

Electrical Power Systems

Power System Analysis

Multiconsult performs power system analyses for transmission and distribution grids as well as for grid connection of power plants. Projects can be assessments of transmission grids, distribution grids and isolated power systems. Our power system analyses include load flow analysis, short circuit analysis, harmonic analysis and dynamic analysis.

Results of the analyses provide the framework for further dimensioning, detail engineering and technical specification of power system components. Software programs PSS/E, Paladin DesignBase and NETBAS are used to perform power system analyses. Multiconsult can build new models or employ the client's existing models.

Multiconsult has extensive experience with assessment of connecting wind farms to the power grid. We have assessed the grid connection of five of the six wind parks in Europe's largest land-based wind power project, Fosen Vind, with a total installed capacity of 1000 MW. In this project, the reactive compensation capacity of the wind parks were evaluated in accordance with the Norwegian SO's functional requirements (FIKS). The wind farms' contributions to voltage regulation, in order to control reactive power development in the local grid in summer- and wintertime, were also studied. For Egersund Wind Farm we have calculated the short circuit currents and power losses.

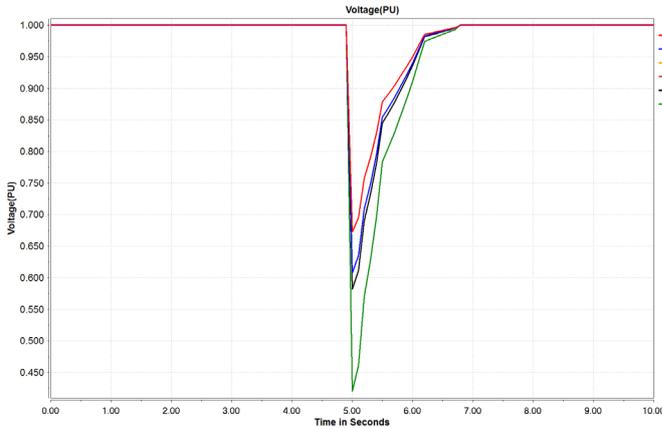
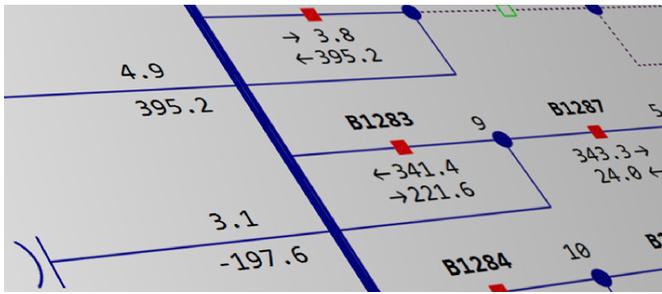
Multiconsult has performed power system analyses of the 33 kV grid in Zanzibar. By establishing a model of the grid in PSS/E, we carried out load flow analyses and contingency analyses, and recommended a technical-economic optimal grid development plan extending to the year 2030.

PROJECT REFERENCES

- Power system analysis Frøya and Sørmarksfjellet Wind Farm
- Power system analysis Fosen Wind Farm
- Regional grid assessment for TSO TrønderEnergi Nett
- Egersund Wind Farm
- Masterplan Zanzibar
- Smøla Wind Farm
- Makambako Wind Farm
- Grid assessment for TSO Agder Energi Nett
- 420 kV grid planning for national TSO Statnett



High voltage power system | Photo: Teknisk Ukeblad, tu.no



Top: PSS/E | Ill.: Siemens press picture
 Bottom: Paladin DesignBase | Ill.: Paladin DesignBase



Smøla Wind Farm | Photo: Teknisk Ukeblad, tu.no

Short circuit calculations are performed in accordance with IEC 60909 for symmetrical and asymmetrical short circuit faults. Additionally, Multiconsult can use these results to recommend protection relay settings and/or coordinate protection devices (PDC), design earthing systems and cable installations, and dimension switchgear. Multiconsult has extensive experience with building short circuit models of electrical power systems, identifying the worst-case operation scenarios, calculating fault currents, analyzing the results and recommending measures to reduce the short circuit levels where necessary.

Load flow analyses are performed to identify bottlenecks, and to determine power losses, voltage, and power flow in a grid. Multiconsult can also perform contingency analyses to assess a power grid's robustness during loss of one or more important system components.

In power grid planning, Multiconsult can assist with establishing a development plan for a grid, or evaluate various development alternatives based on socioeconomic and/or technical factors.

Motor start studies, voltage stability studies, frequency stability studies and transformer inrush current studies are examples of some of the dynamic analyses Multiconsult performs.

Multiconsult is well acquainted with relevant standards and regulations governing power quality, contingency planning, and performance requirements of the power system. We are passionate about helping our customers to analyze and optimize their power system performance and improve its reliability.

SERVICES

- Voltage and power flow studies
- Power loss calculations
- Contingency analyses
- Stationary analysis of loss of components
- Identify transfer capacity limitations and need for upgrades
- Identify the need for reactive power compensation
- Symmetrical and asymmetrical short circuit calculations according to IEC 60909
- Motor start analysis
- Inrush current studies
- Voltage stability analysis
- Voltage harmonic distortion