

Dear Referee,

Thank you for taking the time to review our paper. We are grateful for your thoughtful comments.

"The revised manuscript is substantially improved, where the authors have effectively addressed my previous comments. The proposed modeling approach represents an important contribution to the literature, offering a method to simulate hydropower production with fine spatiotemporal resolution within the context of power-grid-level electricity demand. Therefore, I recommend the publication of this study in HESS.

Yet, I have a minor suggestion. The authors could add a discussion (perhaps in section '5.3 Perspectives') on how the detailed hydropower production model could be instrumental in more sustainably planning future hydropower expansion. This discussion is particularly relevant in the context of hydropower's future role under economy-wide decarbonization, which is likely to significantly increase hydropower demand (see Chowdhury et al. (2024), "Hydropower expansion in eco-sensitive river basins under global energy-economic change," <https://doi.org/10.1038/s41893-023-01260-z>). Including this discussion could provide valuable insights for future studies to utilize the developed model's capabilities effectively in the sustainable planning of hydropower."

Thanks for your suggestion, we have added a discussion on this point at the end of the conclusion (section 5.3): *"Such a detailed model could also be instrumental in planning future hydropower expansion more sustainably. It would help assess the demand satisfied by new hydropower plants at the grid scale, considering both existing and planned hydropower plants. Besides, the model could evaluate the potential impacts of new projects on river discharges and ecosystems."*