ENVIRONMENTAL IMPACT OF OFFSHORE WIND FARM CONNECTION INFRASTRUCTURE

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ABSTRACT

Several new offshore wind farms (OWF) are planned for construction in Poland. The submarine power cables (inter-array 66kV and export 220 kV cables) play a vital role in bringing the power from the wind turbine first to the offshore- and then to the onshore substation. The purpose of this paper is to present the results of the studies involving calculation of the temperature distributions in the cable right-of-way formed by the set of about 70 HVAC cable lines, which represent the power output from the offshore wind farms (OWF).

KEYWORDS

Cable ampacity, large right-of-way

INTRODUCTION

This paper presents thermal calculations for a cable right-of-way that is the onshore portion of wind farms transmission lines in the Baltic Sea. It is assumed that electricity from the Baltic offshore wind farms will be transmitted to the onshore substation via cable circuits operating at 220 or 275 kV.

Each circuit, consisting of 3 single-phase cables with copper or aluminum conductors (phases: L1, L2 and L3), will be run in a trench (or tunnel), an example cross-section of which is shown in Fig. 1. The distance between the axes of the individual cables in each circuit will be about 0.3 meters.

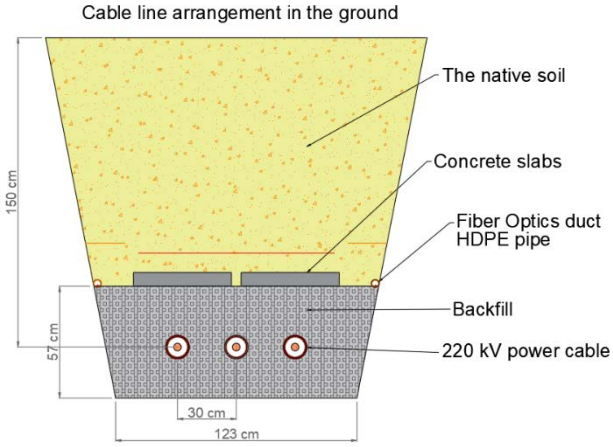
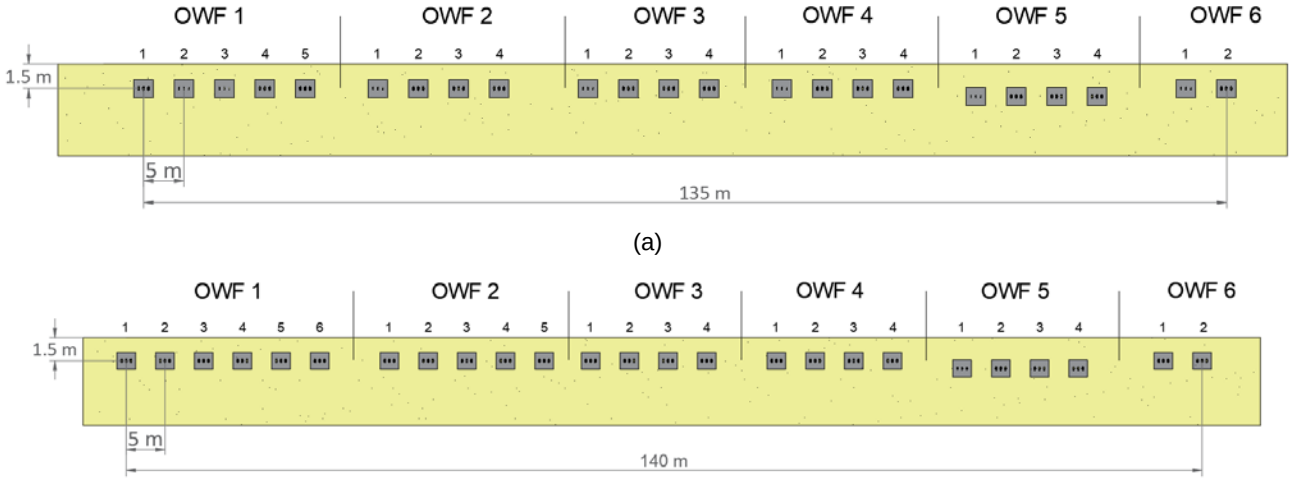


Fig. 1: Example of cross-section of an open trench in which 3 single-phase cables with copper or aluminium conductors are routed, forming a single cable line

Cables will be laid in native soil in a flat layout at a depth of 1.5 m and 2 m (only OWF 5). The designed distance between the axes of the cable circuits is 5.0 m. The distance between the lines of different owners is about 10 m, as shown in Fig. 2.



(a)

(b)

Fig. 2: Layout of cable lines adopted for modelling of cable right-of-way - (a) layout with 69 cables, (b) layout with 75 cables

The individual cable lines (23 in the first case or 25 in the second), will be run in parallel, forming a cable right-of-way, as shown in Fig. 2a and 2b, respectively.

The transmission of electricity via high-voltage cable power lines naturally involves the presence of thermal impact in their immediate vicinity. The thermal impact of typical power cable lines is due to the occurrence of power losses