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Strategy

PSS®SINCAL

Strategic Planning in Electrical Networks

These calculation methods provide the best possible support for strategic planning in electrical networks. The economy of development variants can be evaluated and the supply security of the network (even for future operating conditions) can be verified.

The following modules are available:

- Reliability
- Cost calculations
- Load profile
- Load development
- Load trim

Reliability

This calculation module determines the probability of supply reliability in electrical networks. This simulation provides quantitative evidence on supply reliability for entire networks and individual customers in the network, complementing information gained from pure electro-technical planning.

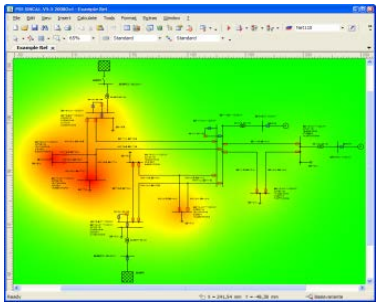

Figure 1: Visualizing interruption frequency HU

The different error scenarios described by malfunction rates and lengths as well as any measures taken to restore normal network operation conditions provide the basis for determining reliability.

Failure models have been developed with the help of analyses of real networks operations and fault statistics which allow the course of events of faults to be classified. The most important models are:

- Independent single failure
- Common mode failure
- Multiple earth fault with multiple tripping
- Failure during maintenance of the backup component
- Over-functioning of protection devices
- Protection device failure

Due to the complexity, probabilistic reliability calculations mean the user needs to have more profound knowledge of the subject than with other power system planning tools.

PSS®SINCAL provides calculation results for individual consumer nodes, network areas and entire networks. These contain all the essential parameters such as:

- Interruption frequency HU
- Unavailability threshold QU
- Interruption duration TU
- Interrupted power PU
- Energy deficit WU
- Interruption cost KU
- Refund cost AU

PSS®SINCAL also provides availability values according to IEEE 1366.

- SAFI
- ASIFI
- SAIDI
- ASIDI
- CAIDI

Cost Calculations

This calculation module assesses the economic benefit of network planning measures with a method commonly used in electricity companies: net present value.

Economic efficiency, also known as cost efficiency or cost effectiveness, is the principle of rationality in economics (efficiency rule). A specific goal is said to be cost efficient, when it can be achieved with the least possible expense or when the highest possible earnings can be achieved as the result of a specific expenditure. In the first case economic efficiency is measured by the ratio of target expenditure to actual expenditure; in the second case it is measured by the ratio of target performance to actual performance.

These calculations are based on PSS®SINCAL's own network model and are, for the most part, independent of the electrical network model used.

Load Profile

These are basically enhanced load flow calculations with load values that can be varied over time. In addition to their rated values, loads are assigned consumer types with load profiles.

Customer data, such as annual consumption values, reference rights or maximum power can be used to enter loads.

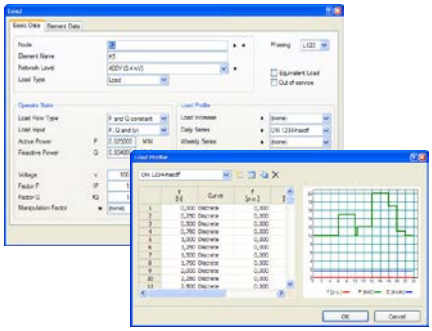

Figure 2: Load profile for a load

Using functions that can have parameters, the current performance can be adjusted on the basis of simultaneity as well. As results, calculated times and diagrams with daily profiles for each node and each branch are available.

Additional information is provided in diagrams showing where limits have been exceeded during the time and energy loss in kWh for the time.

Load Development

These calculations are enhanced load flow calculations with load values that vary over time. These calculations are done annually for a specific period of time. In addition to rated values, PSS®SINCAL assigns load increases to the loads. All network elements can be assigned individual establishment and shutdown dates that will be considered in the calculations.

Load increases can be assigned according to graphic functions or network element groups, or they can be assigned to specific consumers.

The results show the entire load flow calculations with evaluations according to minimum and maximum values (e.g. voltages or utilization) and diagrams with information on power and overloaded branches.

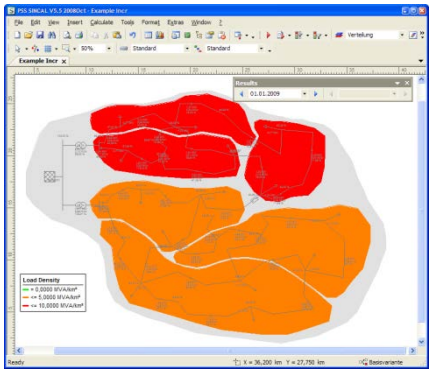

Figure 3: Time-dependent output display for load development

Load Trim

Load trimming is done to determine a load condition while taking measurements into consideration. For this purpose meters are added to the model. In real networks, the measurements are maximum values. So the results of load trimming are a load condition that reflects the maximum load of the network at the measuring points.

Powers or currents can be entered as measurements.

Load trimming results show the power or current entered at the measuring device location and the power factor produced by the loads. For all the trimmed loads, you get the prescribed power factor and the current produced to fulfill the current rating at the measuring devices.

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