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Investigation into the impact of wind power generation on demand side management (DSM) practices

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Abstract

The construction of a number of wind farms in South Africa will lay the foundation for the country to embrace the generation of greener energy into the National Grid. Despite the benefits derived from introducing wind power generation into the grid, this source encompasses adverse effects which need to be managed. These adverse effects include the intermittency and lack of predictability of wind. In power systems with a high penetration of wind energy, these effects can severely affect the power system's security and reliability in the event of significant rapid ramp rates. Recently, many utilities around the world have been exploring the use of Demand Side Management (DSM) and Demand Response (DR) initiatives and programmes to support and manage the intermittency of wind power generation.

This report outlines the programmes and benefits of DSM/DR and provides a critical analysis of the challenges facing South Africa with implementing these initiatives. Introducing these programmes necessitates the employment of a number of Smart Grid technologies including Advanced Metering Infrastructure (AMI), next generation telecommunications technologies, smart meters, enterprise system integration and dynamic pricing. These tools and techniques are discussed and their challenges described within the context of South Africa's current state of the power system. The current practices for DSM/DR in South Africa have been evaluated in this report. Despite, the success of many DSM/DR initiatives in the commercial, industrial and agricultural sectors, it is found that much work is still required in the residential sectors as the current DSM initiatives are not adequate for managing wind power generation. A detailed analysis and recommendations for South Africa's DR program is then presented based on industry best practices and experiences from other utilities who are currently exploring DSM/DR in the residential sector using Smart Grid technologies.