

ElecLink Cable Fire Performance and Bespoke Fire Test

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ABSTRACT

Under the EU Construction Product Regulation, the 320kV ElecLink HVDC interconnector cable shall comply with the EU Fire Classification defined in EN 13501. Additionally, for the cable section installed inside the North Running Tunnel of the Channel Tunnel, it needs to achieve a minimum B2ca, s1a, a1 classification as per EU Directive n°1303/2014 requirement. This paper firstly outlines the project cable fire performance requirements, subsequently describes the design challenge and approach, and finally details the associated performance tests and results. Being the first of this kind, it shall provide useful information on HVDC cable fire performance design within a complicated installation environment.

KEYWORDS

HVDC cable, Fire Performance, Euroclass CPR

INTRODUCTION

Being one of the European Commission's Projects of Common Interest, ElecLink project aims to design, install and operate a 320kV HVDC 1000MW electricity cable interconnector between France and Great Britain to be installed within the North Running Tunnel of the Channel Tunnel (Fig.1 and Fig. 2).

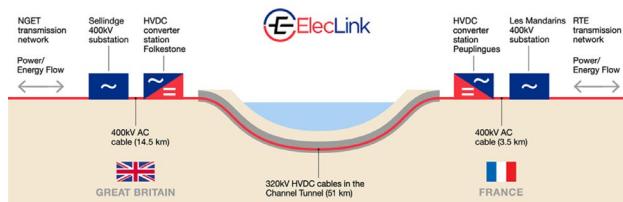


Fig. 1: ElecLink transmission schematic

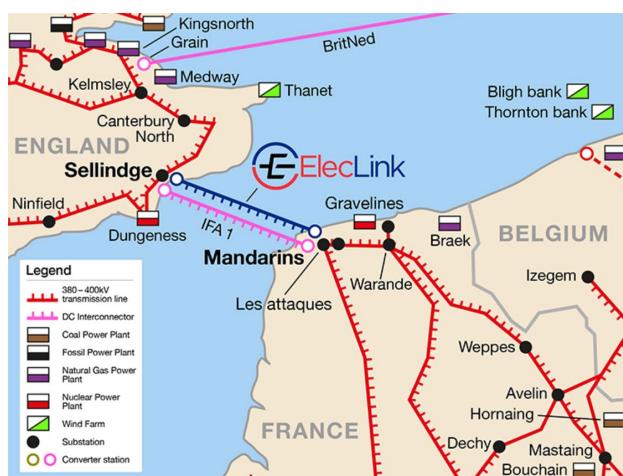


Fig. 2: ElecLink project location

With an initial introduction of the European Construction Product Regulation (CPR) in 2016, it became mandatory

from 1st July 2017. CPR sets out harmonized rules for the construction products marketing, i.e. CE marking, in the EU, where specific requirements for electric cables are detailed in BS (EN) 50575 [1]. To comply with CPR, cable fire performance shall be evaluated against the so called 'Euroclass' classification system following EN 13501-6 [2], with performance results being clearly declared and shown in the CE marking.

Manufacturing of the 2 x 51km d.c. cable length commenced in the first half of 2018 and the CPR is mandatory. Further to the existing project fire performance specifications, as per EU Directive n° 1303/2014 [3] requirement, the cable design shall also meet a minimum B2ca, s1a, a1 fire classification.

To properly describe the relevant engineering process, accumulative cable fire performance specifications from various stakeholders are firstly outlined with a short comparison. Subsequently, the cable design is presented with focus on how to improve the fire performance while retaining sufficient robustness on other properties, e.g. mechanical, electrical. Finally, bespoke lab test is detailed to demonstrate the overall fire performance.

FIRE PERFORMANCE SPECIFICATION

As the first project of this kind where a high power HVDC cable circuit is to be installed inside a running railway tunnel of significant length, very stringent fire performance requirements have been specified to ensure safety risks remain tolerable.

As result, the accumulative power cable fire performance requirements come from three primary stakeholders, a. ElecLink (interconnector operator); b. Eurotunnel (operator of the Channel Tunnel concession); and c. European Union;

ElecLink requirement

ElecLink requires the d.c. cable to be of low-smoke zero halogen (LSOH) type and the cable oversheath shall also be of flame-retardant material to limit spread of fire. The low smoke property shall comply with BS (EN) 61034-2 [4] with a min. 60% light transmittance. The zero-halogen property shall be evaluated following BS (EN) 50267-2-1 [5] with <0.5% halogen acid. The flame-retardant property shall be assessed along with BS (EN) 60332-3-2x [6].

It is believed that above requirements follow the best industry practice to specify HV cable fire performance.

Eurotunnel requirement

Eurotunnel requires the cable to pass smoke test following BS 6724 [7], BS 6401 [8], NF X10-702 [9], and NF C20-902 [10], which specifies a higher 70% light transmittance from cable sample and smoke density measurement from material specimens. The cable also needs to comply with BS (EN) 60754 [11], NF X70-100 [12], and NF C20-454 [13] which specifies more chemical elements to be tested