SPECIAL HEAT CYCLE VOLTAGE TEST OF 275KV XLPE CABLE SYSTEM

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ABSTRACT

Testing to IEC62067 does not subject cable systems to the maximum overload operating temperature of 105℃. The 275kV XLPE cable project undertaken in Adelaide, Australia included most cable system testing requirements in line with CIGRE experience and pertinent IEC standards plus an additional test (Special Test) to subject the cable system to the maximum overload operating temperature.

The cable system is supplied by two cable manufacturers who have independently prequalified their cable system components, but not in combination.

The Special Test provided an opportunity to test the cable system components in combination.

KEYWORDS

Heating cycle voltage test, voltage breakdown, partial discharge, A.C. and impulse voltage, standards, system reliability, test assembly and life expectancy.

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INTRODUCTION

An 18km long 275kV underground cable system is currently being installed in the city of Adelaide in Australia. The cable system consists of cable and accessories from two separate manufacturers.

The route comprises a wide range of installation conditions including direct laid cable, long ducted sections, purpose built bridge, cable installed on existing bridges, directional drilled ducts, all generally in flat formation.

Cable condition is monitored using partial discharge (PD) sensors fitted at each joint or termination and a DTS system with direct input to a dynamic rating system (DRS).

While there is general industry acceptance that the maximum continuous and emergency operating temperatures of XLPE insulated cables are 90ºC and 105ºC respectively, IEC62067 does not require testing at temperature values above 90 to 95ºC (for Prequalification(PQ) test) and 95 to100ºC (for Type test). In practice, these tests are usually performed as close as possible to the lower end of the specified temperature range.

On the other hand North American standards stipulate testing to 105ºC and specification AEIC CS9-06 stipulates specific durations.

The specification for the 275kV cable system in Adelaide included requirements for overload operation for nominated periods and cumulative times over the cable operational life.

To verify compliance to the maximum continuous and overload operating temperatures and durations, a Special Test was specified.

The test concept was, in many respects, similar to the IEC62067 Type test but of an extended testing period and at a higher testing temperature intended to verify that the offered cable system has been designed to comply with system operating requirements and to confirm that it will provide the expected reliability under normal and overload operating conditions.

The number of loading cycles was based on CIGRE (WG B1-06) reported experience that the XLPE thermal shrinkage would stabilise after a certain number of heating-cooling cycles, generally in the range of up to 60 to 80 heat cycles.

The Special Test assembly included cables and cable accessories supplied by both manufacturers installed to simulate planned installation conditions. The assembly was subjected to elevated thermal and voltage stresses by applying 24hr heating cycles of 105±2℃ (two hou rs per cycle) while continuously maintaining the installation at 2Uo over a 70 (seventy) day testing period.