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# Solar Power Generation in a Mining Town: A Case Study for Australia

**Authors :** Ryan Chalk, G. M. Shafiullah

**Abstract :** Climate change is a pertinent issue facing governments and societies around the world. The industrial revolution has resulted in a steady increase in the average global temperature. The mining and energy production industries have been significant contributors to this change prompting government to intervene by promoting low emission technology within these sectors. This paper initially reviews the energy problem in Australia and the mining sector with a focus on the energy requirements and production methods utilised in Western Australia (WA). Renewable energy in the form of utility-scale solar photovoltaics (PV) provides a solution to these problems by providing emission-free energy which can be used to supplement the existing natural gas turbines in operation at the proposed site. This research presents a custom renewable solution for the mining site considering the specific township network, local weather conditions, and seasonal load profiles. A summary of the required PV output is presented to supply slightly over 50% of the towns power requirements during the peak (summer) period, resulting in close to full coverage in the trench (winter) period. Dig Silent Power Factory Software has been used to simulate the characteristics of the existing infrastructure and produces results of integrating PV. Large scale PV penetration in the network introduce technical challenges, that includes; voltage deviation, increased harmonic distortion, increased available fault current and power factor. Results also show that cloud cover has a dramatic and unpredictable effect on the output of a PV system. The preliminary analyses conclude that mitigation strategies are needed to overcome voltage deviations, unacceptable levels of harmonics, excessive fault current and low power factor. Mitigation strategies are proposed to control these issues predominantly through the use of high quality, made for purpose inverters. Results show that use of inverters with harmonic filtering reduces the level of harmonic injections to an acceptable level according to Australian standards. Furthermore, the configuration of inverters to supply active and reactive power assist in mitigating low power factor problems. Use of FACTS devices; SVC and STATCOM also reduces the harmonics and improve the power factor of the network, and finally, energy storage helps to smooth the power supply.

**Keywords :** climate change, mitigation strategies, photovoltaic (PV), power quality
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