Abstract for the Solar-Hydro Conference 2024

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Hydrological Risk Mitigation in Cameroon by Floating PV Plant Installation

Cameroon's electricity production is and will remain strongly hydropower dominated. In the here presented study, the hydrological risk is defined as the financial risk for the Government of Cameroon related to the hydropower generation cost and revenues. With the foreseen increase in electricity demand and potentially effects of climate change, this hydrological risk may increase. This study done by AFRY deals with the sustainable mitigation of the hydrological risk and is one of the six project components of the Technical Assistance Project for the Development of Hydroelectricity on the Sanaga River financed by the International Development Association.

One of the studied mitigation measures is the installation of Floating Solar Plants (FPVs) on the reservoir surface of existing or planned hydropower schemes. Given a set of general assumptions of the boundary conditions, a FPV unit was defined, and then applied to the selected potential sites. The resulting power potentials for each of the potential sites were estimated with the software PVSyst based on the available water surface and the local irradiation conditions. Although technical limitations such as foundation and mooring conditions, growing vegetation and debris pose uncertainties related to the accurate estimation of the yearly power production, the social and environmental restrictions have been considered potentially even more relevant limitations for the selected sites. For this reason, two scenarios with an upper limit for the feasible capacity in case of were applied in a consecutive step for the sites with the biggest potential.

In a second step, the resulting capacities were included in the financial energy model developed specifically for the project. This model simulated the whole future energy system of Cameroon as planned for 2035, including both hydropower as well as other energy sources, and was thus used to evaluate the risk mitigation potential of the FPVs. Given the national hydropower development plans and the likely low hydrological risk in Cameroon foreseen for 2035 as demonstrated both by the hydrological model developed in a previous step of the study as well as by the financial energy model, the development of FPV projects will not improve the economical situations for Cameroon in 2035, as this on the contrary will cause an increased cost for the energy system. However, Cameroon is currently facing a power capacity deficit until the planned hydropower plants will be put in operation. The potential for solar power found in this FPV study can therefore support a recommendation of FPV developments as a faster realizable solution which may help improve the energy situation in the short term. Furthermore, FPVs also provide an attractive alternative to the currently operated thermal plants, both as it does not rely on fuel supplies from the coastal ports or major cities, while proposing a green alternative with respective international funding opportunities.