



## Water Usage for Solar Power Development in the Semi-Arid Nevada

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Solar energy is a sustainable and renewable energy source. It is growing in popularity as a clean source of electricity production because the usage of fossil fuel based power technologies has led to elevated pollution levels and CO<sub>2</sub> emissions. The water limited arid and semi-arid regions such as southwestern U.S. possess tremendous solar resources for solar power development. Hence understanding water use by solar power industry becomes vital. The main types of solar power technologies namely solar photovoltaics (PV) and concentrated solar power (CSP) have water requirements for washing the panels/mirrors to prevent reduction in efficiency. The CSP technology has additional water requirements for the wet, hybrid and dry cooling processes which is comparable to that in thermoelectric plants. The objective of this study was to analyze the water requirements and availability as well as land usage and reduction in CO<sub>2</sub> emissions due to solar installations by using a system dynamics model. The analysis was performed for the state of Nevada to meet the goals of renewable portfolio standard (RPS) during the period 2010-2030 for different configurations of PV and CSP technologies. Surface water, groundwater and wastewater were investigated as potential sources of available water. It was found that unappropriated groundwater resource has the potential to meet the water demands of solar installations for 2010-2030 under Nevada RPS. Largest amount of water withdrawal was found for CSP Linear Fresnel but the same had the smallest impact based on land usage. Solar PV technology created minimum environmental disruption based on water withdrawals and carbon emissions. For future work, this model can also be implemented in other states using the datasets applicable for that region. This research contributes to objective 1 of nexus project.



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