

Promoting Small Hydropower in Romania

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Abstract: The paper presents a European scale project and initiative for promoting the small hydropower as one of the most important renewable energy source. The background includes the contradictory statements of the WFD and RES-E Directive. A European running project is presented, whose goal is to prepare an updated database for the small hydropower sector within the EU Member States, to support them in producing their Renewables National Action Plans. Finally, a scenario is presented regarding the installed capacity and the annual energy output of the hydropower sector within European Union countries.

Key words: small hydropower, hydropower, renewable energy sources, SHPSTREAMMAP

Rezumat: În lucrare se prezintă un proiect și o inițiativă la nivel European, pentru promovarea microhidroenergiei ca una dintre cele mai importante resurse regenerabile de energie. Acestea se derulează pe fondul contradicțiilor dintre Directiva Cadru a Apei și Directiva pentru producerea energiei electrice din SRE. Se prezintă un proiect european în derulare a cărui finalitate o va constitui o bază de date actualizată în domeniul microhidroenergiei pentru țările membre ale Uniunii Europene și al cărui scop este să le fie acestora suport la elaborarea planurilor naționale de acțiune în domeniul energiilor regenerabile. În final se prezintă un scenariu privind puterea instalată și producția anuală de energie electrică în hidrocentrale în țările membre ale UE.

Cuvinte cheie: microhidroenergia, hidroenergetica, resurse de energie regenerabile

Notations

EAC	- Executive Agency for Competitiveness & Innovation;
EC	- European Commission;
EREC	- European Renewable Energy Council;
ESHA	- European Small Hydropower Association;
EU	- European Union;
EU-27	- EU after the 1st of January 2007 (including Romania);
IEE	- Intelligent Energy Europe;
IHSD	- Institute for Hydropower Studies and Design;
NREAP	- National Renewable Energy Action Plan;
RES	- Renewable Energy Source;
RES	- Electricity from Renewable Energy Sources;
ROSHA	- Romanian Small Hydropower Association;
SHP	- Small Hydropower Plant;
WFD	- Water Framework Directive;
RES-E	- Electricity from Renewable Energy Sources.

Contributions

The authors present two actions at European scale, managed by ESHA, where Romania is part of, for the promotion of the micro hydro energy, within the framework of the WFD and of the RES-E directive.

1. Introduction

Romania entered EU at the 1st of January 2007. As a result, the whole European legislation has to be transposed into national legislation for RES in general and for SHP in particular. Two of the European Directives are the most influencing ones for the small hydropower

sector: the WFD and the RES-E Directive.

In order to facilitate and to increase the knowledge between old European countries and the new Members, there are co-operation programs at the EC level are now in progress.

In the SHP sector, apart from EC, EREC is the umbrella organization of the European renewable energy industry, trade and research associations [1]. Created on April 13, 2000, EREC is active in the sectors of bioenergy, geothermal, oceanic, small hydropower, solar electricity, solar thermal, and wind energy.

One of the non-profit associations and federations which compose EREC is the ESHA [2]. The European Small Hydropower Association (ESHA) was founded in 1989 as an initiative of the European Commission and it is a non-profit International Association representing the sector of the small hydropower. In Romania, the national association is ROSHA, member of ESHA, and has to become the pole of small hydropower for actors within this sector [3].

2. The SHPSTREAMMAP project

ESHA is the leader of a new European project in the framework of the European Commission, EACI [4], IEE - The Intelligent Energy - Europe program, described as the EU's tool for the funding actions in the energy field [5]. This is one of the issues following the ambitious: „3 times 20 target“ – 20 per cent less greenhouse gases, 20 per cent better energy efficiency, and a 20 per cent share of renewables. The IEE comes in support of these objectives by tackling the „softer“ factors: removing the market barriers, changing the behavior, creating a more favorable business environment for the growing energy efficiency and for the renewables markets, and making EU energy policies better understood in Europe's communities and regions.

The objective of the project is to define a clear and a consistent Road Map for the SHP sector, applicable to the current prospects of the ongoing EU Energy and Climate Change Packet regulations based on the real situation of the SHP sector at present [6]. In order to reach this goal it is strictly necessary to define a unique source of information on reliable SHP data. ESHA aims at creating a common and central database on SHP data covering the different aspects of the sector and thus becoming the EU “official” body for collecting and publishing the SHP data. In this respect, collecting the information was extended for the entire hydropower sector.

Considering the ESHA experience with previous projects, like BlueAge (ALTENER) the Thematic Network on SHP (FP5) and SHERPA (EACI), they faced the problem of collecting accurate, reliable and timing data on the sector and therefore we appreciate that we need the EU support to carry out this exercise with its official support [2].

The ESHA partners in this project are: Lithuanian Hydropower Association – LHA: collecting data for the Baltic countries, Italian Renewable Energy Producers Association – APER: for Italy, France Hydro Electricity – FHE: for France, Slovenian Small Hydropower Association

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– SSHA: for Slovenia, Bulgaria and Balkan countries, Swedish Renewable Energy Association – SERO: for Nordic countries (Finland, Sweden, Denmark), Institute of Hydroelectric Studies and Design – IHSD: for Romania, British Hydropower Association – BHA: for United Kingdom and Ireland, Polish Hydropower Association – PHA: for Poland and certain Eastern countries, Portuguese Renewable Energy Association – APREN: for Portugal and Spain, and Belgium Renewable Energy Federation – EDORA: for Benelux countries.

The project will group for the first time the sectors needs, barriers and challenges in a common, centralized, accurate and realistic way, thus offering a valuable reference for the European Commission in terms of monitoring the successful implementation of the RES-Directive. It complies as well with the IEE program priorities for 2008 by assisting the EACI in gathering of reliable data of the SHP technology including quantifications of each market, potential, trends, installed capacity, energy production, fees, prices, capital and operation and maintenance costs, timeframes and rates of projects approvals. It will also assist and facilitate the workload in defining the Commission Renewable Energy Road Map.

The major output of the project is the definition, drafting and publication of a Stream Map for SHP. A draft of the Stream Map is expected in 2010. During the year 2011 a validation process will take place both in theory and in practice. This validation process will include not only the engagement of the scientific community, but also the organization of different workshops at a national level where the key actors of the project will be involved. Based on the results of the validation process, the final Stream Map will be published by 2012 and the results will be widely distributed and specially concentrated on the target group identified in this proposal. In order to draft the Stream Map in 2010, a whole process of data and information collecting, quality control, analysis of the hydropower in general and the SHP in particular will be carried out during the year 2010 (as soon the project starts). This collection of inputs will be done in a concentrated and concise way by making use of a new hydro database. This database will include two dimensions: one covering the availability and storage of hydro statistics and data (the database will be structured into three parts: energy, market and policy) and the other one including a living platform of best cases where all stakeholders and the public in general will have the opportunity to exchange experiences, and analyze case studies, wrong decisions, worst cases, educational exchange etc.

3. The Questionnaire to collect data and issues of the project

In order to collect the data a questionnaire was conceived. The definitions of the terms that appear in the questionnaire were discussed and they are included in a file.

The information was organized into 3 parts / topics: energy, market and policy. The most important definitions and observations are presented below.

In Part I, *energy data*, the requested information are referring to: *annual electricity net generation, installed capacity, annual electricity consumed for pumping, plants under construction, planned plants (with concession), gross theoretical potential, technically feasible potential,*

economically feasible potential, economically feasible potential with environmental constraints taken into account.

The definitions of *run-of-river* as plants without or with very small water storage capability, having the filling period less than 2 hours, are very important. Other definitions refer to the *storage plant*, respectively *poundage*, with the filling period of 2 to 400 hours, and to the *reservoir* with a filling period higher than 400 hours (source: UNIPEDE).

Another very important issue of this part is the *normalized electricity generation from hydropower*, calculated using a normalization rule as set out in Annex II of Directive 2009/28/EC [7].

The distinction between different heads for the characterization of hydropower plants is as follows: high head: 100 m and above, medium head: 20 - 100 m, low head: up to 20 - 30 m.

In Part II, *market data*, the requested information are referring to: *employment*, considered with the following branches: *hydraulic equipment suppliers, civil works, engineering activities, maintenance services and others (legal assistance, economical and environmental consultants); investment cost [EUR/MW]; cost per kWh produced; operation and maintenance (O&M) costs; lifetime of the mechanical equipment; cost of the civil works; energy payback ratio; the internal rate of return (IRR).*

In Part III, *policy data*, the requested information are referring to: *current support mechanism*, which includes: *investment aid, tax exemptions or reductions, tax refunds; renewable energy obligation support schemes* including those using *green certificates*, and the *direct price support schemes* including *feed-in tariffs and premium; type support and measurement*, which includes two categories: *regulatory price-driven strategies* and *regulatory quantity-driven strategies; concessions and legislation.*

The EC recommendation is to consider the small hydropower plant as a hydropower plant with the installed capacity lower or equal to 10 MW. There are countries where the support schemes for the electricity generated using renewable sources are allotted using other criteria. For this project the recommendation is to use national divisions between small and large hydro in this section and to mention it.

The questionnaire containing questions about energy, market and policy data will be translated into the national language of each Member State and sent to the factors directly implied in small hydropower in order to directly collect the necessary data.

4. Draft for an Energy Policy Scenario

The European Commission is currently working at setting the 2030 and 2050 RES scenarios. EREC is contributing to this work by representing all RES. EREC will present the estimated figures and predictions from the industry point of view of all RES technologies.

In this respect EREC is preparing a document called RE: Vision 2050. For this purpose ESHA has been asking its members to submit the estimated figures. The preliminary results and discussions took place during the EREC

Board meeting of November 27 2009 at the REH in Brussels. Some interesting remarks and additional work are needed, therefore, this paper shows in which state Hydro is represented and the work and deadlines to be fulfilled in the near future. The estimations for Romania are presented in table 1.

Table 1

Estimations for the evolution of hydropower sector for 2030 and 2050

	Installed capacity at 2008 [GW*]	6.42
2030	Installed capacity [GW]	8.4
2050		9.3
	Electricity generation in 2008 or average/ most recent years TWh*	17.1
2030	Electricity [TWh]	22.6
2050		25.1
	Technically feasible potential [TWh] („ceilling“)*	40

* Source: *Int. Journ. HP & Dams, 2009 World Atlas & Industry Guide*

The problem with this information is that the figures forecasted in EREC for 2020 are higher than the ones in 2030 and 2050, which looks very strange and not good for the sector. The explanation is that (a) the 2020 figures already published in the EREC road map were not submitted by ESHA and (b) the 2030 and 2050 figures do not include the entire EU-27 since it can be seen in Table 1 that there are still many countries missing, in particular some important ones, like Sweden. Another issue is that for the 2030 and 2050 figures the methodology has been clear and we only presented the economic potential, while for 2020 we do not exactly know where these figures come from.

Two important notes for Hydropower, from the ESHA point of view, are that it would be better to make a distinction between small and large and that it is necessary to discuss the issue of pumping in order to avoid double counting.

For Romania, the evolution of the installed capacity is considered to be 8.4 GW in 2030 and 9.3 GW in 2050, and the estimations of the electricity production are 22.6 TWh in 2030 and 25.1 TWh in 2050. Data were determined by the authors on the basis of [8].

Table 2 presents the installed capacity, the annual production of energy and the share of energy from the total production in 2008. [9]

Table 2

Place of hydropower in the total energy mix in 2008

	Nuclear	Coal	Hydrocarbon	Hydropower
Installed capacity [MW]	1413	7478	5306	6422
Annual energy [GWh]	11223	27531	8902	17105
Share of energy [%]	17.33	42.50	13.74	26.41
	Wind	Total	Export	Total consumption
Installed capacity [MW]	10,76	20630	-	-
Annual energy [GWh]	11	64772	4436	60336
Share of energy [%]	0.02	100	-	-

Conclusions

In Europe ESHA defends the interests of the small hydropower sector within the European Commission, as an association of the national associations, corporate members and individual members within EU-27. By means of European projects, they collect all kind of data from these countries, regarding the hydropower in general and the small hydropower in particular.

The Romanian National Association ROSHA is a member of ESHA since 2008. The ROSHA represents the Romanian small hydropower sector at the European Commission.

There are many activities at the European level in the field of renewable energy sources and Romania takes active part in these activities. Currently, the most important task for the EU Member States is to elaborate, till mid 2010, the NREAPs and till the end of 2010 they Member States should bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 5 December 2010.

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Bibliography

- [1] *** - <http://www.erec.org/>
- [2] *** - <http://www.esha.be/>
- [3] *** - <http://www.roscha.ro/>
- [4] *** - <http://ec.europa.eu/eaci/>
- [5] *** - <http://ec.europa.eu/energy/intelligent/>
- [6] Gema San Bruno - (*ESHA Project Manager*), *ESHA proposal for SHPSTREAMMAP project*, 2008
- [7] *Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC*
- [8] *** - *Romania Energetic Strategy for 2007-2020*, September 4, 2007
- [9] *** - *Hidroelectrica Annual report*, 2008

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