



## **UNDP-GEF PROJECT:**

# **„REDUCING BARRIERS TO ACCELERATE THE DEVELOPMENT OF THE BIOMASS MARKET IN SERBIA“**

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## Content:

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- Key information about the project
- Expected project outcomes
- Key project indicators and targets
- Project context
- Key challenges
- Investment Grant Support Mechanism
- Sequence of activities
- Selected biogas CHP facilities
- Project results

## KEY INFORMATION ABOUT THE PROJECT

- **Title:** Reducing Barriers to Accelerate the Development of the Biomass Market in Serbia
- **Project goal:** to increase the share of energy from renewable sources in energy mix of Serbia
- **Total value of the Project:** USD 30,475,000 as follows
  - The Global Environmental Fund (GEF): USD 2,845,000
  - United Nations Development Programme (UNDP) : USD 310,000
- **Other project participants:** USD 27,630,000 (institutions of the RS and investors)
- **Project implemented by:**
  - UNDP (4 components) and
  - The Ministry of Mining and Energy (1 component) in cooperation with the Ministry of Agriculture and Environmental Protection (NIM).
- **Project duration:** 2014 – 2019



## PROJECT PARTNERS


- **Partners who signed the Project Document:**
  - Ministry of Mining and Energy – lead partner who signed a Letter of Agreement with UNDP and
  - Ministry of Agriculture and Environmental Protection.



## PROJECT OBJECTIVE

- To increase the share of energy from renewable sources in energy mix of Serbia, namely the share of biomass in power generation


## EXPECTED PROJECT OUTCOMES

1. Improved capacity of investors to identify, develop, fund and manage bankable biomass projects for energy generation;
2. Improved institutional and legal framework for investments in biomass projects;
-  3. Successfully funded, constructed and operational 6 to 8 heat and power co-generation plants using biomass/biogas of total installed capacity of 4 MW;
4. Another investment cycle supported by the project.


## KEY PROJECT INDICATORS AND TARGETS

<https://youtu.be/hWkvK1ZB9RY>

1. Reduced emissions of equivalent CO<sub>2</sub> expressed as direct result of project activities in an amount of 1.04 Mt during 20 years of the life-cycle of investments.

 Achieved!

1. Successfully supported, constructed and in operation biomass/biogas fired CHP facilities of total installed capacity of 3 MWe.

 Overachieved! The total installed capacity is 6.32 MWe!!!

## PROJECT CONTEXT

- **Availability of great volumes of biomass in Serbia:**
  - 61% of the total potential of renewable energy sources
    - **Agriculture: 1.7 Mtoe**
    - **Forestry: 1 Mtoe**
- **As a member of the Energy Community, Serbia has undertaken to harmonize its legislation with the EU, which means specifically the application of the Directive 2009/28/EC on renewable energy sources:**
  - The share of renewable energy in gross final energy consumption is to increase to 27% by 2020, compared to 21.2% in 2009.
  - In 2013 the National Action Plan for RES of the Republic of Serbia was adopted defining objectives and measures, with biomass playing an important role



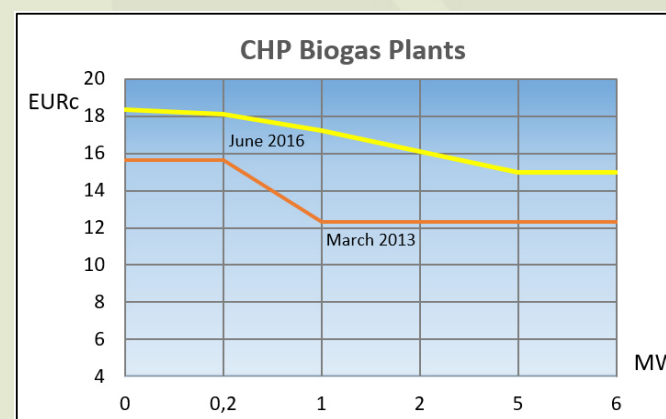
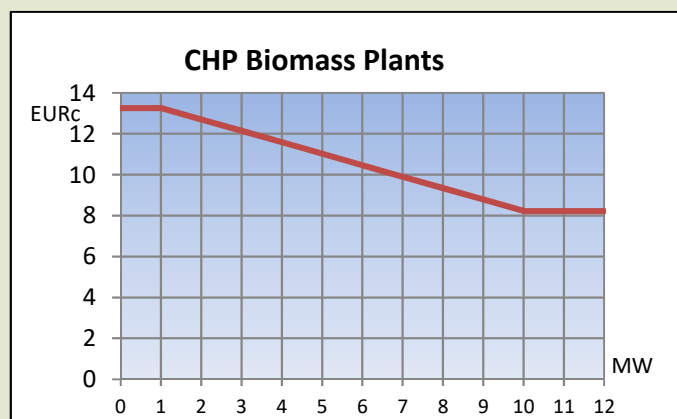
## PROJECT CONTEXT

- **Incentives for power producers from RES exist in Serbia since 2009 (revised in 2013 and 2016).**
  - Decree on incentives for power producers from RES and highly efficient CHP;
  - Decree on the Requirements and Procedure of Acquiring the Status of Privileged Power Producer (3P), Preliminary Privileged Power Producer (4P) and Producer from Renewable Energy Sources;
  - Decree on Setting on Power Purchase Agreement, etc.
- **The New Law on Energy, adopted in December 2014, introduced a number of improvements with respect to use of RES and opened new potential for investing in the free market.**

## PROJECT CONTEXT

- Incentives in Serbia for power producers from RES (as of 2009, revised in 2013 and 2016):**

Type of plant	Installed capacity R (MW)	Incentive feed-in tariffs	
		March 2013 (c€/kWh)	June 2016 (c€/kWh)
Biomass plants	Up to 1	13.26	13.26
	1 - 10	13.82 – 0.56*P	13.82 – 0.56*P
	Over 10	8.22	8.22
Biogas plants	Up to 0.2	15.66	18.333-1.111*P
	0.2 – 1	16.498 – 4.188*R	16.85-0.370*P
	Over 1	12.31	15



## PROJECT CONTEXT

- Despite the incentives for generation of power from biomass, the number of constructed plants is relatively small considering the biomass potential.
- In December 2015 installed capacity of biomass/biogas CHP plants in Serbia was only 4.8 MW.
- The share of RES in gross final energy consumption did not increase (Progress report on implementation of NREAP, December 2014).
- Biomass is mostly used in form of wood for heating (7-10% of primary energy consumption).

## KEY CHALLENGES

- Undeveloped financial mechanisms for financing biomass projects:
  - Only financial mechanisms that are available are loans or direct financing by investors' own means.
  - High up-front costs and high perception of risk among banks make debt financing difficult for project developers.
  - Energy services as per EU Directive 32/2006/EC, such as supply contracting or energy performance contracting, are foreseen by the Law on Efficient Use of Energy but are still in very initial phase of implementation.
- Although the relevant laws and by-laws are in place the PPP is not developed in field of energy supply.

## KEY CHALLENGES

- Security of long term biomass supply and demand: fragmented agricultural land (3 ha in average) and private forests (0.2 ha in average), stability of production, logistics, legal issues, etc.
- Technology and knowledge: diversity and complexity of technologies, lack of laboratories and equipment for quality assurance and R&D.

## GEF PROJECT: INVESTMENT GRANT SUPPORT MECHANISAM

- The total value of individual grants: **USD 1.6 mil USD**
- Awarded by the MME through a public call to interested investors
- Technologies: biogas, gasification and direct combust. (boiler+turbine)
- Focus on private investors
- Minimum investment value per project **1.2 mil USD**
- Individual grants per project up to **15%** of investment value, or max. **266,000 USD if the investment value exceeds 1.2 mil USD**
- Payment method: **30%** after contract signature and **70%** after plant construction and connection to the grid

## PUBLIC CALL FOR BANKS

- **In January 2015 the Ministry of Mining and Energy published a public call to banks and other financial institutions to cooperate on the project.**
- **Applications for cooperation in the project have been filed by the following interested banks which:**
  - extend loans for financing of construction of CHP plants from credit lines provided by international financial institutions (IFI) and/or from their own assets, and
  - perform the analysis of technical and financial feasibility of investment in constructing CHP plants during the process of loan approval, with the assistance of a technical consultant within the available credit lines provided by IFI or by engaging a licensed technical person for assessment of such projects.

## PUBLIC CALL FOR BANKS

- The following banks have applied to the public call :
  1. Banca Intesa a.d. Beograd;
  2. Komercijalna banka a.d. Beograd;
  3. Unicredit Bank Srbija a.d. Beograd;
  4. ProCredit Bank a.d. Beograd;
  5. Sberbank Srbija a.d. Beograd.
- KfW and EBRD have also expressed their willingness to participate in the project either by means of their direct lending facilities (DEG or WeBSDFF/WeBSFF), or indirectly by means of their credit lines available through financial intermediaries (commercial banks).
- Bidders shall not be obliged to provide financing through any of the above banks, they shall have full freedom to freely select a bank or another financial institution of their choice which is willing to provide the funding of the project proposed by the specific investor.



## GEF PROJECT: INVESTMENT GRANT SUPPORT MECHANISAM

- **Key eligibility requirements:**

- Open to companies, cooperatives and physical persons performing the registered economic activity (entrepreneurs and agricultural estates) of predominantly private or cooperative ownership;
- Must fulfill requirements for construction and commissioning of CHP plant;
- The plant uses as primary fuel biomass as defined by the Law on Energy;
- The project is mature and ready for financing:
  - Approved loan for project funding by a bank;
  - Positive assessment by a technical consultant of a bank/financial institution that the project is viable and bankable
- The plant shall not be connected to the grid before the announcement of the public call, etc;



## PUBLIC CALL FOR AWARD OF GRANTS

- **Criteria for grant award:**

1. Criterion of environmental viability **P1**;
2. Criterion of development of the region where the investment is made **P2**;
3. Criterion of how modern is the applied technology **P3**;
4. Criterion of efficiency and cost-effectiveness of the plant **P4**;
5. Criterion of full utilization of the technical potential of the plant **P5**.

The total number of points is calculated as a sum of individual points by all criteria for evaluation and equals:

$$\mathbf{P = P1 + P2 + P3 + P4 + P5}$$

## PUBLIC CALL - SEQUENCE OF ACTIVITIES

- **January 2015:** Public call to banks to participate in the project
- **8<sup>th</sup> May 2015:** Public call to investors to participate in the project
- **15 Oct 2015:** Closing of the public call



10 companies submitted applications duly!!!



- **November 2015:** 6 private companies were selected!!!
- **13<sup>th</sup> November 2015:** Contracts between the Ministry of Energy and Mining and selected private companies signed
- **December 2015:** 30% of approved grant amount was disbursed by UNDP through the Ministry of Mining and Energy
- **2016/2018:** Commissioning of the plants and disbursement of the remaining 70% of approved grants

## SELECTED BIOGAS CHP FACILITIES

	INVESTOR	INSTALLED CAPACITY	VALUE OF INVESTMENT
		MW	USD
1	Forkom doo, Beograd	0.40	1.42 mil
2	BGS gama BP doo, Bač	0.65	2.14 mil
3	BGS beta BP doo, Bač	0.65	2.14 mil
4	BGS alfa BP doo, Bač	0.65	2.14 mil
5	Biogas Energy doo, Alibunar	3.57	12.43 mil
6	Bioelektra doo, Zrenjanin	0.60	2.37 mil
	<b>TOTAL</b>	<b>6.52</b>	<b>22.66 mil</b>



<http://biomasa.undp.org.rs/?p=1354&lang=en>

<https://youtu.be/BwHLkFYMv2M>



After finalization of the selected projects the total installed capacity of biogas CHP facilities in Serbia will be increased for 130% compared to baseline year (December 2015)

## CONSTRUCTION SITES - ALIBUNAR

<b>INVESTOR (COMPANY)</b>	Biogas Energy doo, Alibunar
<b>INSTALLED POWER CAPACITY</b>	3.57 MWel
<b>INSTALLED THERMAL CAPACITY</b>	3.20 MWth
<b>INVESTMENT VALUE</b>	12.43 mil USD
<b>TOTAL EFFICIENCY</b>	83.3 %
<b>GRANT</b>	275,000 USD
<b>HEAT USE</b>	Green houses
<b>BIOMASS FEEDSTOCK</b>	25.156 t/year Corn and sorghum silage, wheat straw, waste from starch plant and pig manure
<b>MATERIAL OUTPUT</b>	Up to 20,000 t/year, of solid fertilizer and up to 50,000 t/year of liquid fertilizer



## CONSTRUCTION SITES - BAČ

<b>INVESTORS (COMPANIES)</b>	1. BGS Alfa BP doo, Bač 2. BGS Beta BP doo, Bač 3. BGS Gamma BP doo, Bač
<b>INSTALLED POWER CAPACITY</b>	3 x 0.65 MW = 1.95 MWeI
<b>INSTALLED THERMAL CAPACITY</b>	3 x 0.70 = 2.10 MWth
<b>INVESTMENT VALUE</b>	3 x 2.14 mil USD = 6.42 mil USD
<b>TOTAL EFFICIENCY</b>	81.6 %
<b>GRANT</b>	3 x 275,000 USD = 826,500 USD
<b>HEAT USE</b>	Agri-pelet production
<b>BIOMASS FEEDSTOCK</b>	23,056 t/year Sugar beat residues, sorghum silage, cattle manure, sheep manure and fruit and vegetable residues
<b>MATERIAL OUTPUT</b>	2,880 t/year, agri-pelet 6,000 t/year, fertilizer



## CONSTRUCTION SITES - BOTOŠ

<b>INVESTOR (COMPANY)</b>	Bioelektra doo, Zrenjanin
<b>INSTALLED POWER CAPACITY</b>	0.60 MWeI
<b>INSTALLED THERMAL CAPACITY</b>	0.60 MWth
<b>INVESTMENT VALUE</b>	2.37 mil USD
<b>TOTAL EFFICIENCY</b>	82 %
<b>GRANT</b>	275,500 USD
<b>HEAT USE</b>	Green houses
<b>BIOMASS FEEDSTOCK</b>	12,014 t/year Sugar beat cuts, sugar production waste and corn silage
<b>MATERIAL OUTPUT</b>	4,000 t/year, fertilizer



## CONSTRUCTION SITES - ALEKSINAC

<b>INVESTOR (COMPANY)</b>	Forkom doo, Beograd (plant located in Aleksinac)
<b>INSTALLED POWER CAPACITY</b>	0.40 MWeI
<b>INSTALLED THERMAL CAPACITY</b>	0.36 MWth
<b>INVESTMENT VALUE</b>	1.42 mil USD
<b>TOTAL EFFICIENCY</b>	84 %
<b>GRANT</b>	222,200 USD
<b>HEAT USE</b>	Green houses
<b>BIOMASS FEEDSTOCK</b>	3,118 t/year Sorghum residues, corn residues, poultry manure and cattle manure
<b>MATERIAL OUTPUT</b>	2,494 t/year, fertilizer





## CEREMONIAL COMMISSIONING OF CHP FACILITY IN BOTOŠ



<https://youtu.be/bKdxV0p2gWY>

<http://biomasa.undp.org.rs/?p=1987&lang=en>

## **COST BENEFIT ANALYSIS (CBA) OF SUPPORTED BIOGAS PLANTS**

- The economic CBAs for the biogas CHP plants supported by the Project was conducted by using the standard European Commission methodology for investment projects
- Financial inputs from each investor were transformed into economic ones for two scenarios (75% and 85% capacity utilization)
- The economic analysis was followed by sensitivity analysis
- CBAs identified the key social benefits and costs which are a direct result of inv. projects

## **COST BENEFIT ANALYSIS (CBA) OF SUPPORTED BIOGAS PLANTS**

- All grants have significant effects on the sustainability of project :
  - By stabilizing cash flows by bridging problems with financing which all investors have experienced due to delays and losses in various phases of project implementation.
  - Have a stabilizing effect in the context of long-term projections of unstable inputs (raw material) and outputs (electricity after the expiration of feed-in-tariffs). This stabilizing effect is especially strong when applying to commercial loans, as it has an effect equivalent to increasing equity, which facilitates borrowing under conditions which are not favorable for biogas projects.
  - In two cases grants were decisive for project continuation.
  - Efficiency of all grants is very high and grants generated between 2 and 3 times greater value than their original amount.

## RESULTS OF CBA

Economic benefits							
Scenario		Alibunar	Botoš	Bač alfa	Bač beta	Bač gama	Aleksinac
Capacity (MW)		3.57	0.6	0.65	0.65	0.65	0.2
CAPEX (EUR)		15,250,000	2,279,320	1,781,700	1,781,700	1,781,700	1,377,000
ENPV	1	17,162,274	3,217,744	4,334,611	4,334,611	4,334,611	1,916,400
	2	24,084,058	3,010,446	5,737,671	5,737,671	5,737,671	2,380,779
ENPV with residual value	1	43,973,650	7,505,827	8,783,750	8,783,750	8,783,750	3,837,329
	2	56,017,278	6,976,817	11,462,721	11,462,721	11,462,721	4,605,390
ERR	1	15.13%	17.56%	26.27%	26.27%	26.27%	32.97%
	2	18.39%	16.70%	30.89%	30.89%	30.89%	38.54%
ECB ratio	1	1.77	1.85	2.31	2.31	2.31	2.63
	2	2.08	1.79	2.74	2.74	2.74	3.02
Non-monetarised externalities							
Job creation (FTE equivalent)		41	12	13	13	13	8
GDP growth (EUR/year)		1,751,340	307,874 – 660,667	250,258 - 462,265	250,258 - 462,265	250,258 - 462,265	107,039-130,440
Increase of tax base - salary tax and corporate profit tax (EUR/year)		54,029 49,000-230,00	15,974.66 81,310	15,974.66 10,813 – 42,614	15,974.66 10,813 – 42,614	15,974.66 10,813 – 42,614	13,775 7,000 - 10,500
Improved living conditions in local community							
Increasing the use of biomass-biogas							
Improving the local power distribution network							
Technological improvement							
Reducing pollution and waste							



## **DEVELOPING INSTRUMENTS FOR ENSURING FINANCIAL SUSTAINABILITY OF INVESTMENTS IN BIOMASS FIRED PLANTS**

- 5 model contracts for long term biomass supply
- Elaborated technical catalogues of agricultural and woody biomass

## DERISKING INSTRUMENTS: MODEL CONTRACTS FOR LONG TERM BIOMASS SUPPLY ALONG WITH DETAILED TECHNICAL CATALOGUES OF AGRICULTURAL AND WOODY BIOMASS



[http://biomasa.undp.org.rs/?page\\_id=940&lang=en](http://biomasa.undp.org.rs/?page_id=940&lang=en)

## ENHANCING REGULATORY FRAMEWORK: METHODOLOGY AND MODEL REPORT

for reporting of privileged power producer from biomass/biogas plants to Ministry of Mining and Energy in line with decree on the requirements and procedure of acquiring the status of ppp, pppp and power producer from renewable energy

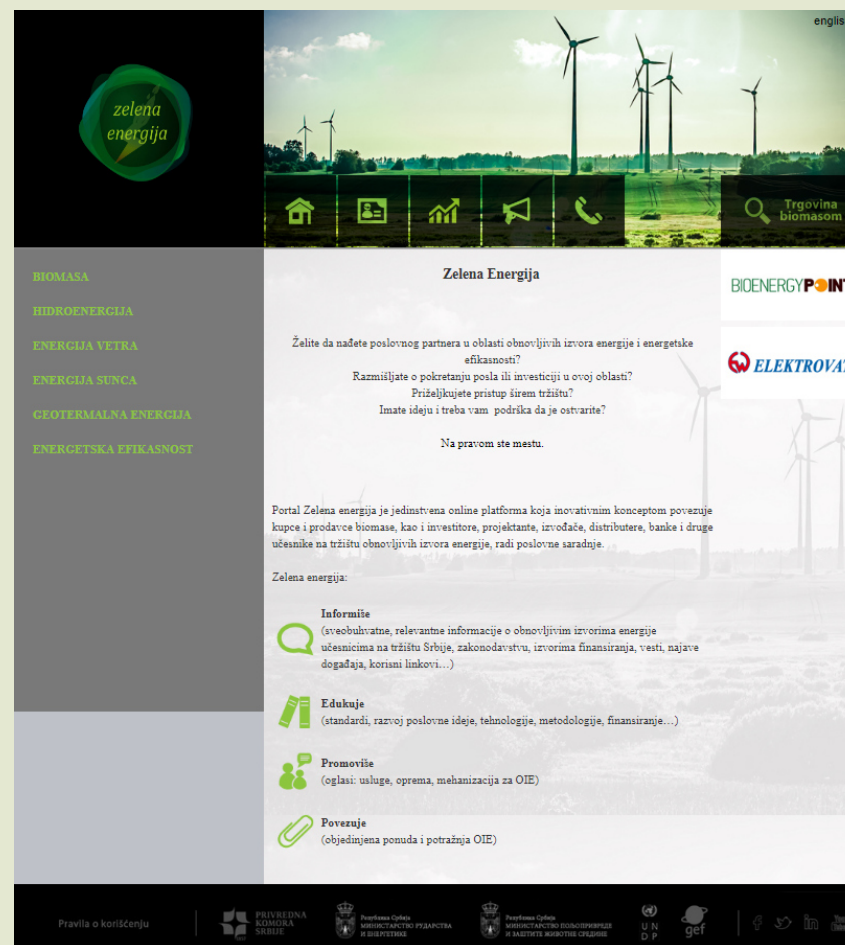


## SUPPORT TO BIOMASS MARKET: COOPERATION WITH CHAMBER OF COMMERCE AND INDUSTRY OF SERBIA

### DEVELOPED WEB PORTAL “GREEN ENERGY” ALONG WITH THE BIOMASS E-TRADING PLATFORM

<http://zelenaenergija.pks.rs/>

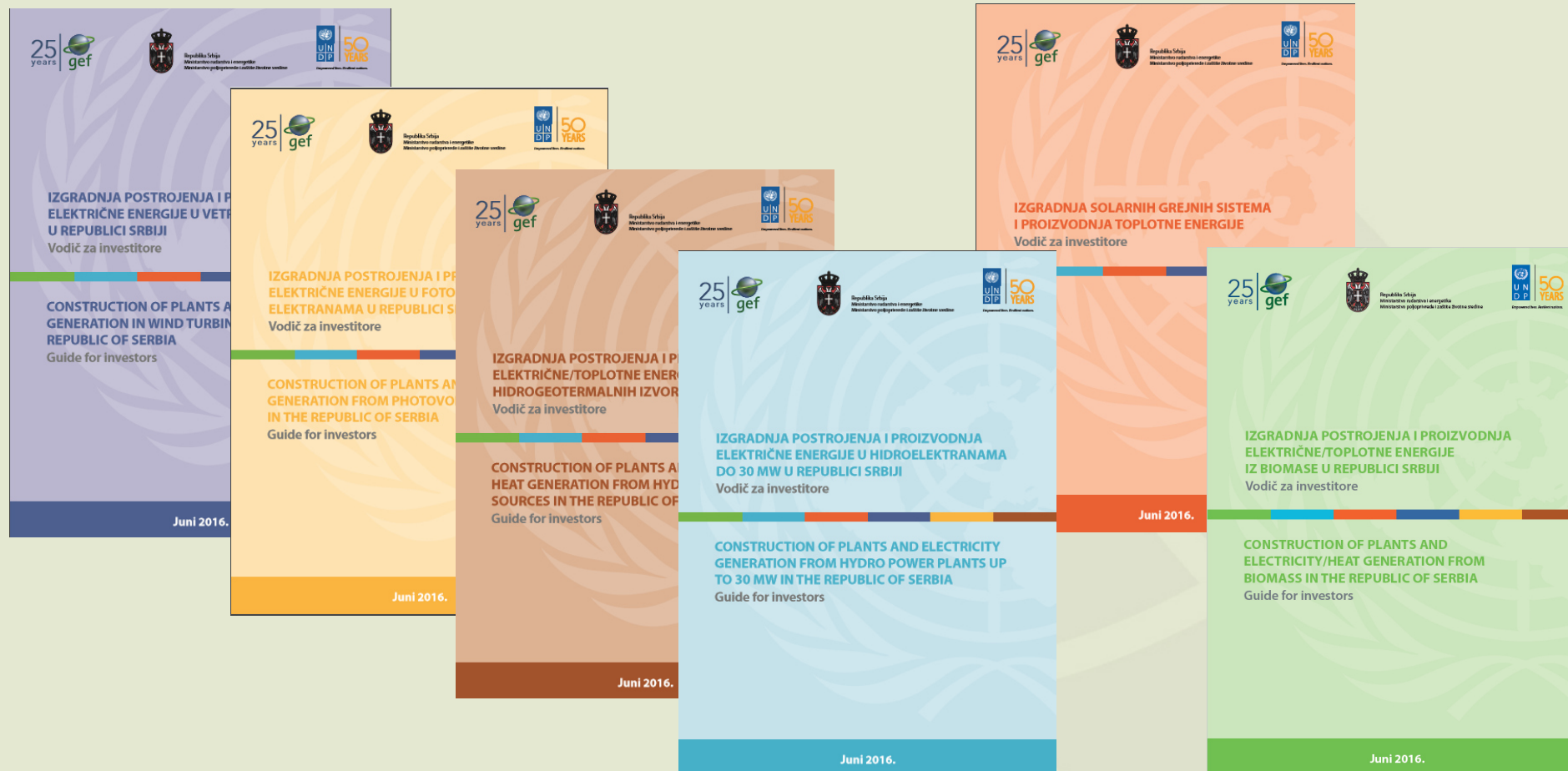
<https://youtu.be/noYW37Xf9uU>



The screenshot shows the web portal for 'Zelena Energija'. The top navigation bar includes a home icon, a document icon, a bar chart icon, a megaphone icon, and a phone icon. The main content area is titled 'Zelena Energija' and features a search bar with the text 'Trgovina biomasom'. Below the search bar, there are several sections: 'BIOMASA', 'HIDROENERGIJA', 'ENERGIJA VETRA', 'ENERGIJA SUNCA', 'GEOTERMALNA ENERGIJA', and 'ENERGETSKA EFIKASNOST'. The main text area contains a message: 'Želite da nađete poslovnog partnera u oblasti obnovljivih izvora energije i energetske efikasnosti? Razmišljate o pokretanju posla ili investiciji u ovoj oblasti? Priželjkujete pristup širem tržištu? Imate ideju i treba vam podrška da je ostvarite? Na pravom ste mestu.' Below this, there is a description of the portal: 'Portal Zelena energija je jedinstvena online platforma koja inovativnim konceptom povezuje kupce i prodavce biomase, kao i investitore, projektante, izvođače, distributere, banke i druge učesnike na tržištu obnovljivih izvora energije, radi poslovne saradnje.' The portal also offers services: 'Informiše' (sveobuhvatne, relevantne informacije o obnovljivim izvorima energije učesnicima na tržištu Srbije, zakonodavstvu, izvorima finansiranja, vesti, najave događaja, korisni linkovi...), 'Edukuje' (standardi, razvoj poslovne ideje, tehnologije, metodologije, finansiranje...), 'Promoviše' (oglasi: usluga, oprema, mehanizacija za OIE), and 'Povezuje' (objedinjena ponuda i potražnja OIE). The footer contains logos for the Ministry of Mining and Energy of the Republic of Serbia, UNDP, and the Chamber of Commerce and Industry of Serbia.



## SUPPORT TO INVESTORS: 6 GUIDES FOR INVESTORS IN RENEWABLE ENERGY FACILITIES



[http://biomasa.undp.org.rs/?page\\_id=984&lang=en](http://biomasa.undp.org.rs/?page_id=984&lang=en)

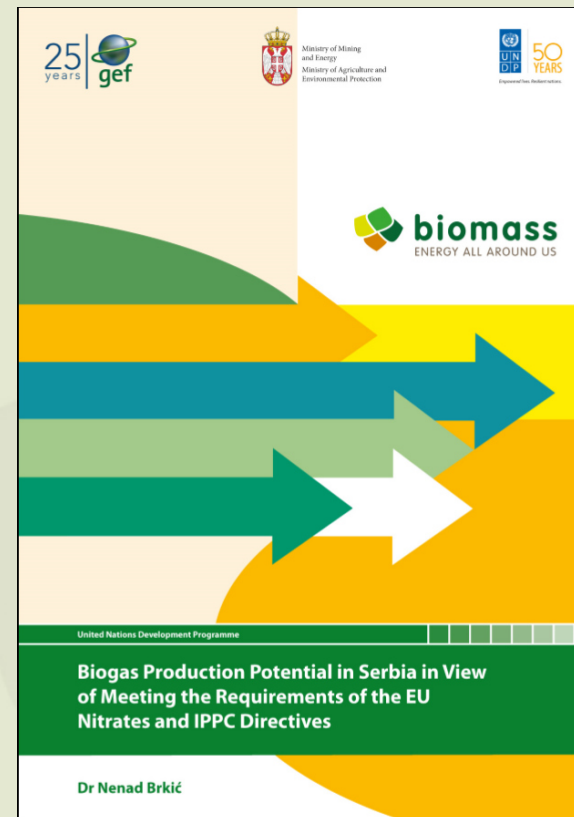
## SUPPORT TO INVESTORS: ENERGY CROPS IN SERBIA – POTENTIALS AND BARRIERS



[http://biomasa.undp.org.rs/wp-content/uploads/2017/12/Izvestaj\\_engleski\\_26\\_11\\_2017\\_.pdf](http://biomasa.undp.org.rs/wp-content/uploads/2017/12/Izvestaj_engleski_26_11_2017_.pdf)

## ENERGY AND ENVIRONMENT CROSS CUTTING ISSUES:

- Study on Biogas Production Potential in Serbia in View of Meeting the Requirements of the EU Nitrates and IPPC Directives



## EDUCATION: TRAININGS ON THE SITE FOR STUDENTS FROM TECHNICAL FACULTIES IN BELGRADE AND NOVI SAD



<https://youtu.be/olsRnkyN3qA>

<http://biomasa.undp.org.rs/?p=2367&lang=en>



## Thank you for your attention

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