# SMALL HYDROPOWER SECTOR IN POLAND

## ——FACTS, OPPORTUNITIES AND CHALLENGES

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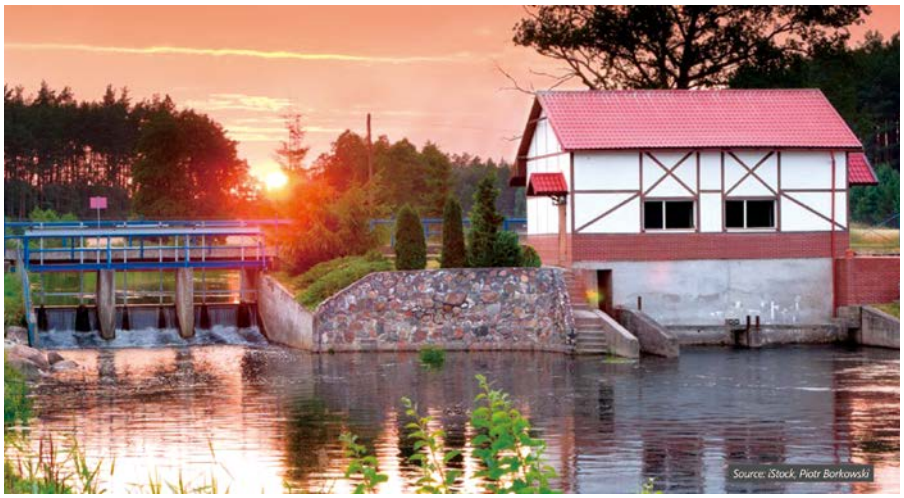


A summary of the present status ofthe small hydropower sector in Poland should not be missed. Representing the Polish Association for Small Hydropower Development, the organization with a history spanning over 30 years, whose main objectives include development and promotion of small hydropower in Poland, I feel I have a duty to present such overview of this sector and I would like to do so in this article.

## DEFINITION

There is no official definition of small hydropower (SHP) plants in Poland. However, normally installations with a total capacity of no more than 5 MW are included in this category[1]. This categorisation is also partially reflected in the Act on Renewable Energy Sources (Act on RES), according to which hydropower plants with a capacity up to 5 MW are currently entitled to receive "green certificates". However, the Act on RES also includes other size-dependent regulations, such as the capacity limit of 20 MW for hydropower plants entitled to auctions for renewables, separate solutions (prices, baskets in auctions and feed-in premiums (FIP)) for installations with a capacity not exceeding 1 MW, as well as separate solutions (prices, feed-in tariffs (FIT) and some simplified rules) for hydro facilities defined as "small installation" with a capacity below 500 kW.However, considering that in many countries a small hydropower plant is defined as a plant with an installed capacity less than or equal to 10 MW, I will use this criterion in this article to make it more comprehensible for international readers.

## SHPP IN NUMBERS AND HYDROPOWER POTENTIAL OF RIVERS

In 2017, Poland had 766 hydropower plants, of which 756 were up to 10 MW[2]. The total installed capacity of hydropower plants in Poland was 988.38 MW of which 294.75 MW was the installed capacity of small hydropower plants. In 2016, electricity generation from all hydropower plants (renewable) was 2139.4 GWh, of which 908 GWh was produced in SHP plants[3]. In addition to the developed capacity, in 2017, 162 SHPP projects (up to 10 MW), with a total capacity of 55.97 MW and expected annual generation of 252 GWh, were pending approvals

or under construction[4].

Furthermore, the technically feasible potential capacity, which could be developed over a longer perspective, is likely to be much higher. The total theoretical hydropower potential of Polish rivers has been estimated to be 23.6 TWh/year with a technical potential of 13.7 TWh/year[5]. Out of this, the technical hydropower potential for SHP plants is estimated to be approximately 5 TWh/year of which approximately 50 per cent (2.5 TWh MW) is economically feasible[6]. Taking into account the current annual generation at SHPP plants (908 GWh) that would indicate that less than 20 per cent of the country's technical SHPP potential has been developed so far. Hydropower potential in Poland is characterized by uneven distribution throughout the country with 68 per cent of resources concentrated in the Vistula River basin, out of which half are allocated in the lower Vistula region. The Oder River basin contains 17.6 per cent of the hydropower potential, while 2.1 per cent is concentrated in the rivers of Przymorze as well as Warmia and Mazury regions, which are not connected with Vistula River Basin. Another 12.5 per cent of hydropower potential is concentrated in the remaining rivers in Poland. The rivers with the largest hydropower potential are the Vistula, Dunajec, San, Bug, Oder, Bóbr and Warta. Regions most favourable for hydropower development are southern parts of Poland (mountain area) as well as western and northern parts (due to existing hydro infrastructures)[5].

## REPOWERING OF HISTORIC SITES

It is estimated, that in the 1920s and 1930s, there were over 8,000 hydropower facilities in Poland (many types of mills and some hydroelectric power plants). In 1953, there were still 7,230 installations, but only 2,131 remained by 1980s and only 300 were in use at that time7. The possibility of repowering these historic sites is indicated as the potential for economically feasible and environmentally sustainable small and micro hydropower generation both by the Government and non-governmental organizations. In the Energy Policy of Poland Until 2030 as well as in the Addendum To The National Action Plan For Energy From Renewable Sources utilization of existing state-owned damming structures for electricity generation is listed as one of the aims. To meet this objective, the National Water Management Authority took an inventory of the damming structures. The results showed that there are more than 14,000 dams and weirs (with minimum head of 0.7 m) of which only 4.5 per cent is used for electricity generation[7]. At the same time, similar objectives to develop micro-hydropower potential, by identifying and restoring suitable historic sites, were at the core of the European project RESTOR Hydro, cofunded by the Intelligent Energy Europe Programme of the European Union, with Poland as one of the project implementation countries. Within the project, the RESTOR Hydro Map was created indicating 50,000 SHPP sites in Europe with 8,000 located in Poland.

## ADMINISTRATIVE PROCEDURES

Obtaining administrative permits for the SHPP project in Poland consists of several steps. Firstly, the environmental impact of the development needs to be considered and the environmental decision needs to be obtained. Furthermore, the decision on building conditions is necessary and issued by the local administration unless, in rare cases, there is a spatial development plan covering the investment area. A 'water-legal' consent and 'water-legal' assessment needs to be gained from the water authority. The next important stage is to acquire the rights to manage the real estate which is the property of the State Treasury (i.e. lands covered with running water and most probably the weir) from the water authority which is responsible for maintenance and ownership supervision over the estate. The final stage of the procedure is to acquire a permit for construction through an application to the 'Poviat' or 'Voivodship' authority. Apart from the decisions above, to start operating a power plant a decision on terms and conditions of grid connection and subsequently a grid connection agreement is required from the system operator. Finally, the concession to produce electricity from the renewable energy source from the Energy Regulatory Offi ce will be needed for plants with an installed capacity exceeding 500 kW. Plants with a capacity between 50 and 500 kW must be entered in

the register of electricity producers in small installations, also run by the Energy Regulatory Office, while micro producers (installations of up to 50 kW) need to notify the local system operator about their plan to start generation.

## POLICY

Although Poland refers to sustainable development in its constitution (Constitution of Poland, Article 5), the electricity sector is still largely based on carbonintensive fossil fuels, and renewable energy sources development do not play a signifi - cant role for decision-makers.

The main energy policy objective in the fi eld of renewable energy sources, and the country's binding target from the EU 2020 Climate and Energy Package, is to increase the share of renewable energy sources in total energy consumption to at least 15 per cent by 2020, and further increase it in the following years. By 2016, Poland had reached an 11.30 per cent share of energy from renewable sources (including electricity, transport, heating and cooling sectors) in gross fi nal energy consumption3. The path indicating how Poland is intending to meet its 2020 targets is concluded in the National Renewable Energy Action Plan.

On 16 November 2017, the European Commission presented the Clean Energy for All Europeans proposals which, according to the Ministry of Energy, will imply the work on Energy Policy of Poland 2050. This longawaited document should determine a longterm vision for energy sector in Poland. Until then the Energy Policy of Poland until 2030 adopted in 2009 is the main energy-specifi c long-term strategy in force.

Another strategic document which indicates the main directions of the country's development, including those of the energy sector, was adopted in 2016. In the Strategy for the Responsible Development increasing the use of hydropower potential and hydropower sector development was classifi ed as one of the projects to be implemented. This objective should be achieved by means of "liquidation of administrative barriers constricting hydropower investments, development of hydropower equipment manufacturers industry as well as utilisation and refurbishment of existing, State-owned damming facilities for the purpose of hydro-power generation".

## SUPPORT SCHEMES

Since 2005, support schemes for renewable energy have been based on green certifi cates. Renewable energy producers who could join this system by 1 July 2016 are supported in two ways: fi rst, they are entitled to obtain tradable certifi cates of origin (green certifi cates); second, in the case of installations up to 500 kW there is an obligation for electricity to be purchased by the appointed energy entities, with a price announced quarterly by the Energy Regulatory Offi ce and based on the average electricity sales price on the competitive market. Since mid-2012, the system has been destabilized mainly due to the oversupply of certifi cates, causing the value of green certifi cates to decrease from PLN 251.21 (€58.42) per MWh in 2012 to PLN 36.47 (€8.48) in 2017 and electricity price within the obligation of purchase to decrease from PLN 198.90 (€46.25) per MWh in 2012 to PLN 169.70 (€39.46) in 2016. On 20 February 2015, the Act on RES was adopted in Poland, introducing a support scheme based on tendering (auctions). In the new scheme, reference (maximum) prices are defined for each technology and additionally within the technology separate reference prices are defined for installations with capacity not exceeding 1 MW and separate for those with capacity above 1 MW. Auctions are conducted separately for existing and new installations and there are separate auction baskets for installations with capacity up to 1 MW and separate for larger ones. The producers who win a tender have the right to receive the offered price for 15 years. The key solutions comprised in the act came into force on 1 July 2016.Several auctions were carried out according to the these rules in 2016 and 2017, including two auctions for installations with productivity above 3 504 MWh/MW/year and with $CO_2$ emission levels up to 100 kg/MWh, where 93 offers from SHPP producers won contracts and were able to migrate from the certificate system to the system of guaranteed prices within auction system.

The latest amendment to the RES Act dated 7 June 2018 is the most significant for the small hydropower sector. It brought changes in the auction system, including implementation of simple

technological auction baskets, introduction of a mechanism which excludes bids with highest offers and softening thus far very strict sanctions for failing to generate the contracted volumes. But first of all, the latest amendment introduced FIT and FIP for small hydro and biogas installations. According to the RES Act, the guaranteed price for electricity fed into the grid by both existing and planned hydro installations which will join the FIT or FIP scheme in 2018 is PLN 495 (€115.12) per MWh for SHPP with a capacity lower than 500 kW and PLN 450 (€104.65) per MWh for those with a capacity of 500 kW - 1 MW.

## WATER LAW

Another important legal act which has an impact on the SHPP sector is the new Water Law, adopted on 20 July 2017. This act entirely reformed water administration and management by introducing catchment- based approach and the National Water Holding "State Waters". From an SHPP perspective, the most significant changes include introducing fees for water use in the hydropower sector (PLN 1.24 (€0.29) per each MWh of electricity generated in a hydropower plant) and rules of enabling investors' utilization of stateowned weirs through tenders, with certain exceptions. Other important regulations, such as requirements for residual flow, fish migration and restrictions in developing new hydropower projects which have to be consistent with the EU Water Framework Directive are contained in Water Basement Management Plans and Conditions of Water Use in Water Regions.

## THREATS

So far continuously changing legal conditions have made a challenge both for SHPP investors and operators. The reduction in prices of green certificates has been very perceptible for renewable energy producers, nevertheless, very few hydro producers have decided to make offers in tenders and switch from certificates to auction system, regarded as very risky, complicated and not appropriate for small producers.

At the same time, the small hydro sector is bearing an increase in the operational cost of SHPP due to the obligation to adapt facilities to more and more rigorous environmental requirements (building fish passes and fish barriers, increasing residual flow, etc) as well as the implementation of water pricing for hydropower in 2018. In addition, due to the financing model of the newly established "State Waters" the sector predicts a further increase in operational costs caused by the increase in fees for leasing damming structures and lands covered with water.

Last but not least, operators of existing SHPP plants are facing a threat of reduced profitability after the operational support period. According to the Act on RES, in 2020 small hydropower plants commissioned before 2005 (approximately 350 out of 740 installations) will be deprived of the support which could be claimed so far. Having very little profitability already, such a reduction of income could bankrupt many producers. The regulations on refurbishment, which could constitute a solution in such cases, are not clear enough, making the future of existing SHPP plants uncertain. So is the future of the whole sector in the longer term perspective, because all the regulations seem to disregard any development after 2020.

## CONCLUSIONS

More than 80 per cent of technical SHPP potential capacity in Poland remains unexploited as a result of historical circumstances and various administrative barriers, but also due to its specific nature. Both the governmental inventory and the RESTOR Hydro project outcomes prove the need for adaptation of existing weirs, and for making use of sites characterized by very low heads and small flows. According to the SHPP sector, this goal can only be achieved with stable financial conditions and effective regulations, giving investors access to SHPP sites (i.e. state owned weirs). There is a chance that the newly adopted FIT and FIP system will reverse the stagnation in launching new SHPP projects. Thus, the SHPP producers and investors await the Energy Regulatory Office's decisions enabling their installations to join the FIT and FIP system, and seek strategic documents and a legal framework, especially as regards SHPP refurbishment, which would include a time horizon beyond 2020. They also hope for effective management of State-owned weirs by newly established "State Waters" which will allow utilisation of existing

weirs for hydropower purposes.

**References:**

*1 European Small Hydropower Association. Guide on How to Develop a Small Hydro-power Plant – Polish edition. 2010.*

*2 Energy Regulatory Office. Map of RES as of 30 Sebtember 2017. Energy Regulatory Office http://www.ure.gov.pl/uremapoze/ mapa.html*

*3 Central Statistical Office. Energy from renewable sources in 2016. Statistics Poland. http://stat.gov.pl/en/topics/environment-energy/energy/energy-from-renewable-sourcesin-2016,3,9.html*

*4 Lis, Michał and Drzewicz-Karyś, Justyna. Investments in national hydropower. Hydroelectric Power Magazine (Energetyka Wodna). no. 1 (January 2018). http://www.energetykawodna. info/*

*5 Hoffmann, A. and Hoffmann, M. Cadastre Of Technical Resources Of Water Energy In Poland. 1961, See also: Steller, J. Hydropower in Poland and in the European Union. Opportunities And Barriers Of Development. National Forum on Renewable Energy Sources. Warsaw.2005.*

*6 European Small Hydropower Association (2015). HYDI Database. http://streammap.esha.be/6.0.html*

*7 Geoportal KZGW, http://geoportal.kzgw.gov.pl/gptkzgw/catalog/main/home.page*