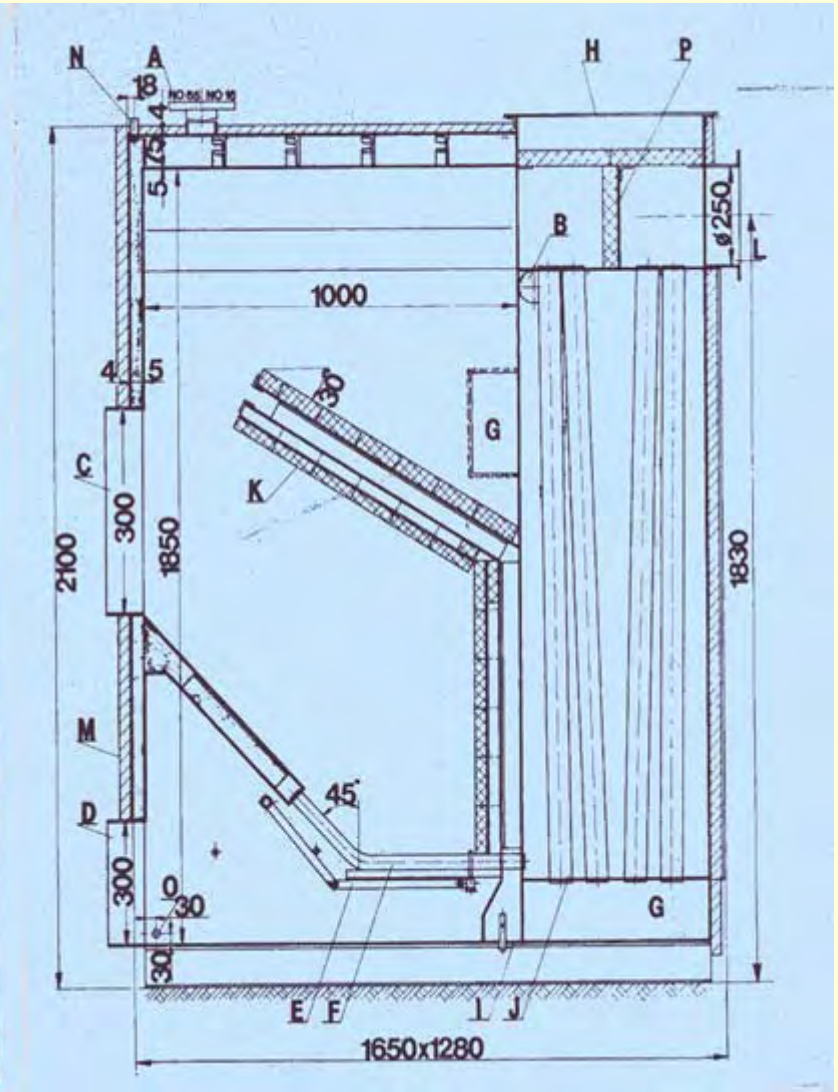
SKLADIŠTE ZA BALE OD KUKURUZOVINE

RUČNO LOŽENJE KOTLA

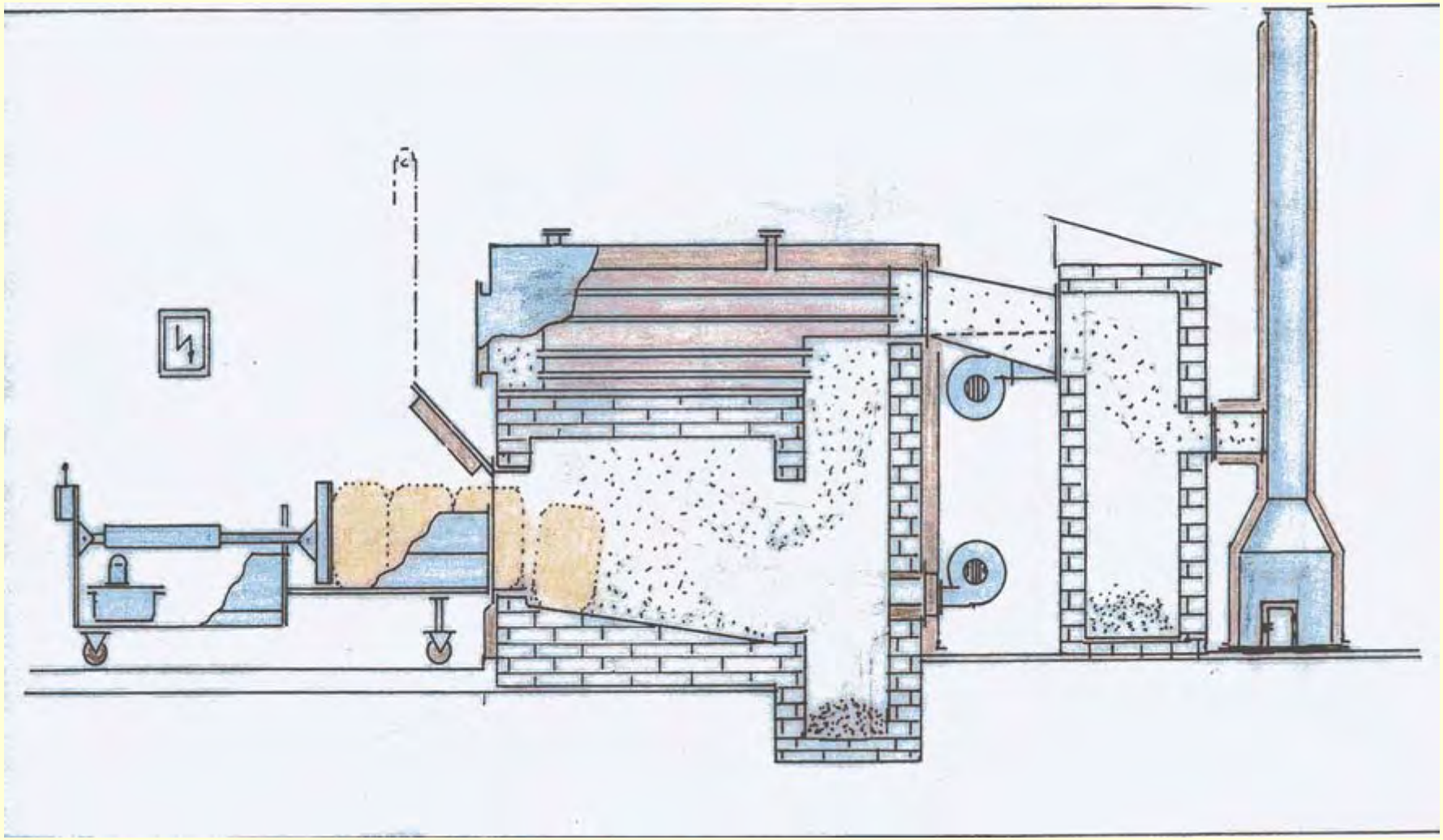
TOPLOVODNI KOTAO ZA CENTRALNO GREJANJE NA BIOMASU “TERMING”



TOPLOVODNI KOTAO NA BIOMASU “NOVKABEL”



Toplovodni kotao za zagrevanje farme svinja na biomasu “NIGAL” termičke snage 750 kW



СТУДИЈЕ ОПРАВДАНОСТИ

- **Енергија из биомасе**
  - "Коришћење биомасе у градским котларницама Неготина"
  - корисник донације општина Неготин
  - снага 5MW
  - уговор потписан на **15,000.ЕВРА**
  - планиран завршетак студије децембар 2006.

ДЕМОНСТРАЦИОНИ ПРОЈЕКТИ

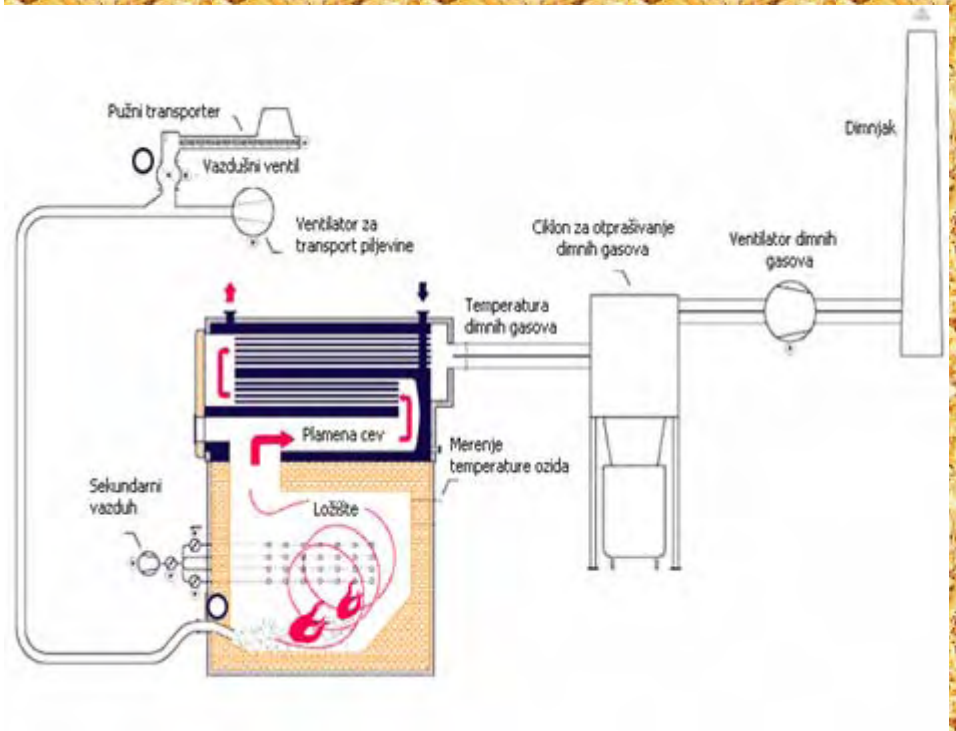
- **Енергија из биомасе**
  - "Замена два котла на мазут котловима на биомасу уз реконструкцију постојеће котларнице"
  - корисник донације о.ш. "Мићо Матовић" у Катићима
  - вредност донације **42,500.ЕВРА**
  - снага 2x230kW
  - планиран завршетак пројекта новембар 2006.

KIRKA

FABRIKA KOTLOVA

BEOGRAD

UDUVAVANJE PILJEVINE



“JELA” Jagodina

TOPLOVODNO KOTLOVSKO POSTROJENJE 3MW

“TARKETT” Bačka Palanka

“GRADINA” Berane

KRUPNI DRVNI OTPAD

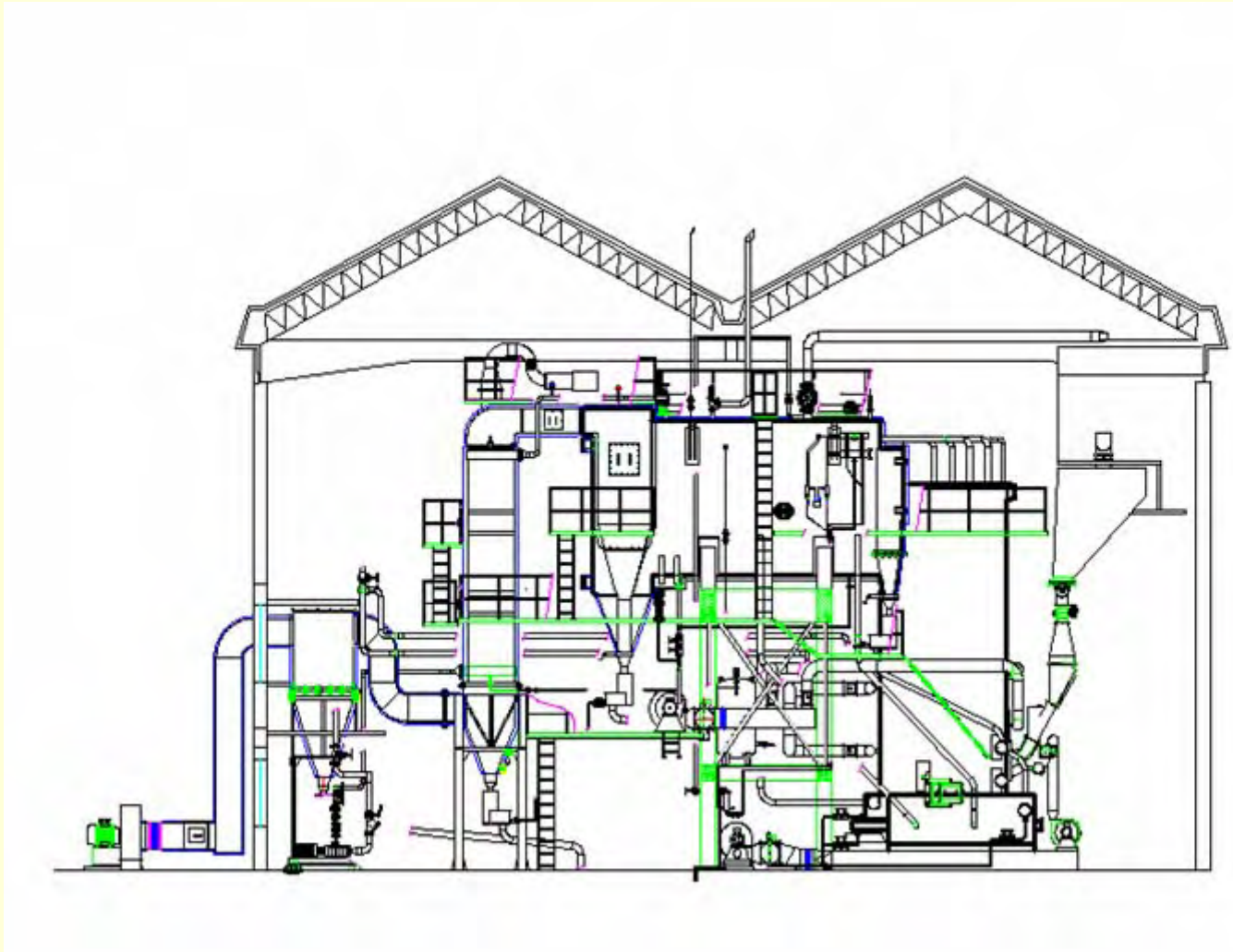
VRATA ZA RUČNO UBACIVANJEGORIVA

PUŽNI TRANSPORTER SA IZVLAKAČEM PILJEVINE

UNUTRAŠNJI DEO SILOSA - IZVLAKAČ

Parno kotlovsko postrojenje, kapaciteta 15 t/h, 15 bara

na ljusku od suncokreta i sojinu slamu



Fabrika ulja “MLADOST” Šid

Tab. 3 Površine za grejanje, potrebna snaga kotla i instalisani kotlovi po radnim jedinicama DPP Mitrosrem u Sremskoj Mitrovici

Tab. 3 Heating areas, required power for boilers, installed power of boilers on working units of DPP Mitrosrem in Sremska Mitrovica

Radna jedinica (Working unit)	Površina za grejanje (Heating areas), m^2	Potreban kotao (Required boiler), kW	Instalisani kotlovi (Installed boilers), kW	Firma (Manufacturer)	Gorivo (Fuel)
„Martinci”	2.528	500	250+150	Ekoprodukt	Slama (Straw)
„Laćarak”	972	194	300	Ekoprodukt	Slama (Straw)
„Veliki Radinci”	1.425	285	400	Terming	Slama (Straw)
„Sr. Mitrovica”	1.637	327	300	Terming	Slama (Straw)
„Svinjogojska farma”	7.827	1564	750 250	Nigal Ekoprodukt	Slama (Straw) Slama (Straw)
„Bosut”	210+316	42+36	120 50	Ekoprodukt Terming	Slama (Straw) Slama (Straw)
„Divoš”	817	163	80	Terming	Slama (Straw)
„Sremska Rača”			35	Štadler	Drvo, ugalj (Wood, coal)
Ukupno (Total):	15.714	3.112	2.685		

Kotlovi za zagrevanje porodičnih kuća snage 50-60 KW (Stapar)
Kotlovi za zagrevanje plastenika snage 1,5 MW (PK Beograd)

The Boiler Concept for Combustion of Large Soya Straw Bales as the Zero Emission Plant

- **Dragoljub Dakić*, Milijana Paprika, Rastko Mladenović, Aleksandar Erić, Branislav Repić**
- **Institute of Nuclear Sciences "Vinča", Laboratory for Thermal Engineering and Energy**
- **P. O. Box 522, 11001 Belgrade, Serbia**
- ***E-mail: dakicdr@vin.bg.ac.yu**

1. Dr Miladin Brkić, dr Todor Janić, Poljoprivredni fakultet, Novi Sad, dr Veljko Radojević, ZZ Bag – Deko, Bačko Gradište
   ZAMENA KLASIČNIH VRSTA GORIVA BIOMASOM NA TERMIČKIM POSTROJENJIMA ZA PROIZVODNJU ZAČINA

2. Dr Miloš Tešić, Vojvođanska akademija nauka i umetnosti, Novi Sad, dr Milan Martinov, Đorđe Đatkov, Dragan Adamović, Fakultet tehničkih nauka, Novi Sad
   PRAVNI I TEHNIČKI PROPISI ZA PROJEKTOVANJE, GRAĐENJE I EKSPLOATACIJU BIOGAS POSTROJENJA

3. Dr Todor Janić, dr Miladin Brkić, Poljoprivredni fakultet, Novi Sad, mr Saša Igić, JP Srbija – gas, Novi Sad
   UTICAJ KARAKTERISTIKA BALIRANE BIOMASE NA KONSTRUKCIJU KOTLOVSKIH POSTROJENJA

4. Mr Saša Igić, JP Srbija – gas, Novi Sad
   METODE ISTRAŽIVANJA PARAMETARA SAGOREVANJA PŠENIČNE I SOJINE SLAME NA KOTLOVSKOM POSTROJENJU

5. Dr Miladin Brkić, Poljoprivredni fakultet, Novi Sad, dr Milan Martinov, Fakultet tehničkih nauka, Novi Sad
   ENERGETSKA EFIKASNOST I EMISIJA GASOVA TERMIČKIH POSTROJENJA NA BIOMASU

6. Mr Nebojša Dedović, Poljoprivredni fakultet, Novi Sad
   PRIKAZ ENERGETSKIH RESURSA POLJOPRIVREDNE PROIZVODNJE I INSTALISANIH ENERGETSKIH POSTROJENJA I OPREME NA DPP „MITROSREM”

7. Dr Rajko Bernik, Aleš Zver, dipl. inž., Biotehnički fakultet, Ljubljana, Slovenija
   POLJOPRIVREDNE BILJKE KAO OBNOVLJIV IZVOR ENERGIJE (OIE)

8. Dr Rudolf Kastori, dr Miloš Tešić, Vojvođanska akademija nauka i umetnosti, Novi Sad,
   EFEKTI VIŠEGODIŠNJEG ODNOŠENJA ŽETVENIH OSTATAKA RATARSTVA SA POLJA

9. Dr Emina Mihajlović, Fakultet zaštite na radu u Nišu
   BIOMASA KAO POTENCIJALNI OBNOVLJIV IZVOR ENERGIJE

10. Dr Dragiša Tolmač, dr Miroslav Lambić, Tehnički fakultet, Zrenjanin, dr Slavica Prvulović, Tehnički fakultet, Bor
    IZVORI ENERGIJE – GEOTERMALNE I BIOMASE U SISTEMIMA GREJANJA

11. Dr Miloš Tešić, dr Đorđe Bašić, Fakultet tehničkih nauka, Novi Sad, W. Rauscher, European Center of Renewable Energy, Güssing/Austria
    EVROPSKI CENTAR ZA OBNOVLJIVE ENERGENTE U GÜSSINGU

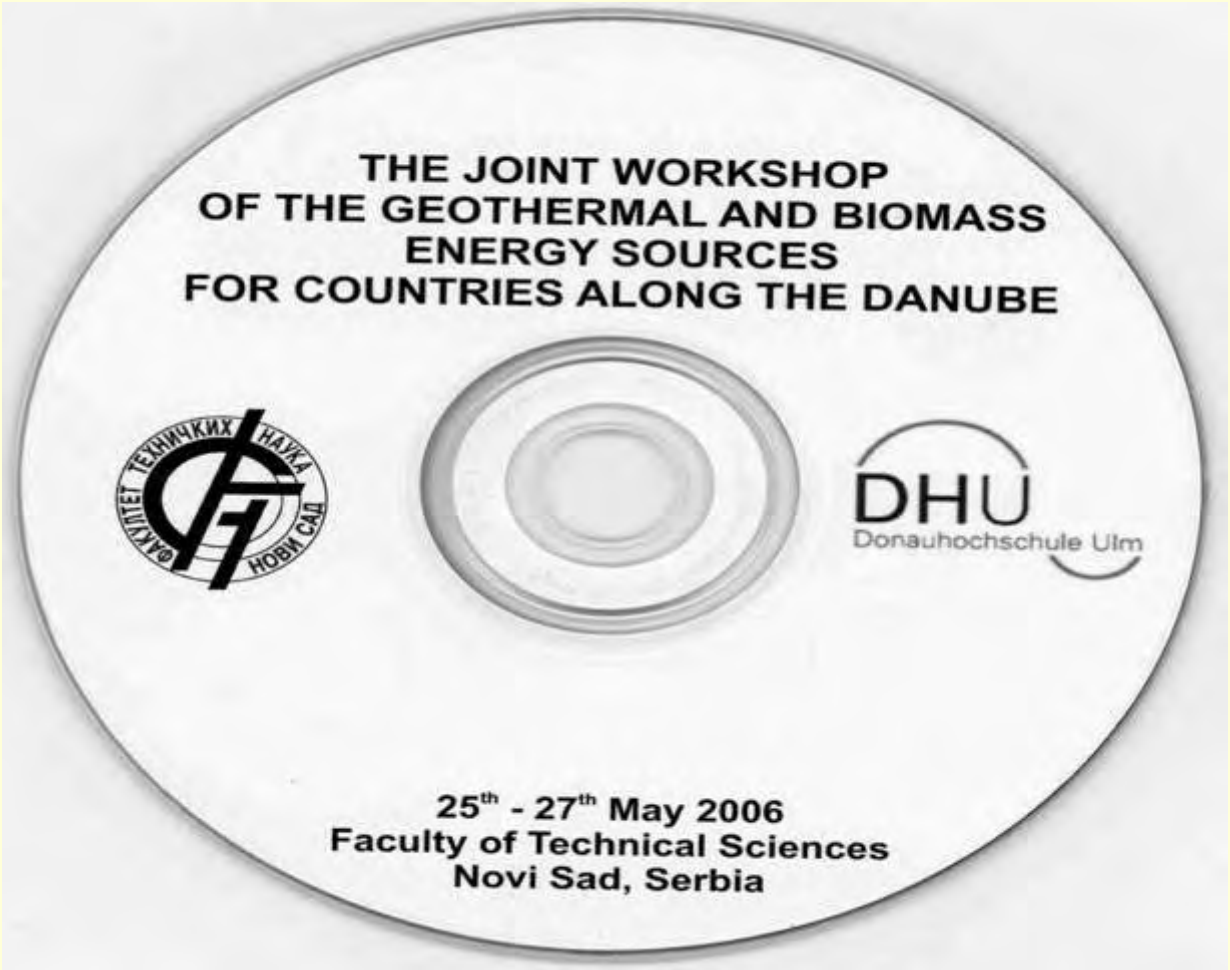
12. Dr Vladislav Zekić, dr Milenko Jovanović, Poljoprivredni fakultet, Novi Sad
    UTVRĐIVANJE TROŠKOVA SPREMANJA SLAME SISTEMOM VALJKASTIH BALA
13. Mr Saša Igić, JP Srbija – gas, Novi Sad, Zora Pekez, PD Panonske TE – TO, Novi Sad, dr Miladin Brkić, dr Todor Janić, Poljoprivredni fakultet, Novi Sad
    ODREĐIVANJE TOPLOTNE MOĆI, SADRŽAJA VLAGE I PEPELA PŠENIČNE I SOJINE SLAME
14. Damir Đaković, mr Dragana Štrbac, dr Đorđe Bašić,, dr Milan Dimić, Fakultet tehničkih nauka, Novi Sad
    MOGUĆNOSTI SUŠENJA ZRNASTIH PROIZVODA U VOJVODINI PRIMENOM OBNOVLJIVIH IZVORA ENERGIJE
15. Spec. Veselin Mulić, mr Goran Janjić, Bela Balint, Viša tehnička škola, Zrenjanin
    RADNO VOZILO ZA BRIKETIRANJE TRSKE

Zaključci

- **Sprovođenje svih izmena zakona prema odluci Vlade od 17.01.2007.**
- **Odluka o otkupnim cenama električne energije iz biomase**
- **Projekti međunarodne saradnje za biogas**
- **Možemo biti dobri partneri u zaštiti životne sredine u Evropi**

Vojvođanska akademija nauka i umetnosti i Fakultet tehničkih nauka, Novi Sad, Donauhochschule Ulm

25 učesnika, iz 5 podunavskih zemalja,
Srbija, Mađarska, Hrvatska, Slovačka, Nemačka



Renewable sources in local community development - experiences from Scandinavia

Dr. NENAD KESERIC, Director Business Development, STATKRAFT WESTERN BALKANS

Novi Sad, 8.June - 2007

Statkraft
PURE ENERGY

Workshop: PROMOTION OF RENEWABLE ENERGY SOURCES

1.

INTRODUCTION, BALKAN AND SCANDINAVIAN MARKET

2.

PRESENTATION OF STATKRAFT: HYDRO AND WIND DEVELOPMENT

3.

RES POLICIES IN SCANDINAVIA; DEVELOPMENTS IN BALKAN EL. MARKET

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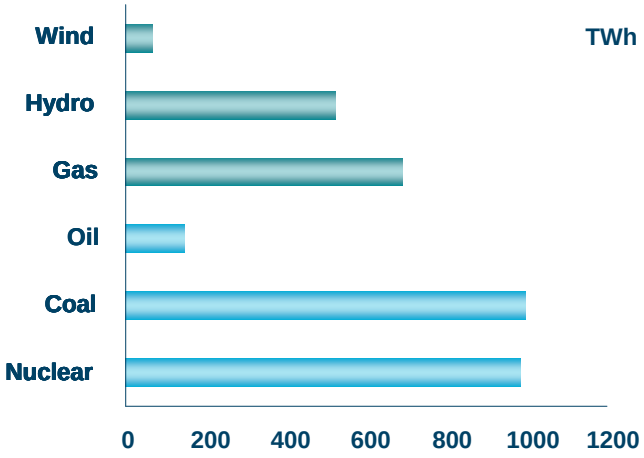
PURE ENERGY

THE ENERGY REALITY OF EUROPE

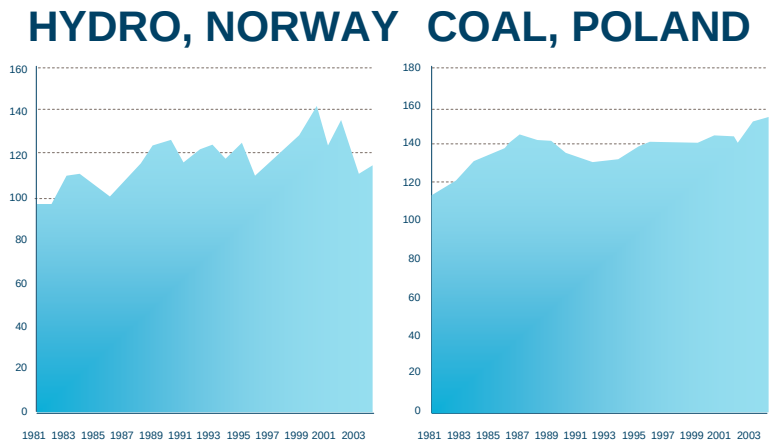
--> Sustainability

--> Competitiveness

--> Security of supply



Source: CERA, OECD Europe, gross annual generation



Source: IEA, Electricity generation per country, 1981-2005

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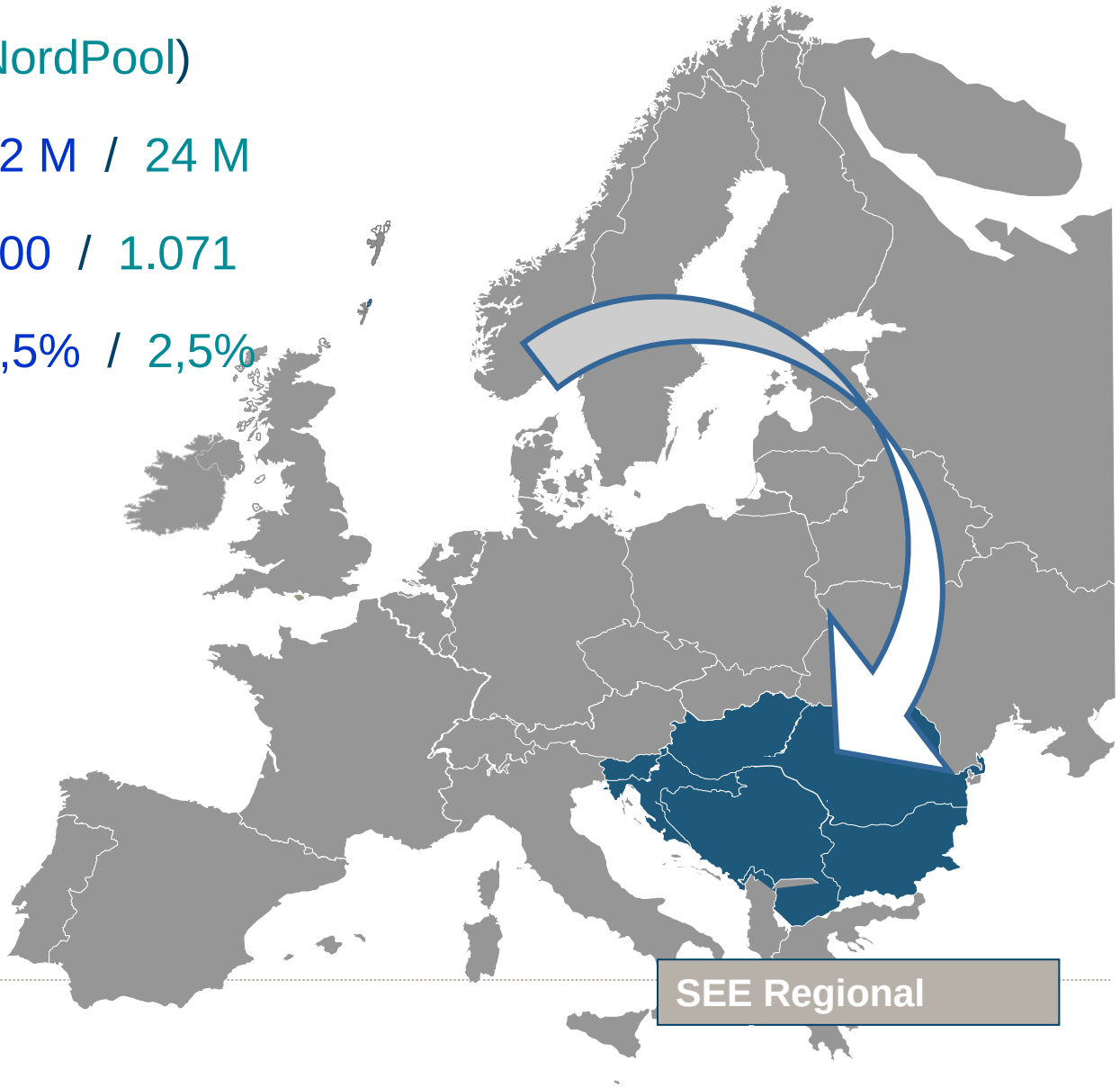
From EU-15 to EU-27 … and Beyond
Tomorrow's Europe

+ + in 2007

SCANDINAVIA & BALKAN

Key Data (SEE/ NordPool)

Population	52 M / 24 M
GDP ($B)	200 / 1.071
Avg. Growth	5,5% / 2,5%



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COMMON NORDIC ELECTRICITY MARKET
➔ SUCCESSFUL MODEL FOR BALKAN MARKET

--> 1991: Deregulation of Norwegian market

--> 1996: Deregulation of Swedish market

--> 1996: Common Norwegian- Swedish market

--> 1996: First international power exchange, Nord Pool.

--> 2000: One common Nordic electricity market

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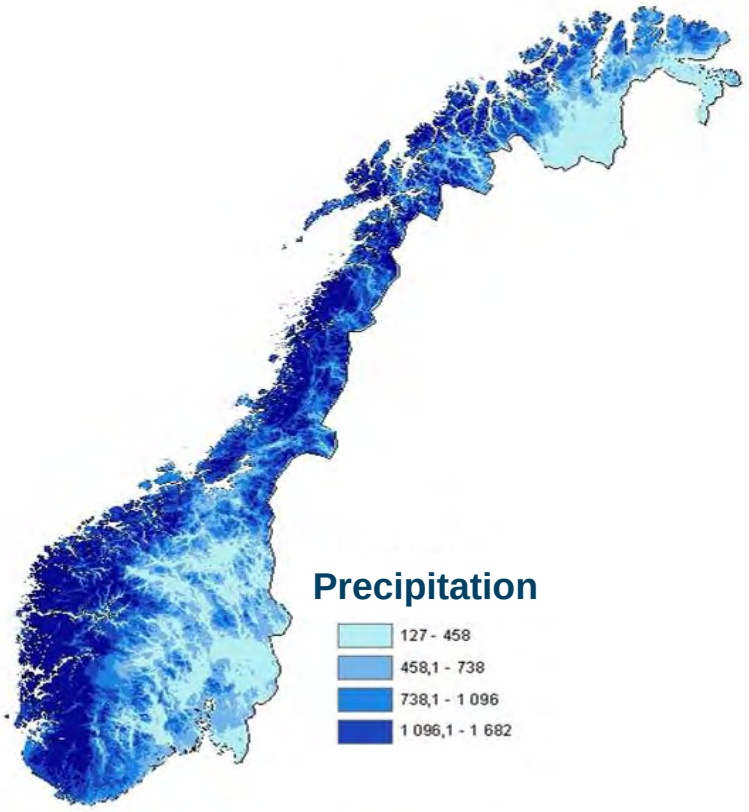
NORWAY – A HYDROPOWER NATION

- --> About 99 % of total electricity generation
- --> More than 50 % of total energy consumption
  - -- Total production approx 120 TWh
  - -- Norway is the 6th largest hydropower producing country in the world after Canada, USA, Russia, Brazil and China.



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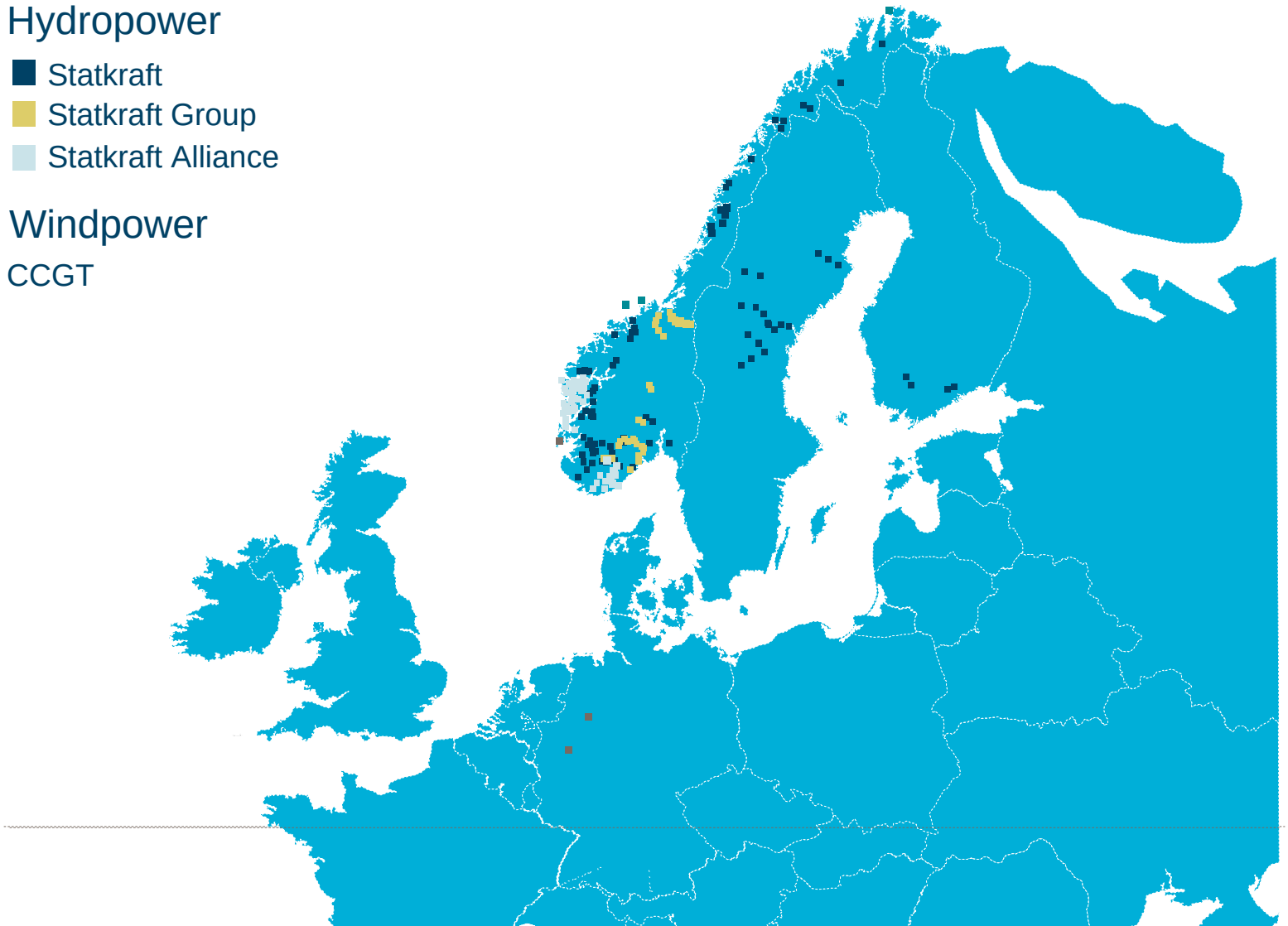
STATKRAFT-
THE NORWEGIAN POWER COMPANY



STATKRAFT TODAY

- Headoffice
- Group
- Alliance/ownership
- Corporate offices
- Baltic Cable

Statkraft

PEAK SUPPLIER TO EUROPEAN MARKETS

--> The most flexible generation capacity in Europe

--> The largest reservoir capacity in Europe

--> Among the largest in Europe in the field of power trading and origination

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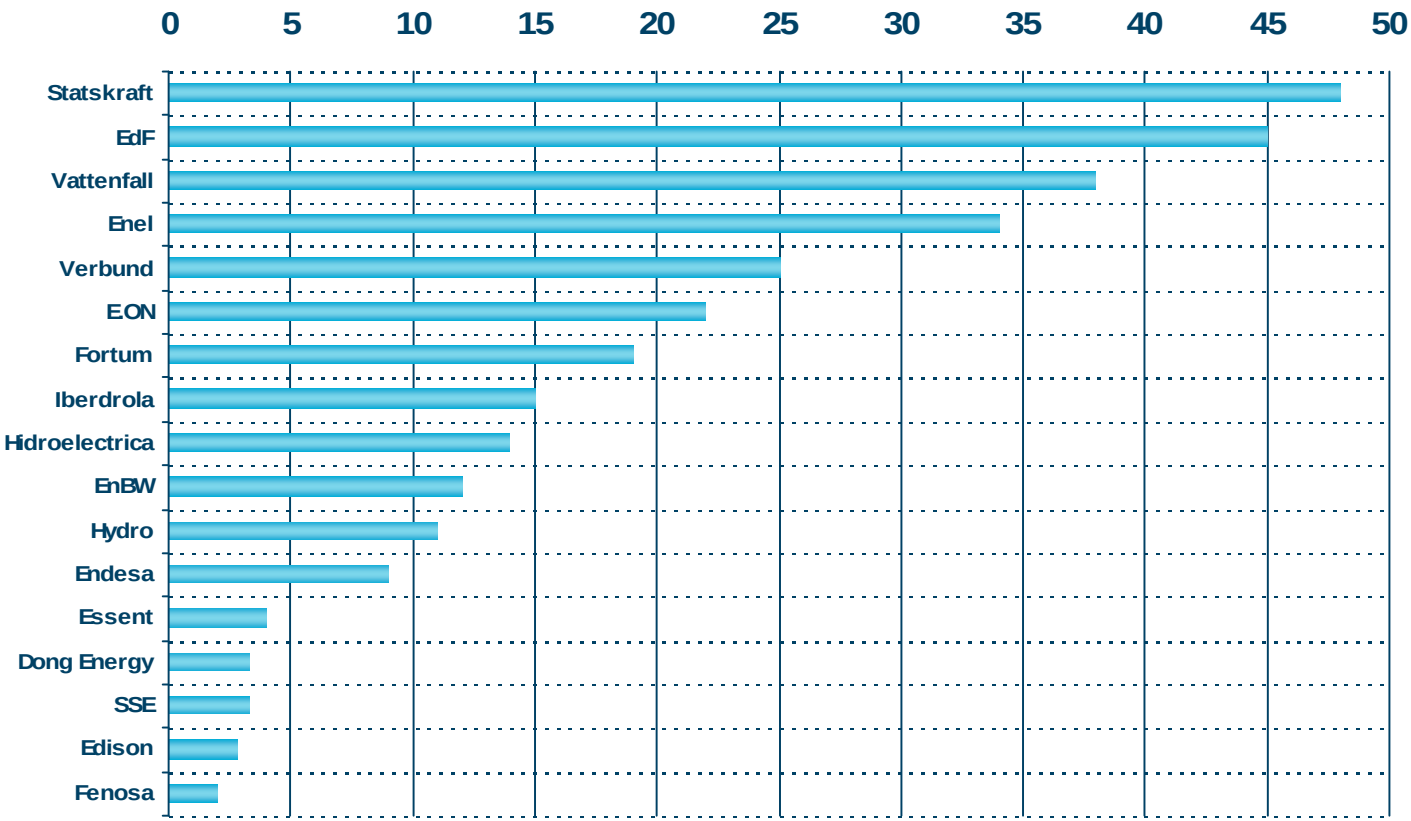
STRONG POSITION IN RENEWABLES

POWER GENERATION FROM RENEWABLES (TWH, 2005)

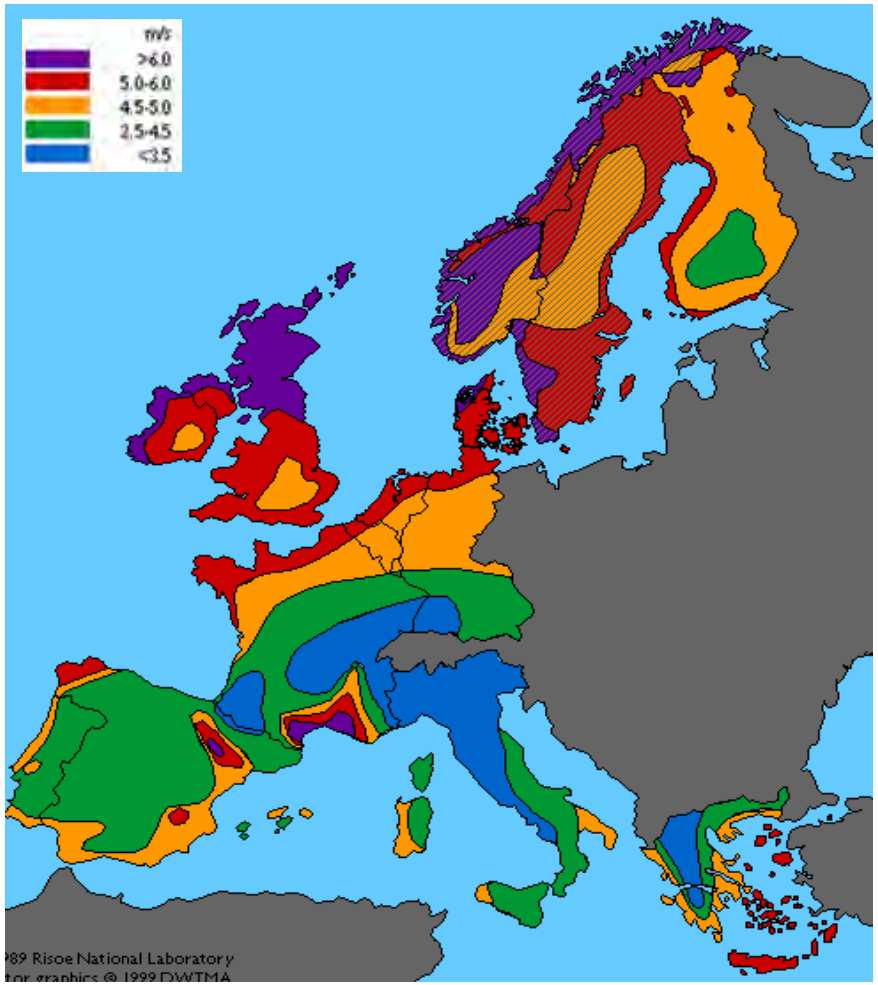


Source: Annual reports 2005, Hidroelectrica 2004 production, Dong Energy 2004 production

HYDROPOWER - FLEXIBLE AND SUSTAINABLE POWER PRODUCTION

- 100 years of hydro power experience in maximising power generation while minimising environmental impact
- Upgrading and new development in Nordic countries
- Global leverage on hydro experience, with SN Power (JV)
  - Nepal, India, Laos, Peru and Chile

DEVELOPING WIND POWER
WHERE THE WIND BLOWS…



--> Natural resources and RES support schemes

--> Grid access

--> Current Statkraft focus areas Norway and UK

--> Balkan?

Statkraft

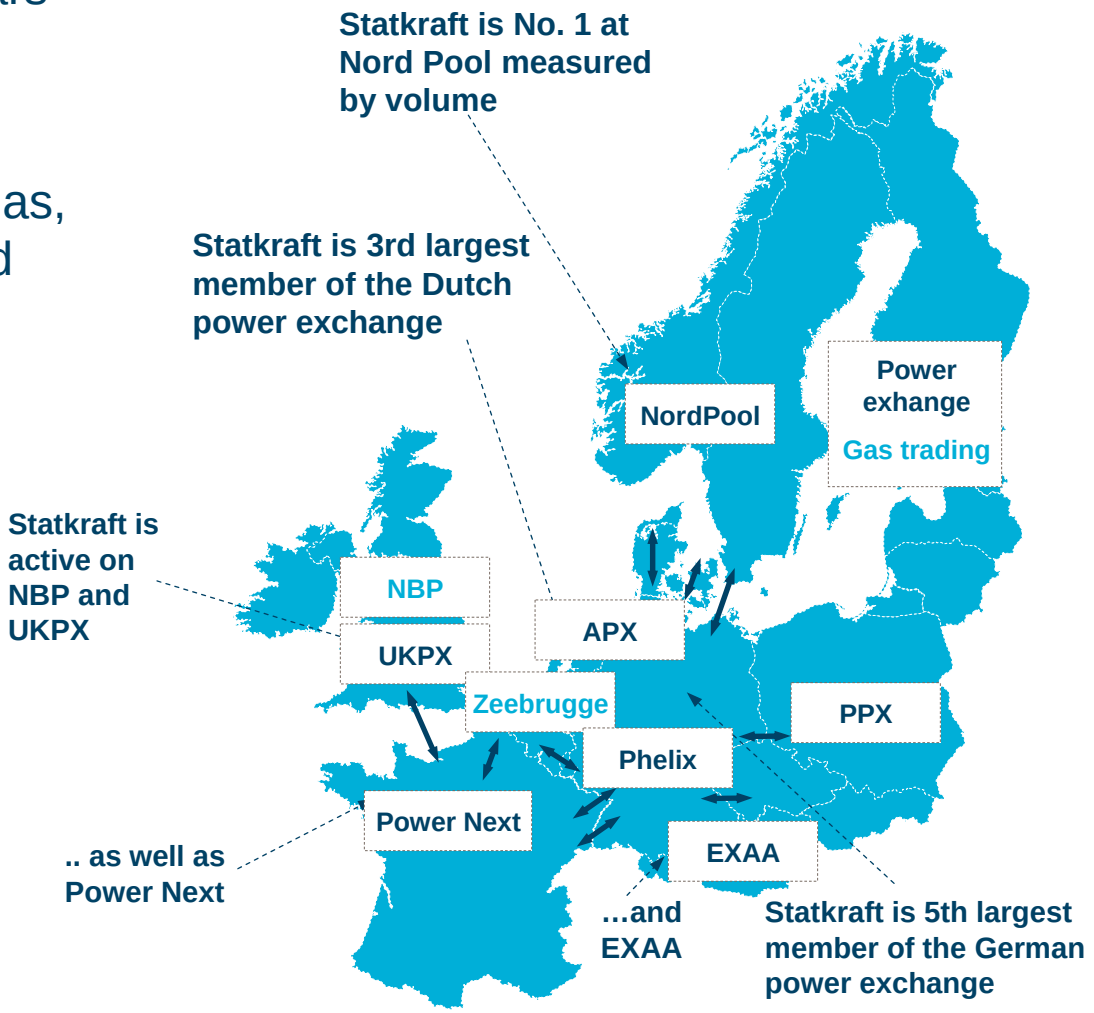
… INCLUDING ONE OF THE LARGEST WIND FARMS IN EUROPE

BUILDING A POSITION IN GAS FIRED POWER

- CCGT projects in Statkraft:
  - Knapsack, Germany
    - 800 MW
    - Investments: ~EUR 400 m
    - 100 % Statkraft
  - Herdecke, Germany
    - 400 MW
    - Investments: ~EUR 220 m
    - 50 % Statkraft
  - Kårstø, Norway
    - 400 MW
    - Investments: ~EUR 250 m
    - 50 % Statkraft
- All projects online autumn 2007
- Long term gas supply agreements

EUROPEAN ENERGY MARKETS OPEN UP...

- --> Statkraft with 15 years of experience with liberalized markets
- --> Trading electricity, gas, emission quotas and green certificates



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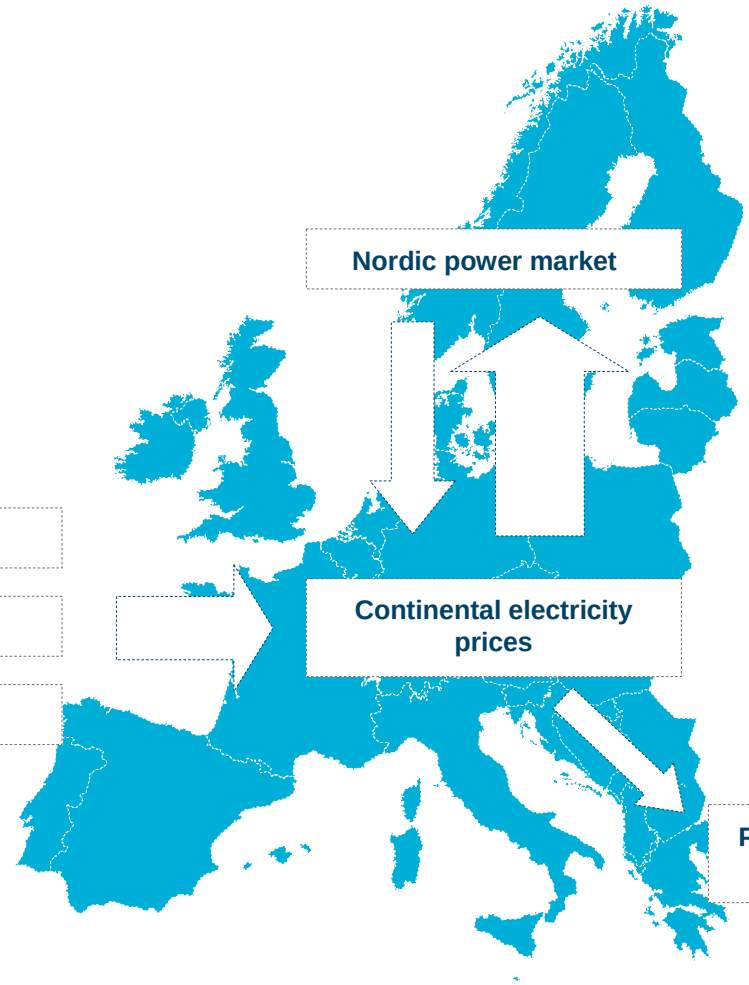
… INCREASING THE COMPETITIVE ADVANTAGE OF FLEXIBILITY



- Flexible generation
- Deep trading skills
- Comprehensive systems and forecasting
- Origination and xborder

STATKRAFT VISION

HYDROPOWER

WIND POWER

GAS POWER

- Statkraft AS Group
  - Equity value (approx) € 18 billion
  - Sales revenues 2005 € 1.9 billion
  - Net profit 2005 € 704 million
- Our vision is to be a leader within environment-friendly energy in Europe!
- Statkraft creates value for its owner, customers and society by:
  - Developing and generating environment-friendly power
  - Trading in energy and associated products
  - Meeting customer need for energy and associated services in cooperation with its partners

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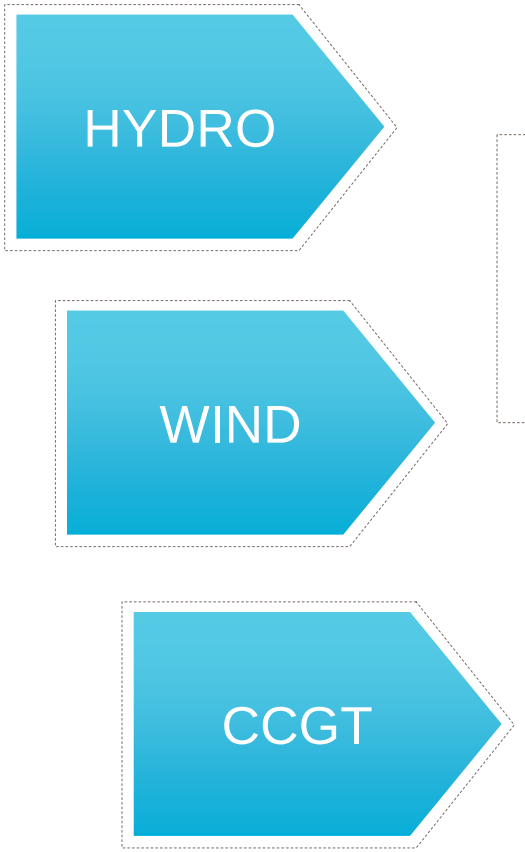
GROWING OUR GENERATION CAPACITY

--> Goals:

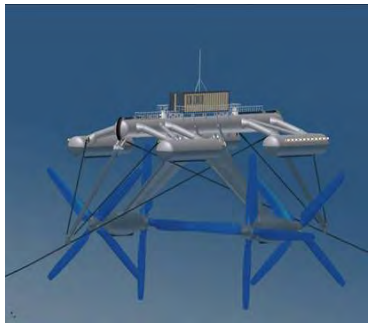
- Develop environment-friendly and profitable generation capacity across Europe
- Commercialise new technologies
- Research and technology development



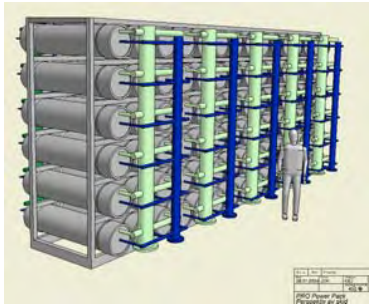
Substantial increase in generation capacity over the next ten years

TECHNOLOGY DEVELOPMENT FOR A SUSTAINABLE FUTURE

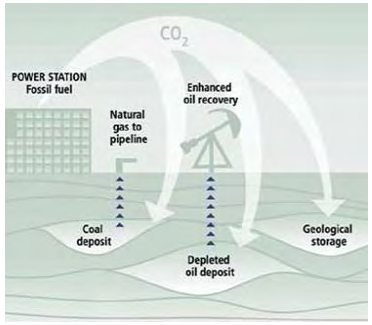
- --> Market based solutions for carbon emissions will support technological development
- --> Statkraft and partners recently awarded CDM carbon credits for hydro project in Chile (SN Power)
- --> Statkraft active in developing technologies for osmotic power and tidal power
- --> Statkraft has joined forces with research institutions, governments and other companies to support carbon capture and storage development for CCGTs



Tidal power



Osmotic power



Carbon capture

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RES POLICIES IN SCANDINAVIA

- EU policies
  - Policy on renewables -RES 2010 goals (Norway 90%, Sweden 60%, Denmark 29%)
- **Finland** Energy tax exemption combined with investment incentives. Tax refund and investment incentives of up to 40% for wind, and up to 30% for electricity generation from other RES.
- **Denmark** Premium feed-in tariffs and tender schemes for wind offshore. Settlement prices are valid for 10 years. The tariff level is generally rather low compared to the previously high feed-in tariffs.
- **Sweden** Quota obligation system / TGC. Obligation (based on TGCs) on electricity consumers. For wind energy, investment incentives and a small environmental bonus are available.
- **Norway** New energy fund NOK 10 billion (€1.2 billion/€2.5 billion from 2009) in addition to fee on distribution tariffs. Norway would create a 2.4-billion Euro (3 billion $) fund to promote renewable energy.
- The public transport system in Oslo can become a considerable consumer of biogas in the future. The planned biogas plant will have the capacity to produce biogas to fuel around 100 buses. The raw materials will be domestic food waste, commercial food waste (from institutions and restaurants) and sewage.

DEVELOPMENTS IN THE ELECTRICITY MARKET AT BALKANS

- Integration of region and with EU
  - Athens MoU and Treaty
  - Market opening 2008 (Industrial) & Full opening 2015
- Obstacles: Vertical integrated companies
- Limited or no support schemes for RES!
- Environmental issues,? Reduction of greenhouse gases-Kyoto Protocol?
- Rapid GDP growth- high demand growth and low efficiency!

- Challenges:- Liberalisation, Creation of a Regional Electricity Market
- Primary goal: Improving Competition and Market Efficiency!
- Big need for new capacity. Improve energy efficiency.
- Take care about environmental issues➔ Develop promotion schemes for RES➔ Make investment in RES viable➔ Reduction of greenhouse gases

Statkraft

INVESTMENT OPPORTUNITIES WITHIN ENERGY SECTOR AT BALKANS

- Statkraft vision is to be a leader within environment-friendly energy in Europe.
- We are interested in investment opportunities within the renewable energy sector (hydropower, wind, biomass) and gas in the following areas:
  - Investment in new greenfield projects
  - Rehabilitation of existing plants
- Support schemes for RES (feed in tariff, certificates) till now limited to Bulgaria, Romania, Croatia. Other governments should follow. Kyoto ratification and support schemes are very important to make investments possible in the Balkan countries!
- Statkraft seeks to establish long-term cooperation with local partners in the Balkans. We believe that combining expertise will build strong partnerships.

Statkraft

Thank you for your attention!

In case of further questions, suggestions, etc. …

Dr. Nenad Keseric
Director Business Development
STATKRAFT WESTERN BALKANS D.O.O
Phone: +381 11 222 3758
www.statkraft.com

VIRTUAL BALKAN POWER CENTRE

RENEWABLE ENERGY SOURCES IN WESTERN BALKANS

Steps toward greater penetration of renewable energy sources in Romania

Lucian Toma Mircea Eremia Ion Triştiu Constantin Bulac

University "Politehnica" of Bucharest

Local Workshop, Novi Sad, 8 June 2007

Sixth Framework Programme, DG Research, International Cooperation
Contract: INCO-CT-2004-509205

European Legislation

Directive 77 / 2001 / EC
It provides new measures concerning the promotion of the electricity produced from RES on the internal electricity market.

Primary legislation

GD 443 / 10 April 2003
Published in Official Bulletin of Romania Nr. 288 / 24 April 2003
It adapts the provisions of the EU Directive 77/2001 (on the promotion of production of electricity from RES on the internal market) to the Romanian specific conditions.

GD 1892 / 4 November 2004
Published in Official Bulletin of Romania Nr. 1056 / 15 November 2003
Establishes the promotion system for the electricity produced from RES.

GD 1535 / 18 December 2003
Published in Official Bulletin of Romania Nr. 8 / 7 January 2004
Assess the RES potential in Romania and establishes the strategy for RES development in the context of Romania adhesion to EU.

"ROAD MAP" (GD 890 / 29 July 2003)
Published in Official Bulletin of Romania Nr. 581 / 14 August 2003
It sets the specific tasks and targets, as well as the evolution milestones for the Romanian power market.

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Secondary legislation

A.N.R.E. Ordinance 52 / 2005

This Ordinance establishes the tariff for the electricity acquisition from the hydro producers which have not portfolio contracts and for the electricity sold by the producers which participate in the system for E-RES promotion.

A.N.R.E. Ordinance 46 / 2005

It modifies the quota obligation for GC acquisition by the electricity suppliers, for the year 2005.

A.N.R.E. Ordinance 45 / 2005

Allocation procedure for the amount of money collected from the suppliers penalties for quota non-compliance.

A.N.R.E. Ordinance 40 /2005

Regulation for Green Certificates Market organization and functioning.

A.N.R.E. Ordinance 23 /2004

Procedure for surveillance of guarantees of origin issuing for the electricity produced from RES.

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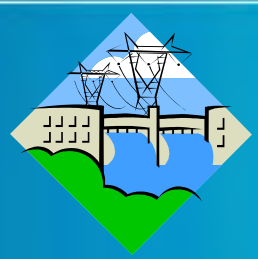
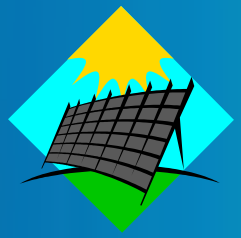
Renewable energy sources eligible to receive the benefits of GC

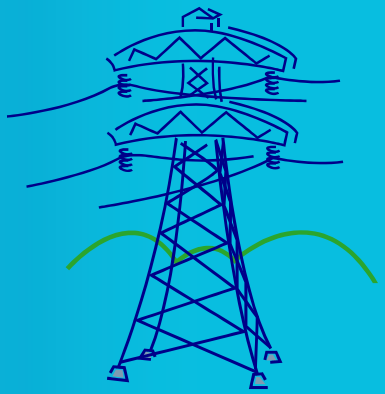


Hydro power plants ≤ 10 MW
new or refurbished after 2004



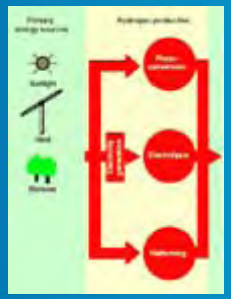
Photovoltaics

Biomass



Tidal energy

Wind



Hydrogen produced by RES

Geothermal

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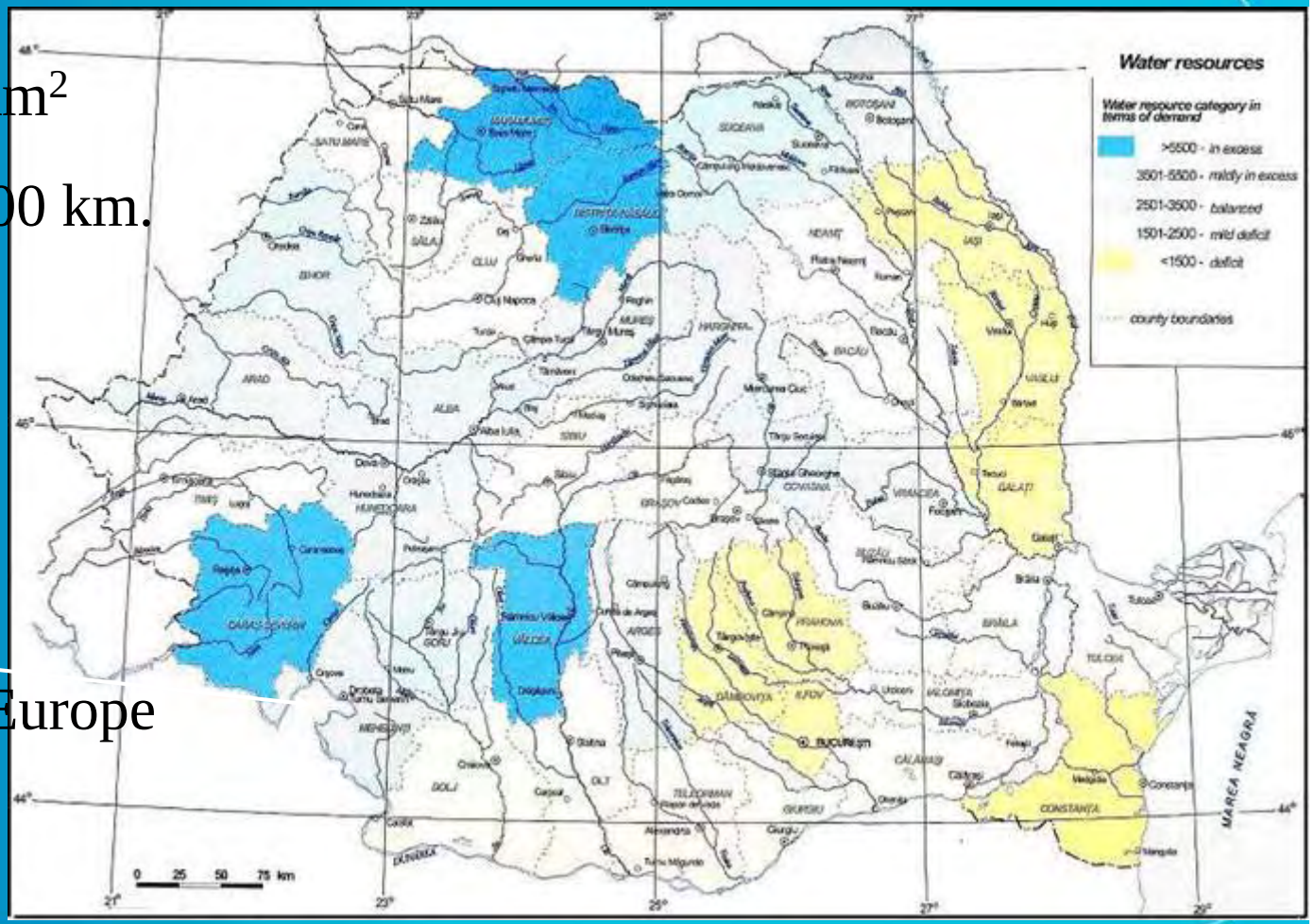
Hydro-power (1)

Surface: 237500 km^2

4000 rivers > 60000 km.

Hydro history:
… since 1880

Iron Gates I
… the biggest in Europe
… 2 × 1050 MW



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Hydro-power (2)

- ~385 HPP: installed capacity of 6319 MW = 32.3% of 19593 MW

  available capacity of 5812 MW = 33.8% of 17163 MW

- Energy produced: … it depends on the presence of rain

  In 1999 = 36.1% of the overall electricity production

- Gradually increase of the hydro energy towards 18000 GWh/year until the year 2015.

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Hydro-power (3)

Small hydro power plants (less than 10 MW capacity)

- **Technical potential = 1134 MW,**
  = 4078 GWh/year
  = 3596 hours / year
- **Economical potential = 60% – 70% of the technical potential**
  = 2447 – 3058 GWh/year
- **SHP status:**
  - **296 MHPP**
  - **365 MW installed**
  - **1082 GWh/year (in 2003)**
  - **2964 hour/year in operation**

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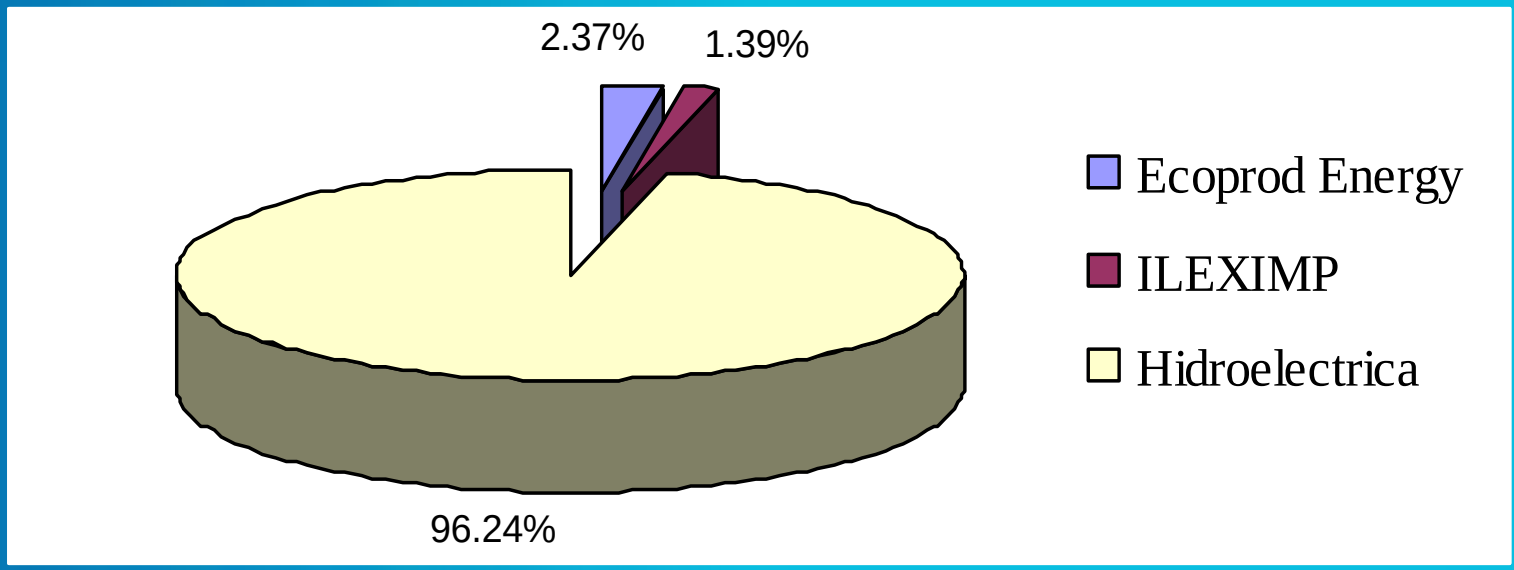
MHPP production

Energy production from RES in 2005 (source: ANRE)



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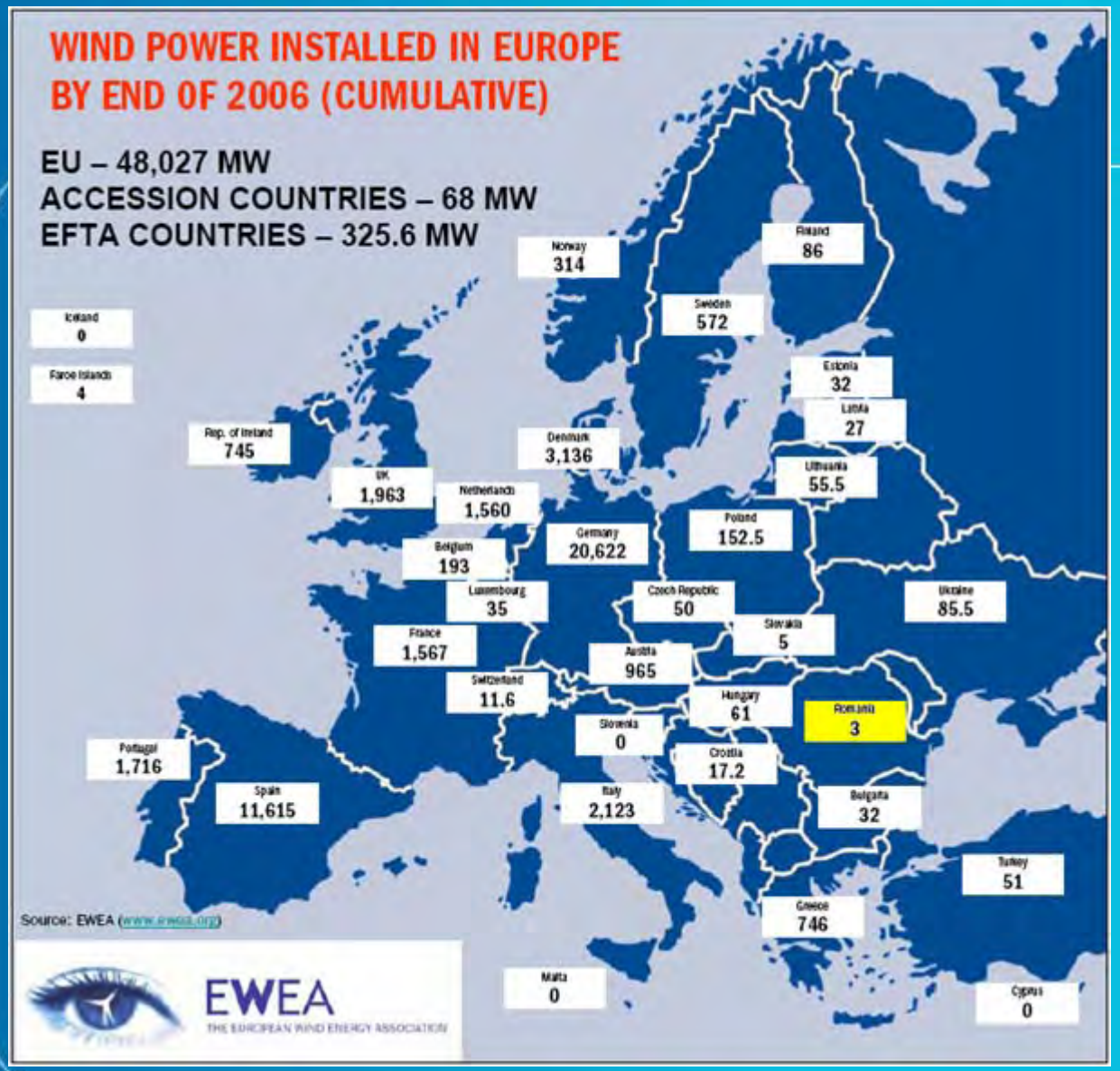

Tihuța = 250 kW

Ploieşti = 660 kW

Baia = 550 kW

Corbu = 100 kW

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Photovoltaics

28 July 2006: the first photovoltaic power plant in Romania

Installed power: 30 kWp

Location: Faculty of Electrical Engineering (Univ Politehnica of Bucharest)

Designed and installed by: ICPE

Financial support:

- 70% from FP5 project

- 30% from National Grant “Relansin”

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Geothermal

The 3rd geothermal potential in Europe: 7000×10^6 GJ/year
currently …degree of use: 22.3%

- The hydro-geothermal sources temperature
  … between 25 °C to 60 °C, in deep water,
  … and 60 °C to 125 °C, in mezzo-thermal waters.
- … the drilling depth does not exceed 3300 m
- 70 wells in operation used for hot water (60 °C)
  45 wells are currently in conservation

The best potential: Oradea, Bors, West Banat, the Getic Platform, Bucharest – Otopeni, etc.).

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Bio-fuel

- **European legislation and incentives**
  - → **Directive UE 2003/30/CE promote the use of renewable fuels, to reduce the energy import dependency and reduce the green-house emissions**
  - → **Structural funds: 40 de euro/ha (probably starting with 2007)**
- **Romanian legislation and incentives**
  - → **exempt producers of biomass from the payment of excise tax**
  - → **promote renewable fuels used by the end of 2007 must reach 2% of total consumption.**
    - ↳ **this level must increase up to 5.75% by 2010. Consequently, production must reach 100,000 tons / year and 300,000 by 2010**

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Promotion system of E-RES

Established by Govern Decision

Fixed amount – obligatory quota

Variable price – established by the market

Minimum and maximum values established by Govern Decision

(24 €/certificate – 42 €/certificate)

For producers protection

For consumers protection

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Obligatory quota system

The value of the green certificates represents a **suplementary income**

The electrical energy price is established on the Electricity Market

The supplementary green certificates are traded on the Green Certificates Market

Government Decision

Establish a fixed quota for the electrical energy produced from RES, that the suppliers must buy

Producers

Receive for each 1 MWh of electrical energy produced from RES and delivered into the network, a green certificate

Suppliers

Must own a number of green certificates equal to the imposed quota

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Trading green certificates

The number and price of green certificates are established by the market:

Bilateral market
between producer and supplier

Central market
organized by OPCOM

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Financial Incentives for renewables

- **Green certificates market**

  price of electrical energy produced from RES = 65…75 Euro

  → energy sold on the electricity market

  → green certificates

- **Obligatory quota for 2006 was 2,22% of the el. energy supplied to the final consumer**

  → total no. of green certificates issued in 2006 is 16381

  → until to 17 August 2006, only 598 GC (3,65%) were traded

  → 15783 GC are available

- **Obligatory quota for 2007 is 3.74% ; Jan – May 2007 : 14 producers, 99 buyers, 21000 green certicates have been traded**

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Business plan

Legislation: GD no. 540/2004

Authority: Romanian Energy Regulatory Authority - ANRE

The business plan must be developed in such a manner to fulfil the following main purposes:

- **to impose the self-discipline of the economic agent in the licensed activity**
- **to determine the detailed plan, step-by-step, of the activity and to anticipate the eventual problems and risks that could occur**
- **to inform the competent authority and the business partners about the technical, financial and organizational capacity of the economic agent to enter the electric power market and the investment market**

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Contract: INCO-CT-2004-509205

Guaranties of Origin (1)

Legislation: GD 1429/2004 approves the Regulatory framework for the certification of the guaranties of origin from RES.

Authority: Romanian Energy Regulatory Authority - ANRE

The guaranties of origin are used to:

- monitor the fulfillment of the national target regarding the share of electricity generated from renewables in the national gross consumption
- determine the share of electricity produced from RES in the electric energy bill of the final consumer
- give access to producers to the legal frameworks that promote the electricity generated from RES
- import/export electricity generated from renewables

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Guaranties of Origin (2)

The guaranties of origin are issued every six months:

- **for the entire quantity of electricity generated from RES and supplied in the electrical network by a producer, during the six month period**
- **with the distinction of the monthly amounts of electricity generated from RES and supplied in the electrical network for each producer**

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Contract: INCO-CT-2004-509205

Guaranties of Origin (3)

The information presented by a RES producer in order to obtain the guaranties of origin refer to:

- **the renewable source and the technology used to produce the electricity**
- **the starting and the ending date of the RES generation period for which the producer demands the guarantee of origin**
- **the location where the electricity will be generated and the name of the generating unit**
- **the installed capacity of the power plant**
- **the amount of electricity (MWh) generated each month for the period for which guaranties of origin are requested**
- **the type of financial support which the applicant has benefited**

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Contract: INCO-CT-2004-509205

Future plans

- The Romanian Energy Conservation Agency (ARCE) has drafted a law project that provides for the granting of fiscal incentives and subsidies to companies and individuals that use renewable energy sources in order to obtain thermal energy.

- The granting of the incentives will be based on projects that target obtaining thermal energy from renewable sources, such as biomass and geothermal energy and the reduction of electricity costs for the final consumer.

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Contract: INCO-CT-2004-509205

Future plans

Incentives:

- **the state could finance 30% of the purchase costs of acquiring renewable energy equipment.**
- **50% funding from state for solar panels used by domestic consumers and public buildings for the production of thermal energy**
- **reduction of VAT to 9.5% for equipment meant to produce renewable energy**
- **exemption from the payment of environmental taxes for companies using RES equipment for a period between 5 and 10 years.**
- **SMEs, commercial companies with production activity and tourism companies could benefit from 30% subsidy for the production of thermal energy from solar panels.**

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Contract: INCO-CT-2004-509205

Chances and barriers for SHPP development in Bosnia and Herzegovina

Almir Ajanović & Dženan Malović

Intrade energija d.o.o.

Sarajevo
Bosnia and Herzegovina

About *Intrade energija Sarajevo*

- Established in 2003
- First private company in Bosnia and Herzegovina with granted concessions for SHPPs
- SHPP project realization in 2003-2005:
  - ❖ Constructed four SHPPs
  - ❖ Total installed capacity 7 MW
  - ❖ Annual energy production cca 25 GWh
  - ❖ Investment 9,5 million €

About *Intrade energija Sarajevo*

In 2004 application for concession for large HPPs on river Neretva:

- Three HPPs (two HPPs on a main flow and pumped-storage HPP)
- Total projected installed capacity cca 730 MW
- Annual energy production cca 1.200 GWh
- Annual energy consumption cca 1.300 GWh
- Estimated total investment 500 million €

Engineering in RES projects

Developments in last few years regarding SHPPs:

- In last five years all necessary laws and decisions passed
- Built new 20 SHPPs – investment of cca 55 million €
- Granted more than 120 concessions (on different levels)

SHPP development – legislative preconditions

In 2002-2004 passed following laws and acts:

- "Energy Act"
- "Concession laws" on all political decision levels
- "Decision on Methodology for establishing redemption price levels of electricity generated from renewable resources with the installed power up to 5 MW" on both entities level
- Other necessary decisions and legislative acts

SHPP development – legislative preconditions

Government of Bosnia and Herzegovina adopted:

- Law on Transmission of Electric Power, Regulator and System Operator of B&H
- Law Establishing the Company for the Transmission of Electric Power in B&H
- Law Establishing an Independent System Operator for the Transmission System of B&H

SHPP development – legislative preconditions

Agencies on state level:

- Independent System Operator – ISO B&H
- State Electricity Regulatory Commission - SERC
- State electric power transmission company

Agencies on entity level:

- Regulatory Commission for Electricity in Federation of Bosnia and Herzegovina
- Regulatory Commission for Electricity of Republic of Srpska

SHPP development – SHPP potential

According to the different single Studies, the estimated technical SHPP potential in B&H amounts up to:

- 700 MW of installed capacity in over 800 SHPPs
- Approx. 2.600 GWh of annual production

More than 95% of technical SHPP potential in year 2000 unused

Since 2004 granted more than 120 concessions with:

- Total installed capacity 180 MW
- Possible annual production 950 GWh
- Estimated investment cca 310 million €

SHPP development – advantages

- Significant investment potential in RES projects
- Chance for domestic civil work companies
- Chance for domestic metalworking industry (hydro-mechanical, electro-mechanical equipment)
- Financial benefits for conceding parties:
  - ❖ In Federation of B&H: cantons and municipalities
  - ❖ In RS: Government and municipalities

SHPP development – advantages

- Already established important number of new companies for RES project development as:

  - ❖ Designing, planning and engineering companies
  - ❖ Companies for RES project realization – concessionaire
  - ❖ Equipment producer and supplier

SHPP development – chances

- Bosnia and Herzegovina to sign Kyoto protocol in July 2007
- Chance for “Green certificate” trading that improves project quality

SHPP development – barriers

- Lack of energy sector strategy (development of energy sector strategy in progress – should be finished till end of 2007)
- In spite of existing necessary laws and decisions, problems on lower decision levels – cantons and municipalities
- Data given in tenders for concession not reliable

SHPP development – barriers

- Problems regarding distribution grid connection:

  - ❖ Potential concessionaire not informed about possibilities of grid connections
  - ❖ State owned electricity generation companies (owners of distribution grid) not obliged to deploy the distribution line to the power plant
  - ❖ Significant costs for connection on distribution grid (depending on the location)

SHPP development – barriers

- At the moment very law prices for electricity produced in SHPPs:
  - 0,8×5,07 = 4,05 cents in EP BiH responsibility area
  - 0,8×3,17 = 2,54 cents in EP RS responsibility area
  - 0,8×6,31 = 5,05 cents in EP HZHB responsibility area