



ELECTRICAL SYSTEM STUDIES

Working with system studies is a complex issue as it affects many parameters in the development of the power system.

Each new upgrade, extension, load and restructuring of grids and networks can create unexpected effects and interactions on a power system not designed for the specific changes.

Ramboll has been involved in electrical system studies for more than 50 years and has the knowledge and experience to assist and support our clients to address these challenges.

Basis for the right decision

System studies provide information that enables the customer to understand contemporary and future problems within the electrical system.

Furthermore, system studies give the client the basis to make the right decisions in the upgrade planning or extensions of the power system. This leads to reduced operating costs, increased availability and minimised equipment or system failure.

Ramboll's goal is to ensure safe, reliable and cost effective electrical systems.

A versatile range of studies

Depending on the client's need we offer a range of calculations, studies and analyses, i.a:

- Adaptive power system modelling
- Load flow studies and calculations
- Load flow voltage drop
- Maximum and minimum short circuit
- System stability studies
- Evaluation and optimisation of existing errors
- Financial and reliability analyses
- Electricity grounding studies
- Relay settings
- Selectivity studies
- Harmonic analysis etc.

Customised solutions

Different areas require different approaches and Ramboll focuses on the client and the specific demands. Ramboll uses the most optimal IT tool, this could be Power Factory, Paladin Designbase, ETAP,

Febdok or any other programs that are most suitable for the job.

Our electrical system studies are always adapted to meet the client's requirements. Ramboll aims to analyse the operation of the power system during normal and fault conditions by means of one or more of the mentioned studies.

These studies enable the client to take the right actions to optimise the design, function and operation of the protection and control system.

For further information please refer to www.ramboll.com/services/energy or contact us directly:

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CASES - ESBJERG POWER STATION, DENMARK

New protection system

At Esbjerg Power Station, DONG Energy's protection system was ageing and the spare parts were obsoleted. Therefore, a refurbishment of the protection system was needed. More specifically, the relays needed to be changed or replaced.

To accomplish the task Ramboll developed a software model of the power plant. The model showed different operation conditions enabling DONG Energy to get the result of the maximum and minimum short circuit calculations for each switch-board.

The power station is an older plant, therefore data were not immediately available. Data were obtained through examination of the archives, surveys of materials on site and in cooperation with the client.

Replacements of 10 kV relay protection

The project includes a complete replacement of all relay protections in fifty medium-voltage fields. This is done to ensure the continued reliability and safe operation for both humans and systems. To achieve the optimal protection of the installation, the project contains a relay study, where the protection is reviewed and recalculated with reference to what the new relays can offer.

A new IEC 61850 network for communication between internal protection relays and the control system has been established.

Ramboll's task was to manage the project from preparation of all tender documents to supplier commissioning and hand-over of the new relay protection as well as assisting DONG Energy with engineering knowledge, supervision and control of deliveries from suppliers.



VOLTAGE QUALITY ANALYSES

CUSTOMER

Sanvik AB, steel smelting plant

LOCATION

Sandvik, Sweden

PERIOD

2014-2015

SERVICE PROVIDED

Analysis of the plant's power quality using measuring equipment placed at the client's facility.

POWER FACTORY ANALYSIS

CUSTOMER

A/S Storebælt

LOCATION

Great Belt Link - East and West Bridge and tunnel, Denmark

PERIOD

2013-2014

SERVICE PROVIDED

Simulations by use of Power Factory.

ELECTRICAL SIMULATIONS WITH PALADIN DESIGNBASE

CUSTOMER

Amager Resourcecenter

LOCATION

Copenhagen, Denmark

PERIOD

2010-2011

SERVICE PROVIDED

Preliminary research and analysis.