Abstract
Since subsea power demand is increasing due to the growth of Subsea Processing and Boosting Systems application and longer tie-back scenarios, a more effective way to feed subsea loads shall be developed. Currently, power distribution is performed topside in one of the production platform switchgears, each subsea load being fed by a dedicated system consisting of, at least, a topside circuit breaker, a topside variable frequency drive and a power umbilical, thus impacting strongly on platform area, weight and available number of dynamic umbilical riser supports. The optimization of topside equipments and facilities is especially important in development of deep and ultra deepwater fields, where smaller and lighter platforms is one of the development strategy goals. As the number of subsea loads increases, new topside equipments are needed and more dynamic umbilical riser supports shall be provided. Furthermore, the great number of power umbilical cables imposes more difficulties on subsea layout, umbilical installation and, of course, escalates application total cost. Additionally, supported by the developments in subsea processing, subsea boosting and flow assurance technologies, production of marginal areas distant from platforms is becoming more frequent, with augmented attractiveness. But as tie-back increases, umbilical cost raises, imposing profitability limitations.

Thus, having a unique power transmission umbilical to feed a cluster of subsea loads, using a Subsea Electrical Power Distribution System, may provide an economically viable solution to develop such areas. Moreover, since the power transmission umbilical is the most expensive component of the system, the complete system shall be analyzed focusing on an optimized use of this component.

In order to achieve this goal, an adequate analysis of the complete Subsea Electrical Power Transmission and Distribution Systems shall be part of subsea power distribution equipments development. Preliminary steady-state and transient system analysis shall be performed prior to subsea equipments specifications. These analyses shall mainly focus on normal operational limits and some main fault disturbances but considering main power source limitations and/or constrains (e.g. power from an isolated weak power generation system on platform or from a utility onshore) and, of great importance, power umbilical characteristics, its influence on the Subsea Power Distribution System. System under and over voltages and currents due to normal operation and under fault conditions and their duration shall be identified and the subsea equipment specified in accordance. Sensitivity analyses can be used to efficiently identify which equipment characteristic shall be flexible to deal with different system configurations or system constraints, and expand equipment applicability. A qualification program shall be established trying to plainly comply with the system real operation condition, taking into consideration system behavior and constraints, under penalty of not achieving production development goals: robustness, platform simplification and, of most importance, cost savings at the final application.