Training Content

Introductory course:
Load Flow and Short Circuit Calculation

MODULE 1: Network Modelling (Estimated Time: 3.5h)

Introduction to *PowerFactory*

Introduction to the *PowerFactory* structure and data model, graphical user interface, diagrams, users, libraries and power equipment modelling. Creating projects and grids, defining elements and types. Single line and geographical diagrams, detailed substation diagrams.

Exercise: Creation of a Network Model

Development of a high voltage network. Modelling of busbars, cables and overhead lines, transformers, generators and loads. Working with the graphical user interface, Data Manager and Network Model Manager. Single line diagram and detailed substation layout diagrams.

MODULE 2: Load Flow Analysis (Estimated Time: 3h)

Load Flow Analysis

Theoretical introduction to the Load flow calculation methods and settings. Results analysis and reporting. Result colouring in the single line diagram.

Exercise: Load Flow Analysis Part I

Executing a load flow calculation and analysing the results. Results are analysed in the single line diagram, results tables and reports. Evaluation of overloading and voltage violations.

Exercise: Load Flow Analysis Part II

Advanced load flow calculation settings. Reactive power and voltage control using synchronous generators and tap changing transformers. Reactive power limits of generators.

MODULE 3: Network Enhancement (Estimated Time: 1.5h)

Exercise: Network Enhancement

Expansion of an existing medium voltage network in an separate grid. Data management and diagrams for multiple grids. Defining templates.

MODULE 4: Short-Circuit Calculation (Estimated Time: 4h)

Short Circuit Analysis

Explanation and comparison of the different short circuit current calculation methods. Presentation of the application areas of short-circuit analysis for different processes such as cable dimensioning, equipment dimensioning, etc.

Exercise: Short Circuit Analysis Part I

Three-phase short circuit calculation at various locations in the network according to IEC 60909. Evaluation of thermal and mechanical stresses with regard to the network components such as cables and busbars. Dimensioning of a circuit-breaker.

Exercise: Short Circuit Analysis Part II

Short circuit analysis using the complete method and calculation of multiple faults. Exercise on dynamic voltage support.

Exercise: Short Circuit Analysis Part III

Execution of single-phase faults in the medium-voltage network. Neutral point handling at the transformer and investigation of different earthing concepts.

MODULE 5: Connection of Grids (Estimated Time: 1h)

Exercise: Connection of Grids

Grouping of networks in different grids and diagrams, e.g. according to voltage level or regional subsystems. Connection of different grids or subsystems topologically and graphically.

MODULE 6: Network Planning (Estimated Time: 4h)

Grid Expansion and Operational Planning

Data management including Grids, Variations and Expansion Stages for grid expansion planning. Usage of Operation Scenarios to consider different operating conditions and Study Cases for analysing the network.

Exercise: Grid Expansion Planning

Grid expansion planning using Variation and Expansion Stages on the basis of the basic network. Defining time dependent network changes in variations and expansion stages. Comparison of network variations.

Exercise: Operational Planning

Defining Operation Scenarios in *PowerFactory* for various load and generation conditions and switching states in the grid.

Exercise: Network Analysis

Analysis of the network with the help of the defined operation scenarios at different points in time in the previously prepared network expansion planning. Use of study cases to combine active operation scenarios, variations and grids for a convenient analysis of different possible scenarios.

MODULE 7: Load Scaling (Estimated Time: 1h)

Exercise: Feeders

Defining feeders. Feeder load flow analysis using Load Scaling and Voltage Profile Diagrams.

Exercise: Load Scaling

Extended network analysis. Use of feeder load scaling to be able to represent operating states based on real measurements.

MODULE 8: Additional Information (Estimated Time: 0.5h)

Additional Information

Additional information on the base package. Tips & Tricks for working with *PowerFactory*.