

## Standardization and Optimization of High Voltage Cables Design

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### ABSTRACT

The electric power transmission system of National Grid Saudi Arabia (a subsidiary of Saudi Electricity Company-SEC) includes a network of underground cables ranging from MV (13.8kV) to EHV (380kV). The backbone of this network has a voltage rating of 110kV to 380kV with conductor cross-sectional area varying from 400 to 2500 mm<sup>2</sup>.

The high voltage underground cable network has three different voltage ratings; 110kV, 115kV & 132kV. Prior to 2003, the electricity network was being operated & maintained by four individual utility companies having their own specifications and franchise areas;

- 132 kV in the Central and Southern regions
- 115 kV in the Eastern region
- 110kV in the Western region

National Grid initiated a study to standardize and optimize the designs for high voltage cables suitable for all high voltage ratings. The study started unifying the cables sizes & designs, verifying performance of existing network and analyzing demand forecast. Suitable designs & sizes were worked out and appropriate ways were looked into to optimize the design by implementing the relevant international standards and taking into consideration feedback from the maintenance and projects about existing cables.

### KEYWORDS

Cable, High voltage, XLPE, Copper wire screen, Design Optimization, Insulation Reduction, Metallic Screen Reduction, System Type test, Short circuit test

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### INTRODUCTION

Utilities around the world are going for optimization of utilized equipment (reduce capital and operational cost). Therefore, Standards & Specifications Department of National Grid Saudi Arabia formed a team of experts to study the possibility of standardizing/unifying cable design to three sizes; 1200 mm<sup>2</sup>, 2000 mm<sup>2</sup>, & 2500 mm<sup>2</sup>. In addition, it will achieve financial savings as a result of this design optimizing.

### STUDY PROCESS FLOW

Process flow for this study is shown below:

