



**RAMBOLL**

## POWER TRANSMISSION - OVERHEAD LINES

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

Working with overhead transmission lines is a complex matter, as overhead lines influence many parameters in the development of a society.

Ramboll has been involved in overhead transmission lines for more than 50 years and we have the knowledge and experience to help and support our costumers solving these challenges.

The planning for an overhead line is carried out in close cooperation with our client and relevant authorities, since the line can pass through rural landscapes, urban cities or sensitive nature.

Different areas demand different approaches and Ramboll has focus on the client and his specific demands. Whatever the route conditions require our team will back you up.

### **Environmental and Social Impact Assessment**

We facilitate Environmental and Social Impact Assessments for international, regional and local clients, including financial institutions, private companies and public authorities.

In addition to carrying out the technical aspects of ESIA, Ramboll also facilitates the contact between our client and the permitting authority throughout the ESIA procedure and actively ensure that a constructive dialogue is maintained.

Our many years of experience means that we are familiar with the level of detail required by authorities to grant project approval and thus avoiding unnecessary surveys and studies

### **Geotechnical and topographical investigations**

Geotechnical and topographical conditions are very important for

the optimisation a route. We have extensive experience from working in more than 70 countries, and we are able to handle any soil condition and provide the technology and methods needed.

Our mapping teams can in assist creating 3D terrain models, where the predicted geotechnical conditions can be included.

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

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## WHEN PLANNING A ROUTE FOR A TRANSMISSION LINE:

We respect the environments and social impact when planning the route or choosing the mast design.

We always do our best to minimise any impact to local communities or sensitive nature districts.

We choose to participate in the dialogue in either public or political forums.

We strive to support our client by upholding a professional project execution through all phases in the project.

We have during construction, always a strong focus on health and safety, closely coordinated with our customer.

### Tower spotting and line optimisation

The detailed location of the towers Ramboll normally undertakes using the computer software PLS-CADD (or similar), the input being 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. There will always be an iterative process checking the specific tower locations on site and updating the program accordingly.

### Tower & foundation design

Our structural engineers' holistic approach aims at developing optimal structures that meets all functional, economic, environmental and architectural requirements. This requires skill, experience and a

detailed understanding of local contexts as well as knowledge of fabrication, transportation, and construction requirements.

Structural engineering has always been a key expertise within Ramboll, and we are proud of our ongoing work developing new types of innovative structures and setting new standards in the business – both in terms of structural concepts and geometric complexity.

We use the most advanced engineering software and develop our own when our needs go beyond the limits of commercially available software.

### Electrical design and optimisation

The overall design of the overhead transmission 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, earthing system design. We have been working with power producers and power transmission owners in many countries and different constellations, so we know the challenges and the players well.

### Life time extension

At Ramboll have all extensive experiences in estimating remaining life time of materials and structural elements to advice how a cost effective life extension can be carried out.

Furthermore, Ramboll has knowledge regarding technical upgrades of lines, including upgrading the voltage and introduction of for instance OPGW etc. We can provide a full technical service package making sure that the upgrade is optimal and that future demands are honoured.



#### LEFT

Suspension Tower,  
1x400kV Bramslev-  
Haverslev, Denmark

#### RIGHT

Suspension Towers,  
1x400kV Konti-Skan  
Line between  
Germany and Sweden