RAMBØLL

POWER TRANSMISSION - HV CABLES

High-voltage cables are considered to be one of the most safe and reliable means of transferring electrical energy to the main consumers.

By supplying densely populated areas with electricity by a high-voltage (HV) cable infrastructure, the communities are not as vulnerable to weather phenomena like flooding or trees being over-turning in a storm, not to mention the esthetical value of having all installations below ground.

Installation of HV cables requires comprehensive knowledge. Special care must be taken from the plan-ning stages right to the installation and termination. Ramboll has more than 30 years of experience with HV cables collected from a range of onshore and offshore projects.

Offshore and onshore cables

Our competencies range from route planning, surveying and engineering to interface handling, design, procurement supervision, tests and commissioning. We work in compact urban districts, remote areas and substations, with onshore and offshore transmission cables as well as wind park array cables.

For onshore as well as offshore projects Ramboll is highly qualified in coordination with other utility owners and stakeholders regarding installation and termination of the HV cables.

Finding the best route

The geotechnical and geophysical services are the foundation of any sub-surface project. Ramboll has significant expertise in undertaking surveys with the aim of identifying the design requirements of the route and the need for cable burial or any other protective measures to ensure cable integrity and longevity.

Dimensioning cables

Our engineering team aids our clients in the specification and dimensioning of cables and cable joints for both onshore and subsea cables.

Facilitating EIA

As a part of our services we facilitate Environmental Impact Assessments (EIA) for international, regional and local clients.
We actively ensure a seamless contact between our client and the proper authorities.

Enabling financial benefits

As a result of our strong project management skills and our broad experience with tendering and negotiations with contractors we can minimise our client's installation costs. In addition, we use advanced software to calculate the technical data and use it as an input for feasibility studies, allowing for the economic optimal dimensioning of cables based on different scenarios.

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

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SERVICES FOR ONSHORE CABLES

Onshore cable projects often require a lot of stakeholder coordination to target cable corridors to existing installations in the ground. Ramboll maps the existing cables and obstacles in the ground using our state-of-the-art 3D Geo radar. The vehicle-mounted equipment allows very high resolution cable mapping even at highway speeds.

Furthermore, we determine the subsurface soil stratification using geophysical seismic surveys and geotechnical soil investigations
Our integrated geotechnical services comprise:

- Soil stratification
- Sub-surface hazards
- Pre and post laid cable trace surveys
- Geotechnical design parameters
- Information on the organic contents of soils
- Heat transmission in soil
- Land fall investigations
- Cable crossings
- Direction drillings
- Excavations
- Construction pits
- Visualisation and GIS reporting
- EIA.

SERVICES FOR OFFSHORE CABLES

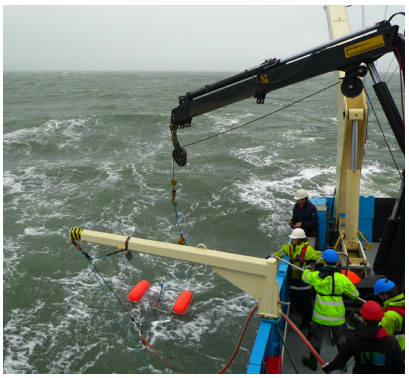
Offshore cables are exposed to harsh conditions and the planning of the installations requires the best pre-knowledge about existing conditions on and below the seabed. Great savings can be made using the appropriate approach to offshore works.

We work with an integrated geotechnical approach uniting the services from:

- Geophysical investigations
- Multi-beam surveys, mapping the seabed surface
- Magnetometer surveys.
- Shallow and deep penetration seismic surveys mapping sub-surface soil strata
- Side-scan sonar mapping obstacles on the seabed
- Cable tracking of the cable burial status
- Seabed Cone Penetration Testing (CPT)
- In-situ sampling (Vibrocores)
- Geotechnical drilling, sampling and down-hole testing
- On- and offshore laboratory testing.
- Magnetic impact analysis from HVDC cables / Compass offset evaluations
- EIA.

ELECTRICAL CABLE ROUTING - RETORTVEJ

CUSTOMER
Dong Energy
LOCATION
Copenhagen, Denmark
PERIOD
2012-2014
SERVICE PROVIDED
Electrical engineering, design and preparation of new cable system in connection with establishment of new railway.



COBRA CABLE SUPERVISION AND BURIAL ASSESSMENT

CUSTOMER
Tennet TSO B.V.
LOCATION
The Netherlands - Germany - Denmark
PERIOD
2010-2011
SERVICE PROVIDED
Supervision of marine geophysical route investigations for the COBRA cable marine power cable between Holland and Denmark.

ESTLINK 2 HVDC POWER CABLE

CUSTOMER
ELERING
LOCATION
Finland and Estonia
PERIOD
2008-2010
SERVICE PROVIDED
Route selection study, negotiations with contractors, supervision, preparation of detailed design