Review of: "Water-Energy Nexus in Power Systems: A Review"

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Potential competing interests: No potential competing interests to declare.

Water-Energy Nexus in Power Systems: A Review

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Comments:

The paper addresses an important topic: the connectivity between water and energy (WEN). The paper is mainly a review paper analyzing about 120 recent publications. One chapter explains the methods applicable for the investigation of the WEN. It has to be appreciated that a large number of papers are subjected to a coherent analysis.

Several points are missing in this approach. Of course, not all aspects of energy generation and storage can be considered, but when “sustainable energy planning of power systems” is intended, then additional aspects have to be at least mentioned.

1. Environmental impacts: Considering the energy sector and hydropower, then also environmental impacts have to be incorporated in energy planning; otherwise, sustainability would remain as a buzzword.
2. Biofuels and biomass in the energy sector are strong competitors for agriculture and food production. Thus, a Water-Energy-Food Nexus is obligatory. Several conferences have been held in this domain, e.g., the International Conference "Sustainability in the Water-Energy-Food Nexus," Bonn/Germany (2014).
3. Paragraph V refers to policies. Although there are documents formulating policies at the international and national levels, very often the institutional structure and the decision-making process in allocating resources and in impact assessment are inappropriate for the successful application of the policies. Environmental impacts have to conform to environmental standards. Thus, the environment is included as a set of constraints in the decision-making process. Very rarely, a sound trade-off based on multi-criterion approaches is applied. See also chapter IV, section C, where optimization procedures are discussed.

4. The scale issue: the WEN has to be treated differently in international river basins, at the national level, and at the local level. Examples can be seen in water conflicts among upstream countries (e.g., Kyrgyzstan, rich in water and thus producing electricity also in the winter time, while the downstream country Uzbekistan needs water for food in the spring and summer periods); within a country producing biofuels and requiring water for food production; at the local level where different interests (ecology, energy use, social aspects) are dominating.
5. In chapter III, two sections are included. Section A refers to “Impacts of Climate Change on the Water-Energy Nexus,” and B deals with “Social Impacts on the Water-Energy Nexus.” Hydropower, thermal power, and the production of PV are connected with severe environmental impacts in both quantity and quality. Rivers are channelized, the river continuum is frequently interrupted by dams, diversions result in a dramatic decrease of runoff, water temperature is increased, while the production of PV plates and energy storage facilities lead to environmental pollution, to cite only a few of the adverse impacts. Nothing is said about these aspects, although often “sustainable energy planning” is mentioned.

Summary:

In the introduction, the intended target group should be identified.

It should be clearly explained why several important topics related to the WEN have been disregarded.

Phrases such as “*Effective management of the water-energy nexus requires sustainable solutions to balance the demands of both resources, prioritize their efficient use, and ensure sustainable management.”* should be avoided, and there are many in the text. What is the meaning of *“Thus, it is essential to develop interdisciplinary, integrated approaches to manage the water-energy nexus with increasing effectiveness, efficiency, and resilience.”*? Nowhere are these terms “effective, efficiency, resilience, and sustainability” explained/defined as they are understood in this paper. As long as food and the environment are not included in the planning and management, the term sustainability should be avoided.

The reference numbers in the text should be harmonized with the references.

The paper should be substantially revised.