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Revisiting the Power Co-ordination Challenges of the Original Snowy Mountains Scheme

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Abstract

The Snowy Mountains Scheme (1949–1972) was an Australian hydro-electricity generation triumph. However, the power co-ordination challenges were significant before the invention of fibre optic cable, as this historic paper from June 1964 attests.

Introduction

Power distribution and telecommunications are strange bedfellows but their marriage was essential to the success of the Snowy Mountains Scheme. Traditionally, power co-ordination is concerned with minimising low frequency electromagnetic interference in communications cabling due to the proximity of high voltage power conductors, and avoiding dangerous earth potential rises due to electromagnetic coupling from faults and imbalances in the power infrastructure. The historic paper (Muir & Lochhead, 1964 [5]), which follows, details the magnitude of the challenges, given the huge generation capacity being provided in the Snowy scheme and its relative inaccessibility, forcing telecommunications and power infrastructure to share the same easements for maintenance reasons. All this occurred well before fibre optic cable became generally available to the telecommunications designer.

To make matters worse, the high soil resistivity in this rugged mountain terrain aggravated the coupling between telecommunications routes and adjacent high voltage power infrastructure. Several examples are given where the earth potential rise under fault conditions at the Jindabyne Zone Sub-station and Upper Tumut Switching Station could reach 4,000 and 8,000 volts, respectively. Special care is required when the earth potential rise exceeds around 1,000 volts, as the use of gas arrestors is no longer satisfactory.

The historic paper discusses a number of telecommunications mitigation techniques, including installing cabling well clear of power station earth mats, prudent selection of cabling in respect of type of insulation and breakdown voltages, floating earths, installation of fuses, as well as isolation or neutralising transformers. The maintenance of these transformers needed to be carried out by personnel trained in high voltage techniques because dangerous voltages could appear on either type of transformer during a fault situation.

The paper also provides an example of a significant interference problem on the trunk route between Kiandra and Cabramurra, where several mitigation actions were undertaken but were only partially successful. It illustrates the complexity of power co-ordination situations, where conductive and inductive effects invariably exist together. It also emphasises that the most important potential difference between line wires and local earth can occur at any point, depending upon the location of the power fault. This fact is particularly important in designing protection, so that arrestors are deployed along the route to reduce the possibility of big differences in potential between lines of differing lengths along the same route.

The Snowy Mountains scheme was continuing to evolve in 1964 when this historic paper was written. The power co-ordination requirements needed to be continually reviewed as more generation capacity came on line and the potential for fault situations increased. This requirement was eased in the longer term with the availability of fibre optic cable, which is largely immune to electromagnetic interference.

Reference

Muir, R. J., & Lochhead, R. A. (1964). Power Co-ordination in the Snowy Mountains Area, *Telecommunication Journal of Australia*, *14*(4), June, 301–309.

Please refer to PDF download for the full paper, including the historic reprint.

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