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## Evaluation of techno-economic aspects of HTS HVAC Transmission Cables by Critical Current Grading Across Phases

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Alternative technologies for transmission cables have gained both scientific and industrial interest in recent years. In fact, global electricity production is planned to increase, causing grid nodes to be very much congested. Therefore, these alternative conductors might efficiently transport relevant amounts of power between the nodes. In such a context, superconducting cables are considered a promising solution: they can carry large amounts of energy with minimal losses and compact dimensions. Hence, there would be benefits for the environment as well. To evaluate whether superconducting cables can be integrated in existing grids, techno-economic approaches should be adopted. Such approaches enable the conceptual design of a specific cable architecture. In this way, users can explore a wide range of operating parameters to optimize designs. This paper reports a comprehensive techno-economic analysis of HVAC cables realized with High Temperature Superconducting (HTS) tapes. The goal is to carry a very high power. The optimal co-axial design is selected by means of OSCaR: this tool allows a graded approach to the critical current of the tapes across different phases. The optimization aims at most effectively balancing tape costs and electrical properties. The main equations of the model, the materials parameters and the applied constraints are reported. The model is then applied to assess how much the length, the carried power and the per unit length cost of the HTS tape impact on the overall cost of transmission lines.

### Topic

Innovative methods and tools for modelling large-scale HTS systems

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