

Future wind deployment scenarios for South Africa

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Motivation

Global trends of RE deployment, particularly wind and solar PV, initially from subsidised programs globally have resulted in cost reductions where cost-competitiveness with conventionals are now a reality (South Africa's utility-scale RE auction program has demonstrated this). The impact of these cost reductions on long-term capacity expansion scenarios is presented.

Problem Statement

South Africa's electricity mix is currently dominated by coal-fired power generation capacity. This fleet of coal-fired power generation capacity is planned to be decommissioned from the mid-2020s onwards until the mid-2040s. Combined with an expected increasing electricity demand, a significant supply gap is expected. This anticipated supply gap should be met with a range of supply technologies of which wind will likely play a significant role considering aforementioned cost reductions.

Methodology

A long-term capacity expansion planning model was developed for South Africa in order to test a range of scenarios. Input data to inform this model is all publicly available and is published as part of this research. The scenarios explored parametrise demand forecasts, technology cost assumptions and CO₂ emissions trajectories.

Results

Key output dimensions for each scenario were compared and include capacity build-out, energy mix, total system costs, average tariff, CO₂ emissions and water usage.

In all scenarios investigated, wind's contribution to the South African energy mix was up to 35% by 2030, 45% by 2040 and 50% by 2050.

A focus on the annual wind deployment for all scenarios is presented and put into context relative to global wind deployment. This is intended to assist industry stakeholders in appreciating the likely range of annual wind deployment to be expected.

Conclusions

Wind should play a significant role in South Africa's future electricity mix at relatively low-cost. This supports global shifts towards low-carbon energy systems supported by wind complemented by a range of other supply technologies. Annual deployment for South Africa enable a steady, significant and sustainable wind market for South Africa.