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Interactive comment on "Long-term projections of global water use for electricity generation under the Shared Socioeconomic Pathways and climate mitigation scenarios" *by* Nozomi Ando et al.

Anonymous Referee #2

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The authors project electric-sector water withdrawal and consumption for the five Shared Socioeconomic Pathways (SSP) in combination with six climate change mitigation scenarios based on Representative Concentration Pathways (RCP). For each combination of SSP and RCP, the authors used two combinations of cooling systems projections: the status quo, which retains current cooling system shares, and recent trends, which continues current trends towards lower once-through cooling system percentages and much higher recirculating cooling percentages. They compare the differences in water withdrawal and consumption values globally to 2100 among the SSPs versus among the RCP-based mitigation scenarios, and find that water use is much more sensitive to differences among SSPs than RCPs. They also examine the Mid-

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Discussion paper

dle East as a case study of differences among scenarios, as well as uncertainties in Carbon Capture and Storage (CCS)-based water requirements.

Overall, the paper is well-written and interesting, and will likely be of interest to a wide audience. However, with one important exception, the work is unfortunately basically a repetition using the AIM model of work that has been conducted using other integrated assessment models. The exception relates to the establishment of cooling system types based on the GIS analysis with the WEPP and CARMA databases – this result is interesting and useful in itself, and could be described in greater detail.

Specific comments:

x Line 135: The authors refer to an earlier paper, Fujimori et al. (2016b), for the details of the SSP scenarios. It would be helpful to provide more explanation in the present manuscript as well.

x Section 2.2: The authors assign fixed coefficients for water withdrawal and consumption over the simulation period, but do not explain why they omit technological change that could lower these coefficients over time. Further, in section 2.2.1, the authors explain that they omit dry cooling, because such systems are currently not widespread. This argument is problematic, since adoption of dry cooling is rising, and concerns over water scarcity are likely to drive even wider adoption into the future.

x Line 438-440: The two omissions listed here are significant: water scarcity is not included because of a lack of a global hydrological model, and trade-offs among various water sectors are not included. In my view, there is unfortunately limited value – given the number of other recent studies published on this topic – in presenting projections of electric-sector water use without these feedbacks.

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