
Standardization of 110/150 kV AC cable systems in the Netherlands

Roy ZUIJDERDUIN, Thinus DU PLESSIS, Jacco SMIT; TenneT (The Netherlands)

Roy.Zuijderduin@TenneT.eu, Thinus.du.Plessis@TenneT.eu, Jacco.Smit@TenneT.eu

Richard ROEFS; Energy Solutions BV, (The Netherlands)

R.Roefs@ensol.nl

ABSTRACT

TenneT is driving the energy transition towards realizing the electrical power grid of the future. In 2045 a target grid is foreseen enabling transmission needs. TenneT identified in their core strategy that innovation and standardization delivers a contribution in realizing the strategic goals. A project demand peak on 110/150kV AC cable is expected in 2027. This puts challenges on resources on e.g. planning, engineering, procurement and realization. Therefore, TenneT decided to develop a cable standardization approach, to cover the engineering approach to be followed in at least 80% of the 110/150 kV future AC land cable projects that will be performed. This paper presents the standardization approach with the selected cable systems.

KEYWORDS

Standardization, engineering, 110/150kV cable, ampacity, cross-bonding

INTRODUCTION

To achieve the energy transition goal of moving to more clean energy sources, electrical infrastructure and power grids are required to be expanded and strengthened at a pace never seen before. Placing TSOs (transmission system operators) and DSOs (distribution system operators) at the centre of achieving this future power grid that can connect, transmit and distribute the large volume of electrical energy planned in Europe and also Worldwide. TenneT operating as the Dutch TSO have set itself the target to have the grid ready for this major shift in the energy transition by 2045. Which requires already, a large volume of grid expansion and strengthening projects in the coming years, and which include also large volumes of cable systems that will be procured, manufactured and installed in the Netherlands. The projected peak of these projects is already expected by 2027. Meaning, that almost double or tripple the amount of cable systems will be required over the next 4-5 years, in comparison to the amount that was commissioned over the past 10 years. Posing great challenges, e.g. to procure and have available larger production and installation capabilities, while competing for cable production slots worldwide. TenneT, therefore had to think different about the approach followed till recently, and identified in their core strategy that innovation and standardization can help realizing these strategic goals and the aim of achieving the energy transition target of 2045.

The standardization of TenneT cable systems in NL was therefore one of the initiatives, whereby good cable manufacturing planning, delivery and installation can be well planned and accelerated for project realization. In

providing more efficient and standard system design approaches, that is easier to procure, operate and maintain based on a more standard approach achieved for all or most new projects. A first step to achieve this, was identified to be a reduction in the amount and range of cable types and sizes used on new projects. TenneT NL therefore decided to standardize on one cable type and three cable conductor sizes, with an aim to realize a minimum of eighty percent of all future 110kV and 150 kV projects with.

This standardized approach chosen by TenneT can then assure a more optimized approach to secure project and resource capacity in advance for the large amount of projects required. With the implementation of standardization the aim is to gain then pre-engineered and pre-procured standardized cable systems, to shorten project timelines and to enable more optimized cable system manufacturing planning and scheduling for all future planned projects.

To achieve a selection of three cable sizes, comprehensive cable rating studies were performed using defined starting points. Which formed the basis for the development of the engineering approach. All the input parameters for cable system engineering such as, projected future loads, soil conditions, laying condition and route lengths, are used to define standardized system fits. That resulted in a engineering instruction guide, which is a step by step approach/guide to realize the standardized cable systems to be used. The engineering instruction provides guidance to engineers to design a connection between substations that are in a meshed and interconnected network.

CABLE STANDARDIZATION FOR THE DUTCH 110 & 150 KV TRANSMISSION GRIDS

In the Netherlands in the coming decade, significant and numerous expansion, strengthening and upgrade projects will be realized in the Extra High Voltage (EHV) and High Voltage (HV) grids. These projects are required to meet the high demands for increased transmission capacity due to:

- a) the planned connection of significant amounts of renewable energy sources
- b) the load growth (associated with the energy transition).

By 2027 a total of 3000 km of new HVAC single core underground cables is expected to be installed, with the highest share being at the regional 110 kV and 150 kV grids respectively. Given the challenge of this tight timeline, TenneT worked towards the standardization of all new 110 and 150 kV cable systems that, most importantly, can facilitate the acceleration of the processes related to the cable system design and engineering.

Pushing to the 2045 target grid and expediting projects