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# *Interactive comment on* "Risks and opportunities for a Swiss hydropower company in a changing climate" *by* Kirsti Hakala et al.

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The article "Risks and opportunities for a Swiss hydropower company in a changing climate" addresses relevant questions of scientific and practical nature. It can be published after a careful revision. The main added value is given by the definition of a set of hydrological indices related to the Group E's vulnerability (well summarized in table 2). Of particular significance are the seasonal changes in inflow distribution. On this basis, the risks and opportunities for the operator are estimated. However, there are some drawbacks that should be considered by the authors, that I summarize below. The analysis focuses on water inflows and energy demand, but doesn't take into consideration other important characteristics of the energy turnaround and the opening of the power market to competition. Furthermore, as recognized by the authors, the anal-



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ysis of the electricity demand is limited to the climate drivers. For instance, the authors point out “Under climate change, as flexibility decreases and energy demand likely increases due to heat waves [. . .], Groupe E stated that they would consider acquiring new sources of energy production to compensate for this loss.” However, Groupe E forgets that very likely its customers will install solar panels and perhaps batteries for the storage of electricity at home. Its market will therefore change quite deeply. I understand that the authors can’t develop this issue, which has not been studied. But they can’t ignore it; on the contrary, they should emphasize it. Several times, the authors take as granted higher energy (in fact, electricity) prices in winter, “given that the winter period usually corresponds to higher energy prices”. No doubt that this is a quite realistic scenario. But the problem is very complex and the future evolution of the market in Europe and Switzerland presents many uncertainties, as shown by a quite large literature. Some scenarios are not so favorable to hydropower. In any case, it is risky to assume a continuity between past and future. The authors state: “The figures we provide will help Groupe E determine the value of water in the future and the price they are willing to pay for the renewal of their concessions.” I agree, but on two conditions: it must be recognized that an economic study of the value of water has not been carried out; one must be aware that only two drivers have been taken into consideration: water flows and energy demand. The collaboration with group E is the basis of this article. It produced interesting results. Group E must be thanked for its transparency. But my feeling is that the authors rely too much on the company’s expertise. It looks like that ultimately it belongs to the company to decide if the authors’ analyses are relevant or not. The authors should be a little more critic. Moreover, the company’s judgments depend on its strategy, which is not presented in the article. The authors state: “This study illustrates the benefits of involving stakeholders in hydropower climate change impact studies”. In fact, only one stakeholder was involved in this study, i.e. a power company. It would have been more interesting to highlight the perception of different stakeholders (public bodies, environmental organizations, local communities, etc.) on these issues, as well as their convergences and divergences. The authors stress the





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importance of their results in the context of the negotiations of the concessions renewal, residual flows and water fees. However, in order to develop a strategy, one has to understand the point of view of the main stakeholders involved. For instance, I imagine that the Groupe E's request that "residual flow requirements should not increase or find a middle ground given the future behavior of low flows entering their reservoirs", will be challenged by stakeholders primarily concerned by environmental issues.

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