



**RAMBOLL**

## POWER TRANSMISSION - ONSHORE SUBSTATIONS

**A substation enables energy to be transformed and distributed over long distances minimising the power loss and cost of distribution.**

Optimal planning and design of substations is a multidiscipline challenge in the field of electrical and mechanical design, instrumentation and control and civil works.

As one of the largest consultancies in northern Europe, Ramboll covers all engineering disciplines needed. Our home market is the Nordic countries which are known for their high standards and quality in substation design. Close cooperation between Ramboll and the client, the Distribution system operators (DSO), or the Transmission system operators (TSO) is an integrated part in keeping this high level.

Ramboll is an international full-range service provider. This is particularly useful when a project encounters unexpected obstacles i.e. archaeological findings, sewage or contaminated soil. We possess all the required competences in-house enabling us to quickly present alternatives or assistance to the client and deal with the emerging issues.

Ramboll has provided services for large and small scale substation projects, both as client's engineer and as external consultant. We cover all project phases from basic design through detailed design and tendering, to construction and on to operations and maintenance.

### Experience and competences

Ramboll has a broad international experience, from deserts, to icy regions and mountainous terrain, and have key competences in establishing the correct earthing in all environments.

We are also well versed in working with compact installation sites such as urban areas, retrofits, tunnels etc. These sites often require the use of gas insulated switchgear (GIS) installations, which is a key competence for Ramboll.

To minimise operation outages most sites are under continuous operations during retrofit/refurbishment. For Ramboll safety on the

work site is of highest importance, and we provide our services and know how into our planning, thus partaking in making the site a safe place for all who work there.

Ramboll has won many awards for our ability to adapt concrete structures to the needs of our clients in close collaboration with architects. We have several framework agreements with system operators to prepare and construct the civil works for their substation.

Ramboll is chosen for our minimum impact on the environment policies and high standards in design and execution.

For further information please refer to [www.ramboll.com/services/energy](http://www.ramboll.com/services/energy) or contact us directly:

### CONTACT

John Ammentorp  
Head of Department  
Automation and Electrical Systems  
Tel +45 51616380  
[jona@ramboll.com](mailto:jona@ramboll.com)

### Electrical design

Ramboll has expert knowledge in all aspects of electrical design and project execution within the following areas:

- Electrical layout (Single Line Diagram)
- Grid connection
- Load flow calculations
- HV distribution
- Relay coordination
- LV systems (LVAC, LVDC, UPS)
- Earthing system
- System compensation (SVC, reactors, capacitor banks)
- Transformers (transmission, distribution).

We provide static and transient simulations of the electrical design using PowerFactory - DIgSILENT or Paladin Designbase.

Ramboll also offers our expert know how in preparation of technical specifications for switchgear components, transformers, etc.

### Substation SCADA and control systems

Automation is a vital part of a substation project. All control and monitoring of HV equipment and auxiliaries are normally carried out from a centralised control room. This increases requirements to the complete communication infrastructure and the control hardware implemented.

Ramboll offers a wide-ranging service covering:

- Design and specification of sub-station
- SCADA and Control systems
- Logical and physical network design
- Line of Sight solutions
- Optical fibre layout.

We have expert knowledge within implementation of station bus communication and signal exchange toward third parties and upstream SCADA systems.

### Civil works

Ramboll is a competent partner in delivering solutions for infrastructure and structural design, from arctic conditions and rock blasting in mountain terrain to operating in compact urban areas.

Our services include:

- Roads
- Foundations, including oil sumps
- Buildings
- Cable ducts
- Fencing/access control
- Lightning protection

For larger indoor substations Ramboll offers architectural services, and detailed engineering of lighting and HVAC. We handle all services including project management, design, authority approvals, supply, procurement, site supervision and construction management.

During construction, the main focus is on work place safety, closely coordinated with the client's facility management.



**KOLTORP SUBSTATION**  
NEW 220KV SUB-STATION AND  
REFURBISHMENT OF 70 KV  
SWITCHGEAR

**CUSTOMER**

Fortum

**LOCATION**

Koltorp, Sweden

**PERIOD**

2012-2014

**SERVICE PROVIDED**

Project management in the design, procurement and supervision phases.

**4 GREENFIELD 420 KV  
SUBSTATIONS**

**CUSTOMER**

Statnett SF

**LOCATION**

Mid Norway

**PERIOD**

2012-2014

**SERVICE PROVIDED**

Civil, Structural, LV-electrical, HV-electrical (switchgear), Station control.

**BELLAHØJ SUBSTATION  
REDESIGN OF ELECTRICAL  
SYSTEMS AND CIVIL PARTS**

**CUSTOMER**

DONG Distribution A/S

**LOCATION**

Copenhagen, Denmark

**PERIOD**

2012-2014

**SERVICE PROVIDED**

Design, procurement, supervision and commissioning for the civil parts and electrical system.