OPPORTUNITIES POWER GENERATION NEEDED TO RUN TROUT REMEȚI, ON IAD VALLEY, BIHOR

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Abstract

Finding sources of energy is very important for the operation of forestry production and administrative work. For this purpose it was intended to study the possibilities of producing electricity for trout in Remeți, Bihor County, about hydro, or by the use of small hydropower installed on Iad Valley, which can substantially contribute to the production of trout, besides providing electricity for deployment activities in their premises. The study looked at two ways of producing electricity using a MHC (variants A and B), by placing them at the base of a dam located in one of the sections studied in the water, and through water feed captured using a pipe 3 sections upstream of the site of MHC section. The values obtained in this work show that the hydropower potential of mountain watercourses must be seriously studied and exploited properly in the context of increasing willingness to use unconventional energy sources.

Key words: trout, water course, non-conventional energy, forestry sector

INTRODUCTION

The forestry sector is very important to find energy sources for the operation of the production and administrative (Bumbu et al., 1981). Concerns for water energy recovery are very old, so Leonardo Da Vinci considered water "motor of nature" (De Azagara et al.,1996).

This has been studied possibilities of producing electricity for trout in Remeți, Bihor County, about hydro, or by the use of small hydropower installed on Iad Valley, enjoying a large hydrographic and forestry basin.

Operation of small hydropower around trout may contribute substantially to the production of trout, besides providing electricity for their activities in their premises. If the water flow used in engagement system is then directed toward the inlet feed channels and basins, it can greatly ensure oxygenation of the water, so necessary trout especially during the summer when water temperature rise decreases this amount of oxygen (Iovan, 2012).

MATERIAL AND METHODS

Iad Valley separating forest mountains Pădurea Craiului and Vlădeasa. It has a length of 46 km from the source (Vlădeasa Mountains) to the confluence with Crişul Repede, average slope of 22 ‰, an area of 220 km^2 catchment (13.***), the surface of forest fund traversed being 13 251 ha (14.***).

Fig.1 Aspects from the Iad Valley course, on the forest fund of O.S. Remeți

Iad Valley (figure 1) flow analysis was carried out in 2005-2010, and based on these calculations and correlations were performed (Bica et al., 2013; Seteanu et al., 2000) on the possibilities of obtaining electricity needed a period of one year operation trout. Average annual energy production was calculated using the following relationship:

$E_{year} = 9{,}80665 \cdot Q_m \cdot H_{n,an} \cdot \eta_{t,an} \cdot \eta_{g,an} \cdot \varepsilon \cdot T_f$ [kWh/an](Cogălniceanu,A.,1986)

where:

Q_m is multiannual average flow;

$H_{n,an}$, $\eta_{t,an}$ şi $\eta_{g,an}$ is average values falling net, efficiency turbine and generator;

ε is utilization coefficient of the stock is below par value, which can be expressed in tenths (0,8-0,9); he plays the loss of stock (volume) by discharge to waters or energy calculation averages (Baya, A., 1999);

T_f is average number of hours of operation in a year;

We studied two possible electricity production using a MHC (variants A and B) or by placing them at the base of a dam (with heights between 1 and 2 m) located in one of the sections studied in water (S3) and the captured water feed (3 embodiments, the Factor C) by means of a sections of pipe 3 upstream of section S3 (section S4, S5 and S6) shown in tables 1, 2 and 3.

In version A was considered whether the location of a small hydro under regulated, respectively on a storage dam on the thread watercourse permanently to ensure necessary water flow of energy. For this, taking into account the three types of height of the dam (1, 1,5 and 2 m). The location was considered to be established in Section S3, the first trout upstream. The flow considered is reconstituted in that section (S3) and turbine efficiency ηt, generator efficiency ηg, and storage coefficient ε were considered the value 0,9. Microhidroagregatului running time is the number of hours in a year, that 8760 hours;

In version B, the location of a small hydro analyzed able to be supplied with water from upstream captured and transported via a pipeline under pressure. In this situation all the location was established in section S3, and was considered the share of the bottom of the river.

RESULTS AND DISCUSSION

Knowing the value of the annual energy required for the functioning of the trout (10426 kWh/year) resulted from previous calculation can be seen in tables 1, 2 and 3 annual energy values, theoretical (no loss linear load) and final (pregnancy loss due pipeline transport) obtained hypotheses studied and discussed as such.

As can be seen from table 1 and figure 1 in all three cases (with dam 1, 1,5 and 2 m height) may have annual energy requirement (10,500 kWh/year), yielding amounts of energy annual E_{year} from 51353,041 kWh/year to 102706,080 kWh/year.

Table 1.

Calculus parameters for annual electric power necessary in the Remeti trout (Iad Valley)–A variant

No. crt	Factor A. Section location mhc	FactorB. Dam height (m)	Flow (mc/s)	Turbine efficiency η_t	Generator efficiency η_g	Storage coeff. ε	Operating time Tf (h/year)	Energy E_{year} (kWh/year)
1	a - S3	1	1.020	0.9	0.9	0.9	8760	51353.041
2		1.5	1.020	0.9	0.9	0.9	8760	77029.561
3		2	1.020	0.9	0.9	0.9	8760	102706.080

Table 2.

Calculus parameters for the annual theoretical electric power produced by MHC placed in different sections with the up stream water catchment on Iad Valley – B variant

No. crt.	Factor A. /Share Section mhc	Factor C. Sections capture	Share Catch-ments (m)	Net fall (m)	Flow captured (mc/s)	ηt*ηg	Storage coeff. ε	Operating time Tf (h/year)	Theoretical energy E_{year} (without lossless linear load) (kWh/year)
1	2	3	4	5	6	7	8	9	10
1	a - S3 448 m	S4	451	3	0.876	0.81	0.8	8760	122746.3
2		S5	455	7	0.748	0.81	0.8	8760	243154.6
3		S6	461	13	0.702	0.81	0.8	8760	356715.8

Annual theoretical energy values (without lossless linear load) results are between 122,746.3 kWh / year and 356,715.8 kWh / year (table 2).

Table 3.

Calculus parameters for the annual electric power prodeuced by MHC placed in different sections with up stream water catchment on Iada Valley – B variant

No. crt.	Factor A. /Share Section mhc	Factor C. Sections capture	Net fall (m)	Metal pipe length (m)	Loss linear load (m/100m)	Loss total load (m/100m)	Final energy E_{year} (with loss load) (kWh/year)
1	2	3	4	5	6	7	8
1	a - S3 450 m	S4	1	300	0,27	0.81	7773.93
2		S5	5	1000	0,27	2.70	175611.60
3		S6	11	1550	0,27	4.19	576459.30

Considering turbine efficiency, generator efficiency, uptime, storage coefficient (ε), the same as in variant A, but share the location of mhc 2 m above (on the banks of the watercourse) and linear load loss 0.27 m/100m Blidaru V. et al.,1997), resulting annual energy values between 7773.932 kWh/year and 576,459.3 kWh / year (table 3). It appears then, that in the first case can not be guaranteed annual energy for the operation of the trout, its value is only 7773.932 kWh/year.

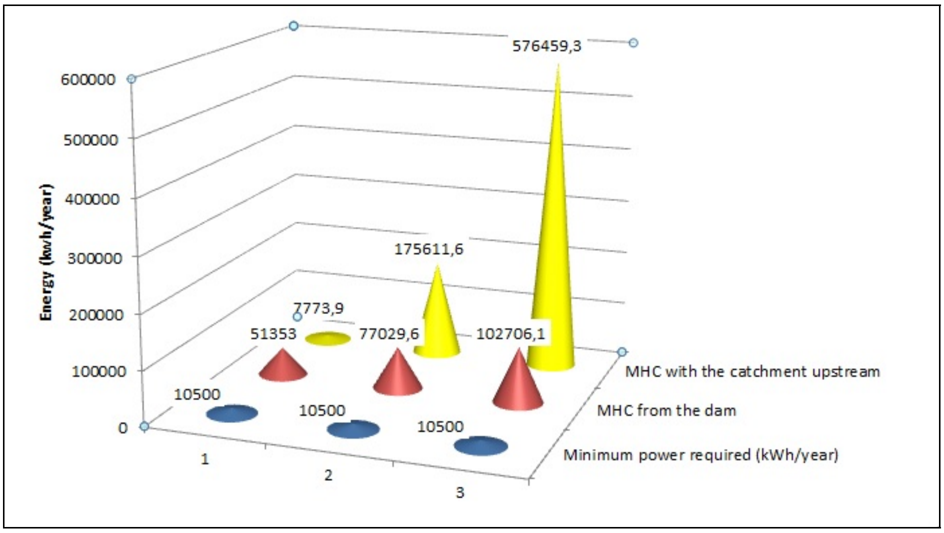

Fig.2 The graphical representation of the two variants of electric power production necessary in the Remeti trout nursery, Iad Valley

In figure 2, which are the annual energy values can be obtained using water, Iad Valley, it can be seen that in the first embodiment, the location of the mhc plant from the dam (shown in red), the three cases would meet the energy needs of the trout, and in the latter, to capture the upstream sections (shown in yellow), only the first case, respectively capturing first upstream section could not be satisfied with the annual energy requirements for trout of Remeți.

CONCLUSIONS

In conclusion, we can state the following: analyzing the valley studied variant A is found that the energy required to be produced for the operation of the Remeți trout comes from high flow and low heads (Q = 0.82 m3 / s and H_n = 0.21 m); from the analysis of variant B, namely those with upstream catchment and adduction appears all the same, namely that the energy needed to be produced for the operation of the Remeți trout comes from high flow and low heads flow (Q = 0.702 m3 / s and H_{nc} = 0.19 m). It is important to mention that these energy values are obtained by taking into account linear losses of load cases mhc upstream water abstraction and its adduction pipes with pressure.

Need to study the possibilities of exploiting hydropower potential of forest fund from Romania is the need to satisfy the production and electricity forestry administration in this case since it is a form of clean, cheap and convenient, the especially as it can harness the power of water and low flow rates taking into account the existence of longitudinal profiles of extremes, large gradients, which can provide hydraulic energy conversion into electricity. Providing electricity in mountainous areas (mainly forest) can be considered a great achievement of those concerned with such goals, the idea that these areas can exist even small isolated communities in terms of administrative, geographical and energetical of course.

The introduction of mhc in trout upstream perimeter can help oxygenate the water warm periods when temperature increases its risk and occurrence of claims issues trout to oxygen.

The values obtained in this work show that the hydraulic potential energy mountain watercourses should not be neglected, on the contrary he has seriously studied and exploited properly in the context of increasing willingness to use unconventional energy sources.

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