The Use of Hydropower in Water Supply

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ABSTRACT:

Renewable energy is a popular subject nowadays. Water supply companies have also seen the benefits, more specific in hydropower. This paper presents the principle of this energy resource and discusses some case studies, in particular Greece and Turkey. The advantages and disadvantages are compared.

1. Introduction

The subject of ‘renewable energy’ nowadays is more popular than ever. In almost every country there is a commitment towards the use of renewable energy. Also water supply companies have seen the benefits.

Mol et al. (2011) presented an inventory of the possibilities to recover sustainable energy from the water cycle. Three main types of energy in this water cycle are specified: thermal energy, organic energy and ‘other energy’, like kinetic energy (flow), energy from osmotic values (blue energy) and high pressure.

In this paper only the use of hydropower in water supply will be discussed and some case studies will be analysed.

2. Hydropower

Hydropower is a principle to convert potential or kinetic energy into electricity, for example conventional methods, like dams, and the stream of water flows. In most cases a turbine is placed in the system to drive a generator. A modern turbine has an efficiency of 90%.

According to Egré and Milewski (2002) hydropower used in urban water supply systems can be described as a multipurpose project. Since the water is not consumed by the hydropower installation, it can be used for other purposes, like water supply for domestic, municipal and industrial use. Kucukali (2010) mentions that the most convenient locations in water supply systems are water supply lines before the water treatment or distribution network.

3. Case studies

In some countries the principle of using hydropower in water supply systems is a well-known phenomenon. For example, Austria uses hydropower in their drinking water supply system of Nasswald. Also Switzerland has 90 small hydropower plants were installed on the municipal water supply network of the country. Out of Europe, this principle is applied as well. For instance in Morocco the produced hydropower accounts for 8% of the total energy production. In this paper two countries (Greece and Turkey) are highlighted.

3.1. Greece

EYDAP is the Athens Water Supply and Sewerage Company. Many municipalities and communities are served by EYDAP. 4,300,000 customers are provided with water by an extensive network of 9,500 km of water pipes.

The western part of Greece is the wet part of the country, while the eastern part of Greece is much drier, however the demand for water is higher. This spatial and temporal imbalance led to the development of a very long distance water conveyance system. To participate in the national effort for sustainable development and to gain economic benefits, they invested in hydropower. In Figure 1 you can find the location of their hydropower projects.

1 Source: www.eydap.gr
EYDAP has six hydropower plants in operation, one under construction and three other ones are proposed and waiting to be realized. The maximum energy produced and the estimated green energy generated of each of the plants can be found in Table 1.

Table 1: Maximum energy produced and estimated green energy generated of the hydropower plants (EYDAP, Greece)
Source: http://www.eydap.gr/media/DimosiesSxeseis/pinakas_MYHE_en.pdf

<table>
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<tr>
<td>Giona – PPC</td>
<td>8500</td>
<td>-</td>
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<tr>
<td>Kirfi</td>
<td>760</td>
<td>5.86</td>
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<tr>
<td>Elikona</td>
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<td>5.03</td>
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<tr>
<td>Kithaironas</td>
<td>1200</td>
<td>5.73</td>
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<td>Mandra</td>
<td>630</td>
<td>4.90</td>
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<tr>
<td>Evinos</td>
<td>820</td>
<td>4.00</td>
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<tr>
<td>Klidi</td>
<td>500</td>
<td>3.60</td>
</tr>
<tr>
<td>Helidonou</td>
<td>1230</td>
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<tr>
<td>Psytalia</td>
<td>350</td>
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3.2. Turkey

Turkey is a developing country and therefore the energy usage is increasing rapidly. Because the oil prices are rising, the government is researching the possibilities of renewable energy. Kucukali (2010) found that there is a lot of hydropower potential in existing water supply systems. The existing municipal water supply dams of Turkey have an electric energy potential of 173 GWh/year. This corresponds to about 24,000,000 EUR/year economic benefit.

One example of these proposed projects is the Ulutan Dam. Not much investments are needed and the proposed project has a payback period of 1.4 years.

These proposed projects can be developed because of the new energy laws and good economic prospects of Turkey.

4. Advantages and disadvantages

The biggest advantage is that hydropower is a type of renewable energy. This way the dependence of fossil energy is diminishing. Countries that rely on energy imports stay unaffected by fluctuating energy prices.

Another benefit is the work employment during the building stage of the hydro-energy plant. Nevertheless, this is only temporary because of the low operating and maintenance man labor.
This results, on the other hand, into low cost during use of the plant.

One of the main discouragements to start a hydropower project is the high capital cost. This can be a problem when financial resources are scarce.

Some other negative aspects are often forgotten. First, by constructing dams the land upstream the water flow floods. This may necessitate the relocation of the people living there and this implies that sometimes whole communities and towns disappear.

Secondly, the land use changes from farmland to water storage. This affects the economic wellbeing of the farmers.

5. Conclusions

Hydropower in water supply is a recognized principle with a couple of case studies in different countries. This is only possible when the financial and geographical situation allows it.

These projects have several benefits, but the disadvantages are noticeable on the social and economic dimension and therefore must be taken into account.

6. References


