



**RAMBOLL**

## POWER TRANSMISSION - OVERHEAD LINES

**Planning an overhead line trace is an environmental as well as an aesthetic challenge.**

Overhead transmission lines are vital for the ability to meet rising demands for flexible energy grid and securing the quality of power supply.

Planning overhead lines is a complex issue as the lines might pass through valuable rural districts, urban areas or sensitive nature. This calls for comprehensive planning, dialogue with authorities and general public - and not at least towers that are designed with the aim to reduce the impact on the landscape.

### **Covering all phases**

Ramboll has been working with overhead transmission lines for more than 50 years and we have the comprehensive knowledge to support our customers in solving their challenges. Our specialists can offer professional consultancy from overall line planning to detailed design of towers and foundations comprising both refurbishment and green-field projects.

Our services cover all project phases from site investigations, mapping, laboratory and in-situ testing to advanced numerical modelling, project implementation, inspection, supervision and commissioning.

### **Optimising the routes**

Geotechnical and topographical conditions are very important for the optimisation of a route. We have broad experience from working in more than 70 countries, and we are able to handle any soil condition and provide the know-how and methods needed. Our world class geotechnical specialists can assist by creating 3D terrain models, where the predicted geotechnical conditions can be included.

### **Spotting towers**

To map the location of towers Ramboll uses advanced software, where the inputs are terrain 3D-models with geotechnical information, tower types, conductors, insulators,

wind and ice loadings, costs etc. Some tower locations are more or less fixed - for instance angle tower - and the remaining towers are then placed to optimise the overall costs for the line.

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

### **CONTACT**

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**EIA**

We carry out Environmental Impact Assessments (EIA) and Social Impact Assessments (SIA) for international, regional and local clients, financial institutions, private companies and public authorities.

In addition, we facilitate the contact between our client and the permitting authority throughout the EIA and SIA procedures and actively ensure that a constructive dialogue is maintained.

We are familiar with the level of detail required by authorities to grant project approval and thus avoiding unnecessary surveys and studies.

**Tower and foundation design**

Our holistic approach aims at developing optimal structures that meets all functional, economic, environmental and architectural demands. This involves skills, experience and a detailed understanding of local contexts as well as knowledge of fabrication,

transportation, and construction. We constantly strive to develop new innovative structures and standards – both in terms of structural concepts and geometric complexity.

**Electromechanical design**

Ramboll has extensive knowledge in ensuring the correct connection between the tower and the overhead line. With the use of PLS-CADD calculations, we help the client prepare specifications for insulators, damper clamps, implosive fittings, earth wire etc. Ramboll can also assist in preparation of assembly instructions as well as all aspects of procurement.

**Electrical design**

The overall design of the overhead line voltage and capacity is normally undertaken by the client, but Ramboll has expert knowledge in all aspects of electrical design and can provide these services, as well as determination of pollution classes, relay coordination and earthing system design.

We are familiar with power producers and power transmission owners in many countries and in different constellations.

**Lifetime extension**

We have extensive experience in estimating remaining lifetime of materials and structural elements to advice how a cost efficient lifetime extension can be carried out. Based on a feasibility study Ramboll can point out which elements to exchange, what to upgrade and what to keep, leading to an optimal balance between quality and cost.

**Service package**

Furthermore, Ramboll has knowledge of technical upgrades of lines, including upgrading the voltage capacity of the tower, and refurbishment of for instance Optical Ground Wire (OPGW) etc. We can provide a full technical service package making sure that the upgrade is optimal and that future demands are honoured.



**REBUILDING OF EXISTING OVER-HEAD TRANSMISSION LINES**

**CUSTOMER**

Energinet.dk

**LOCATION**

Denmark

**PERIOD**

2004-2014

**SERVICE PROVIDED**

Power transmission, analysis & design of masts, towers and poles.

**STUDSTRUP POWER STATION LIFE TIME EXTENSION**

**CUSTOMER**

DONG Energy

**LOCATION**

Aarhus, Denmark

**PERIOD**

2012-2014

**SERVICE PROVIDED**

Assessment of line condition proposal for refurbishment, tender process, supervision, testing and commissioning, project management.

**EMBEDDED GENERATION INTO KENYA TRANSMISSION GRID**

**CUSTOMER**

ERC Regulatory Commission

**LOCATION**

Nairobi, Kenya

**PERIOD**

2011-2012

**SERVICE PROVIDED**

Electrical distribution and supply advice, HV electrical engineering, technical guidance and specification for connections,