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Implications of renewable resource dynamics for energy system planning: The case of geothermal and hydropower in Kenya

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RÉSUMÉ

In 2016, almost 80% of Kenya's current electricity production came from renewables, mainly relying on hydro and geothermal resources. Both of those resources are subject to dynamics that affect utilization. In the case of geothermal resources excessive utilization can lead to production capacity losses. In the case of hydro resources climate change can reduce their availability. This paper investigates what the implications of the dynamics of those two renewable resources are for short- and long-term (sustainable) electricity system planning in Kenya. A demand driven bottom-up model representing the most prevalent technologies of Kenya's future electricity system, including geothermal and hydro dynamics, is used to run a total of eight different scenarios, varying in electricity demand and which resource dynamics are considered. Results show that in the long-term more installed capacity is necessary when geothermal and hydro resource dynamics are considered because of losses in production capacity. However, additional installed capacity does not translate into more production but leads to higher cost. The current power plan for Kenya and other electricity models do not address this issue. Unsustainable use of geothermal resources, if not addressed can lead to temporary depletion of the geothermal reservoirs with significant economic and sustainability related consequences.

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