Modelling energy supply options for electricity generations in Tanzania

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Abstract

The current study applies an energy-system model to explore energy supply options in meeting Tanzania's electricity demands projection from 2010 to 2040. Three economic scenarios namely; business as usual (BAU), low economic consumption scenario (LEC) and high economic growth scenario (HEC) were developed for modelling purposes. Moreover, the study develops dry weather scenario to explore how the country's electricity system would behave under dry weather conditions. The model results suggests: If projected final electricity demand increases as anticipated in BAU, LEC and HEC scenarios, the total installed capacity will expand at 9.05%, 8.46% and 9.8% respectively from the base value of 804.2MW. Correspondingly, the model results depict dominance of hydro, coal, natural gas and geothermal as least-cost energy supply options for electricity generation in all scenarios. The alternative dry weather scenario formulated to study electricity system behaviour under uncertain weather conditions suggested a shift of energy supply option to coal and natural gas (NG) dominance replacinghydro energy. The least cost optimization results further depict an insignificant contribution of renewable energy technologies in terms of solar thermal, wind and solar PV into the total generation shares. With that regard, the renewable energy penetration policy option (REPP), as an alternative scenario suggests the importance of policy options that favour renewable energy technologies inclusion in electricity generation. Sensitivity analysis on the discount rate to approximate theinfluence of discount rate on the future pattern of electricity generation capacity demonstrated that lower values favourwind and coal fired power plants, while higher values favour the NG technologies. Finally, the modelling results conclude the self-sufficiency of the country in generating future electricity using its own energy resources.