

hidroenergia 2010
small streams make rivers



Stream Map Del 7.3: Hidroenergia 2010 report

HIDROENERGIA 2010: Small Streams Make Rivers

June 16-19 2010, Lausanne, Switzerland



- Event:** **Hidroenergia 2010: The global key event for the small hydropower sector**
- Date:** **16-19 June 2010**
- Venue:** **Beaulieu Congress Center in Lausanne, Switzerland**
- Organizers:** **ESHA & MhyLab (ESHA member local partner)**
- Participants:** **Over 350 participants from 37 countries**

The Hidroenergia conference took place in Lausanne from the 17th to the 19th of June at the Beaulieu Congress Center. It gathered together more participants, over 350, than ever before from 37 countries. Twelve sessions were divided into different thematic topics. This report covers the most important messages concerning each issue rather than the conclusions of each session.

Regulation, Administration and finance

The main concerns for the sector are the different environmental regulations being approved in the different member states in the European Union. In particular, the Water Framework Directive (WFD) is currently the most controversial piece of regulation for the hydropower sector in the EU. The implementation of the WFD put into question the efficiency of the Directive promoting renewable energy sources since the binding targets that Member States need to comply with from now till 2020 will not be achieved by considering hydro as one of the sources due to the constraints derived from the WFD. Moreover, the different requirements set in the WFD are creating additional administrative barriers to the already existent ones for hydro. ESHA is working together with the European Commission on the different working groups created to cover the different areas of the Directive.

One attempt to overcome the conflicts between the RES Directive and the WFD and find some balance has been the initiative from the Alpine Convention on drafting guidelines for the development of small hydropower in the Alpine region. ESHA is part of the expert group created within the Alpine Convention to draft the guidelines.

Perspectives and developments

Examples from Switzerland, Romania, Italy and Austria point out some critical aspects which need to be taken into account in successful small hydropower development. These aspects include sufficient support schemes, simplification of administrative procedures, cooperation between different stakeholders such as plant owners and operators, planners, industry, relevant authorities, environmental organizations and fishermen. Small hydropower is often object to conflicting and opposite opinions which complicate the realization of any new project. Collaboration and increased coordination between key decision-makers who are in charge of water regulation, environmental protection and energy management is necessary. This would also help balancing the implementation of the WFD and RES Directives.

Equally important factors in gaining public acceptance are to ensure the development of well-environmentally integrated projects. This requires several conditions that need to be fulfilled, namely projects must demonstrate the rational use of rivers with minimum impact on the environment and measures to be taken to guarantee security in case of flood events. At the same time it is necessary also to guarantee the economic profitability of the plant. Experience shows that small hydropower plants can be well integrated in the environment even in highly protected regions. However, there is a need to increase funds for research and development in order to boost innovations in the sector.

Technical Innovations and Engineering solutions

The sessions on technical innovations were divided into turbine development; equipments, civil works, CFD tools, SHPP design and performance tests and new computer tools. From the turbines perspective, the main developments are going into the direction of tailored micro hydro turbines. Small turbines are very applicable to multipurpose plants. Ultra and low head sites have a great potential in Europe where turbines like the Siphon with an efficiency of 90% have as well a positive impact on the environment. These type of turbines like as well the diagonal have a lot of potential for being the base of standardization in the small hydropower sector. The other area that is developing quite fast is the use of pumps as turbines especially

when the hydro project has some budgetary constrain. For example, the use of centrifugal pumps can be applied in the water industry decreasing the leakage in energy supply and allowing the energy recovery in the industry. Both centrifugal and axial pumps are the best options for rural electrification and off-grid production in places where SHP is an expensive option when comparing to large hydro. In the case of axial pumps the application can be used as well for district heating purposes. Other types of turbines as tidal are known but their cost, efficiency and applicability still remains under research.

CFD tools are being used more frequently that before and the software is improving its performance with several application for flow design, turbine design or performance tests. In civil works the use of new materials like the glass-fiber for pipelines were presented as an economical alternative.

The most revealing conclusion from the innovation session is that quite a number of computer tools are being used in the field of small hydro for several applications like on-line permanent magnet generators, identification of hydro resources, forecast of hydro production in rivers, numerical optimization of turbines and hydrological forecast. All these tools serve to increase the performance and the efficiency of the plant. In addition, the use of GIS to identify the potential sites for developing small hydro is already widely use in the EU and recognized as a good and reliable tool.

Besides the new trends and new applications showed in this area, the main message remains still the same. The need for research is still needed. The different presentations just underlined how the small hydropower sector from the technical point of view is not obsolete but evolving and presenting new and innovative solutions. Unfortunately there are not enough support for Research programs in the field of small hydropower both at European and national level.

Environment

The environment-related topics are more and more crucial for the development of new initiatives and for making more acceptable the existing ones and the re-licensing process easier too. So it's not surprising if the prize "Efficient Use of Water Resources" was awarded to a work related to the "Integrated Assessment of the Small Hydropower Potential". The environmental session once again highlighted:

- the need for greater expertise in landscape and power station architecture from both the proponent and authorities side
- the power of multi-criteria methods for assessing impacts and potential with the possibility of reviewing periodically the weights assigned to the criteria
- the need for constant monitoring of the effects of new plants and of greater supervision during construction works
- the successful implementation of new plants in highly environmentally-sensitive areas provided that sound solutions have been taken
- the continuous technological effort to find more environmental friendly solutions. This demonstrates that small hydro is a mature technology, but R&D is still required to widen the range of environmentally sound exploitation of water resources not even considered as worth considering since few years ago.

Multipurpose Hydro Schemes

This field of application of small hydropower technology in already existing infrastructures which main purpose is not the production of electricity is becoming of high interest in the hydro community and it offers a great potential for future development in the European Union. Several examples of what is understood as a multipurpose plant were shown at the session focusing in how the application has been developed and the results. One of the most important outcomes of this section is that in some cases the environmental obligations and in particular the ecological or reserve flow obligation can offer an opportunity for developing multipurpose plants. The most common cases applied up to now are in drinking water systems or in waste water treatment plants.

Planning, operation and maintenance, education and training

For planning, operation and maintenance a growing number of new tools have been designed. In order to reduce service costs modern measurement devices have been developed to monitor remotely most of the information regarding productivity and availability of the installation. A software application tool has also been developed to help with technical and financial calculations in order to assess feasibility and profitability of building a small hydropower plant at each specific site. Attention was also focused on degradation and how it affects plant performance in terms of energy production, operating costs and operating reliability. Many examples were given on how to monitor civil works degradation and on how the rehabilitation of a plant can significantly improve plant performance and profitability.

In 2010 ESHA for the first time started educational activities with a post-graduate course on 'Sustainable Hydropower'. Bernhard Pelikan, the main organizer and professor teaching in the course, introduced this topic to the audience; the course was further discussed in more detail during the SHAPES workshop. The aim of the post-graduate course is to train post-graduate students to fill the gap between the growing industry demand for specialized hydropower expertise and the skills currently available on the job market, which is very important for the sector. The course focuses particularly on small hydropower and it is designed to equip participants with competence to understand the state of the art of hydropower design and technology. The course helps to improve the understanding of concepts and systems and to enhance knowledge regarding tools and approaches. The course lasts for ten weeks and after the good first experience it will be organized again in spring 2011 in Vienna, Austria.

EU funded projects – Stream Map

This session provided an overview of the activities and initiatives carried out in the framework of the different EU co-financed projects. In the field of small hydro power there are only two EU programs currently supporting the sector: the FP7 (research and demonstration project) and the IEE (promoting and supporting RES).

Technical programs like the FP7 are very important for the sector where the support is still needed to develop innovative technological solutions (like the low head hydropower converters developed within the EU funded project HYLOW) and to optimize/improve the performances of existing turbines and to reduce the cost (like the ongoing HydroAction project).

On the other hand, non-technical programmes like Intelligent Energy Europe (IEE) and the initiative Sustainable Energy Europe (SEE) are important to support "soft" actions addressing

non-technical issues like spreading of best practices, access to up to date data on the sector, conflicts among stakeholders like local Authorities, environmentalists, developers (issue tackled by the funded project SEE Hydropower).

The Stream Map project was presented showing the participants the structure of the project together with project objectives, schedule and results. There was very much interest regarding the HYDI database and ESHA received numerous requests and collaboration proposals at the conference and also afterwards. The two most important outcomes that the Stream Map will produce for the sector are the central database covering energy, market and policy data on hydropower and a roadmap supporting EU, national and local policy makers to define the way forward for the SHP in EU.

Poster session

The considerable potential for further small hydro development was reflected in several posters presentations. Examples were presented from Switzerland, FYR Macedonia and Canada. These countries have considerable potential and development opportunities; provided some current challenges can be overcome, hydropower will continue to be the major player within the range of renewable energy options.

Also reflected in the poster session, as in several other sessions at the conference, was the conflict between development targets, and barriers created by legislation which is aimed at protecting the environment. Presenters looked at ways of finding a balance between what are sometimes contradictory goals. It was demonstrated that our industry does not give up in the face of challenges and that researchers and equipment manufacturers in the small hydro power industry are responding to the increasing environmental concerns by developing some innovative solutions. Several papers described eco-friendly turbines and one focused on "environmentally considerate" lubricants.

Presenters underlined the fact that low head, ultra low head and instream systems are increasing in importance, specially, but not only, in Europe. Some innovative machines are being developed specifically for these applications. Such very low heads or zero heads schemes also naturally reduce negative impacts. Some examples showed schemes where existing hydraulic works are being retrofitted with small hydropower plants, eliminating the need for costly new civil works. This is clearly the best way to maximize the potential at sites where energy would otherwise be wasted and again this minimizes impact on the environment. One example described was a generating unit designed specially for installations in water supply systems.

Finally, one presentation drew attention to the 100th birthday of a mini hydro scheme in Russia which has had to operate in some very challenging climate conditions. This underlined one of the most notable characteristics of hydro plants – their long operating life, even in case of adverse conditions.

SHAPES workshop

The SHAPES session intended to present the final result of a EU partially funded project under the FP6 research program of the European Commission. The SHAPES project has been running for two years and a half coming to an end in June 2010. Therefore, the Hidroenergia conference was the best place to share with the small hydropower stakeholders the results.

The opening and closing sessions

As usual in every conference there is an opening and a closing session. For the opening session relevant personalities in the hydro and renewable energy world were invited in order to express their point of views concerning the sector and its development. After the welcome messages offered by Mr Pelikan (former president of ESHA) and Mr Gay (president of MHyLab) the keynote address was conducted by a representative of the Vaud Canton Government. Besides the interesting presentations on different issues made by the Swiss representatives covering the research and energy programs running in Switzerland for promoting small hydro and the situation of the booming small hydro, two relevant outcomes from the presentations made by Mrs Lins (EREC) and Mr David Clubb (European Environment Agency) are worth to be mentioned.

EREC, the European Renewable Energy Council has conducted a study on the scenarios in the EU for achieving 100% RES by 2050. Mrs Lins presented the main results of this study paying special attention for the hydro power forecast which does not offer an enormous increase or contribution to the 100% goal due to the limited estimated potential for growing. In any case, the publication and the results of the Re-Thinking study are available at the EREC website. Mr Clubb from the European Environment Agency presented the preliminary results of a study they are conducting on assessing the environment aspects and the potential of deployment of small hydropower in the European Union. His presentation was very welcomed by the participants and the inputs the stakeholders would be able to contribute represent an important step in concealing environmental and technical information.

The closing session was conducted by Mrs San Bruno (ESHA Secretary General) after the price for the best student presentation at the conference was awarded. For the first time, a conference wanted to focus on students and their work on small hydropower by giving them the opportunity not only to participate but as well to present their papers under favorable conditions. In order to promote and encourage the young generations to keep the sector alive and innovative a jury was called to award the best presentation.

The closing session grouped the chairmen of the most outstanding sessions in terms of conclusions wrapped on a general level by Mrs San Bruno. Conclusions from the Regulation and Policy session (Mr Pelikan), Environment (Mr Papetti), Technology (Mr Bolli) and perspectives and development in Switzerland (Mr Denis) were shared with the public.

The closing session was the best opportunity to announce the next Hydroenergia conference. Hydroenergia 2012 will take place in Poland and it will be co-organised by ESHA and the Polish Hydropower Association.

To summarize, the debate of the Conference focused on technological innovations and the challenges & trends of Small Hydropower development in Europe and world-wide with the following conclusions:

- There's a considerable potential left for new Small Hydropower development together with refurbishment and modernization in Europe and world-wide.

- Multipurpose plants (combining energy production with drinking water, waste water treatment and irrigation) together with refurbishment of abandoned sites open up new markets and possibilities for Small Hydropower.
- New technologies, automation and innovations are continuously evolving and needed for the development of the sector – however, as a site-specific technology financing for further research is essential to further improve environmental performance.
- Legal framework and sufficient financial support schemes are necessary for successful SHP development.
- Complicated administrative and licensing procedures are still key barriers for SHP development.
- The sector is concerned by the non-coordination of the implementation of the two main EU Directives impacting the sector, the Water Framework Directive and the RES Directive aiming at promoting the use of Renewables in the Member States. ESHA calls for further cooperation and coordination to tackle this problem at national level.
- Small Hydropower can significantly help in boosting local economy and employment – local authorities need to be better informed of the benefits and technological advances of the sector.

Steering Committee: Pr. François Avellan, EPFL – LMH, Switzerland, Mrs Alison Bartle, Chief Editor International Journal on Hydropower and Dams, United Kingdom, Pr. Hermod Brekke, Professor Emeritus Dr. Tech at the Norwegian University of Science and Technology, Norway, Mr. James L. Gordon, Consultant, Canada, Dr. Giovanni Lombardi, Former president of the International Commission on Large Dams, Switzerland, Mrs Anne Pénalba, France Hydro Electricité, France, Pr. Hans Björn Püttgen, EPFL – Energy center, Switzerland, Dr. Henri Rollier, SEVEN, Switzerland, Mr. Jean-Marie Rouiller, Lausanne Public Utility, Switzerland, Pr. Anton Schleiss, EPFL – LCH, Switzerland, Mr. W. B. Smith, President of Hydropower International Services, United States of America, Pr. Arthuros Zervos, President of EREC, Greece.

Exhibitors: In 2010 over 60 stands were booked from the industry and other stakeholders like ABB, Amianty, Hydrolink, Mavel, PLCO, Hansen Transmissions, HOBAS, Siemens, TES VSETIN, Voith Hydro and Kössler and many more. ESHA had own stand where Stream Map project was also displayed with posters, leaflet and information on HYDI and website.

