

IS THE HYDRO POWER STILL ECO FRIENDLY?

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Abstract: The paper focuses on the hydro power plants as the main renewable source in Romania for production of clean energy and the new 2030 climate & energy framework, where one of the tasks is that at least 27% of the energy should come from renewable energy. The paper is structured in four parts. In the first part the share market of hydro energy in the Romanian energetic system is underlined. In this part there are also briefly presented the other renewable sources which are used to produce electricity in Romania. The second part estimates the percentage of renewable sources to be extended in Romania in order to reach a higher presence in the Romanian energetic system. The third part presents hydro energy as the main renewable source in Romania and the more recent technology of small hydro power plant (run of rivers) as an alternative in comparison to large dams, in order to extend the hydro energy percentage. The fourth part will present general conclusions regarding the target of 2030 climate & energy framework for Romania and its options to increase the renewable energy percentage.

Keywords: Environment, renewable sources, hydro energy, climate change, energy production.

1. Introduction

As 2030 climate & energy framework, until 2030 European Union should have at least 27% of the energy of energy to be produce from renewable sources. Hydropower is a climate-friendly energy source, generating power without producing air pollution or toxic by-products. Using hydropower avoids approximately 200 million metric tons of carbon pollution in the U.S. each year – equal to the output of over 38 million passenger cars. Communities that rely on hydropower as a primary energy source reap the benefits of cleaner air and water. Satellite imagery shows that the Pacific Northwest, home to the most hydropower in the United States, is an island of low carbon emissions (Source <https://www.hydro.org/waterpower/why-hydro/clean-and-sustainable/>).

On the other hand, it cannot be considered totally clean, as the constructions of the facilities needed to turn its potential into electricity necessities much of concrete, that is known as a very high energy content material. Thus, not only the CO₂ reduced by using hydro energy must be considered, but also the CO₂ invested in the constructions of the plants, not

mentioning that they for sure are affecting the local ecosystem (human, flora, and fauna). The specialists must choose between keeping a low C footprint, and select the best solution. Every growing population needs more and more energy, especially for a higher life standard and industrial development, but this tendency must be kept under control, by balancing the effects generated [1], [2].

The phrase that: *hydropower provides low-cost, renewable and emissions-free electricity, and in today's environment the need to provide clean and environmentally friendly energy using hydropower must continue to be promoted and expanded* (<https://www.hydro.org/policy/priorities/efficient-regulatory-process/>), has to be carefully analyzed, in terms of sustainability concerning the investments as well, not consisting it in money, but in energy consuming materials and technologies. Regulatory improvements to position the hydropower industry for success are still under development.

Hydro power is clean and renewable it doesn't pollute the air because no fuels are burned, thus it is considered non-carbon sources of energy [3]. Also, it is considered renewable because it uses the Earth's water

cycle to generate electricity. But in general, hydropower from large plants is not even considered a renewable energy in many states. Resuming, it is obvious that hydro power projects in terms of environmental impact are a good renewable option, when respecting the goal of renewable development to minimize the ecological footprint (reproduced according to Elizabeth Daigneau, September 2013, *Is Hydropower a Renewable Energy or Not?*). In case of dams assuring the water capacity constructed on rivers, one must carefully analyze the impact upon kilometers of river could be impacted by the next decades of hydropower dam construction. Integrating science into decision-making is critical [4].

The sustainability is analyzed by several items, and a very important guide is known. The Hydropower Sustainability Guidelines (developed by Helen Locher as lead author and others, https://www.hydropower.org/sites/default/files/publicationsdocs/iha_hydropower_sustainability_guidelines.pdf) define how good international industry practice should be assessed, and build on the global knowledge and experience gathered through the multi-stakeholder process.

One main opportunity offered by hydropower is also that it can assure also a sort of accumulation capacity in the dams, aspect that is very important for the present need of electricity/energy accumulators.

2. Situation in Romania

By the end of 2016, 13.52 % from the energy was produced from classic renewable sources and 28.86 % from hydro, also considered as an alternative and renewable source for energy production, achieving a total of 42.38% as renewable energy. In fact, by 2005 Romania had 17.8 % of energy consumed produced from renewable sources, and hydro counts as a renewable (according Annex 1 – national global objectives for the percentage of the energy produced from renewable sources in the final brut consumption of energy from 2020). Fig 11 presents, in %, the components of the sources

used in Romania, by 2017, according ANRE (National Regulatory Authority for Energy).

Figure 2 presents the results of the statistics run for Romania, concerning the used energy sources, expressed in Thousands of tons of oil equivalent (one tonne of oil equivalent equals 41,868.00 MJ). It is obvious that the participation of the hydraulic energy to the total sources (by 2017) is very important.

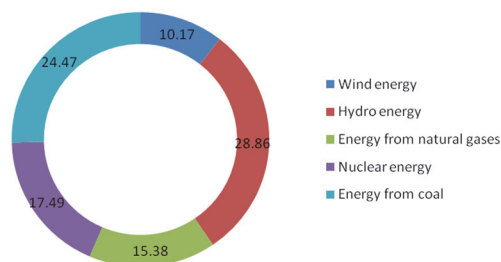


Figure 1. Energy production in 2016 of ANRE- National Regulatory Authority for Energy, (Source: Producers' report no. 61/2016-ANRE arrangement)

In general, the power plants using the hydro energy are weather dependent, very affected by the climate changes as well. Episodes with dry weather or rainy ones are responsible for the normal production. Even they exist they cannot offer all year long the necessary continuous production.

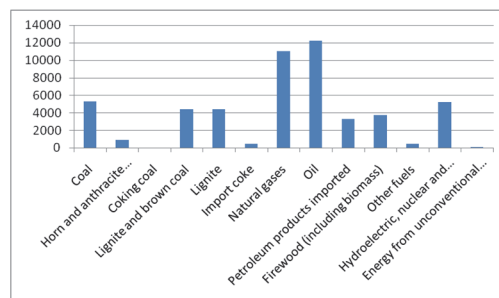


Figure 2. Statistics for the energy sources used by 2017 in Romania (Source: <http://statistici.insse.ro:8077/tempo-online/#!/pages/tables/insse-table>) .

Fig. 2 indicates, even the present use is reduced, that a promising energy resource is the biomass and other fuels, mainly second generations bio based fuels [7].

3. Forecast for Romania

For the period 2018 – 2020, the Romanian national transport operator Transelectrica estimates a decrease of the capacity from renewable (including hydro) and an increase of the capacity from Fossils Fuels (Figure 3).

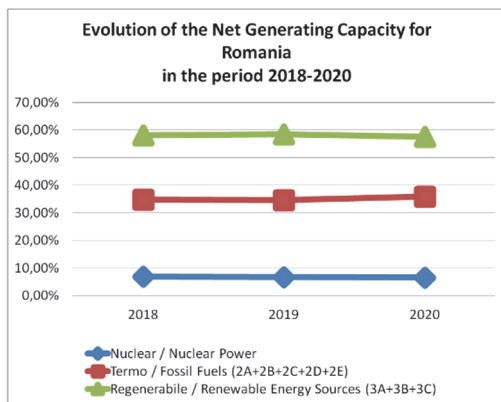


Figure 3. Evolution of the net capacity of generating energy in Romania, prognosis for 2018-2020 (Source: <http://www.transelectrica.ro/documents/10179/45094/7productie14.xls/fc7997ed-94bd-480b-a9e6-78cb3f5e0c8a>)

Figure 3 present the evolution of the Network Generating Capacity in Romania using the available power in SEN (National Energetic System). Thus, it can be seen that the percent of renewable sources is considerable.

Taking into consideration the available resources in Romania, new power plants for producing electricity and to count to the electrical network of distribution could be develop only in segments where there is a real potential for the next future: nuclear, hydro, wind, solar.

The development of new power plants should meet also the expectation of civil society who raise issues like environment protection, habitats protection, Nature2000 network, human health and risks, etc. From this point of view hydro and nuclear are most exposed and should meet high demands for new units' proposals [5].

4. Is hydro energy still an option for Romania?

Although as renewable source, hydro power faces a strong opposition from the civil

society due to the impact which might have on the environment. Especially the smaller plants, in the mountain regions are supposed to a refuse from the population to allow their constructions.

Hydro power from small plants can offer a suitable option for Romania for creating a reserve of energy source that is renewable. If hydro power could be considered further an eco friendly energy, it means that Romania has reached 42.38 % renewable energy from its total production, much more than the 27 % to be reached in 2030.

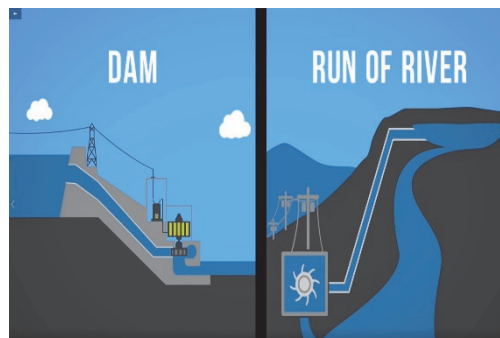


Figure 4. Dam plants versus Small hydro power plant (considered as “Run of river” type)

If the resulted constructions do not meet the ecological minimal footprint and thus the hydro plants cannot be considered as an eco friendly energy process, Romania has to add until 2030 13.48 % energy from the other available renewable resources in Romania: wind, solar, or even nuclear (considered safety concerning the nuclear fuels, and as no other pollutants are exhausted) [1], [5], [6].

After all, hydro energy is a clean and renewable energy, producing zero emissions and could have from a minimal impact on the environment depending on the accepted technical solution. It is important that one takes into consideration the construction of the plant that is meant not to destroy the ecosystem. Thus, smaller plants are easier to develop, when the project is correct designed and applied, taking into account the minimization of the environmental impacts. Once the plant exists, it must not harm the fauna, flora, all the aspects and especially the life style of the people in the vicinity. The architectural view, the landscape and affection

(non-affecting) of tourism are also of major importance. The plants once developed, assure working places, develop the region, but can turn into touristic attractions as well.

5. Conclusions

Romania benefits according to the national geographical outfit of a huge potential of hydro power sources and decisions on future dam project establishing are being made now. But it is very reasonable that one must integrate science and a hydropower power plant by a concept approach into these processes. Hydropower plays a vital role in Romania, as well in other countries, in reducing the world's dependence on fossil fuels. As a renewable energy, it is essential that hydropower is developed sustainably. The science up to now demonstrated that building new hydro projects through a sustainable approach can provide substantial energy production, while minimizing impacts on nature and human life. The hydropower paradox consists of answering the question: is the hydro energy as clean as it seems? And it is obvious that progress in the next future is needed, as much as the source is needed.

The authors conclude that one has to research in all energy sectors in a combined way to bring more. Renewables into the power system. Only innovation can turn power systems into a more flexible one, especially when the accumulation of energy is industrial attested. The novelty must cover sources and technologies for their application into reality.

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