Proceedings of the 2014 ORSSA Annual Conference, Parys, Free State, 14-17 September 2014

Developing long-term scenario forecasts to support electricity generation investment decisions

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Abstract

Many decisions regarding capital investment in electricity generation technologies need to be made well in advance, usually when there is still a large amount of uncertainty regarding the favourability of future conditions. There may be uncertainty about the amount of electricity required in future as well as the the variability in the demand, and both of these uncertainties can affect decisions pertaining to such capital investment decisions. This paper presents an approach that uses multilevel models to develop scenario forecasts for South African load profiles (hour-to-hour changes in the electricity demand), which can then be used to support decisions regarding the electricity generation capacity required. Although historical load profile patterns are known, there is uncertainty about how future patterns will deviate from historical ones. By developing scenarios that represent different views about future load profile patterns, forecasts can be obtained for each scenario and, in turn, these scenario forecasts can be used to investigate the effect of changes in demand patterns on future electricity generation requirements. The approach of using multilevel modelling to obtain long-term hourly forecasts for a particular scenario has not been seen elsewhere in the literature, but shows promise for providing appropriate support electricity generation expansion decisions.

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