

The Highland Council, Cairngorms National Park Authority & Scottish Natural Heritage Undergrounding of Extra High Voltage Transmission Lines

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Appendix 6 – Aarhus - Aalborg Cost Data

The information contained in this Appendix was provided by SAGEM, the cable supplier for the project.



The In-service 400 kV Aarhus-Alborg Line In Denmark

UG/OH Costs Ratios for the three UG sections

P.ARGAUT (SAGEM)

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Aarhus-Aalborg line

- Total length of the 400 kV line OH+UG= 140 km
- Total length of 400 kV UG sections =14.5 km
- Three UG sections: 4.5/2.5/7.5 km
- Dimensioning of 400 kV UG sections:
 - according to the demands and **NOT** to match the possible ampacity of the OH line.
 - Use of short term load of the cables
- Reconfiguration of the 150 kV grid in some parts of the route.

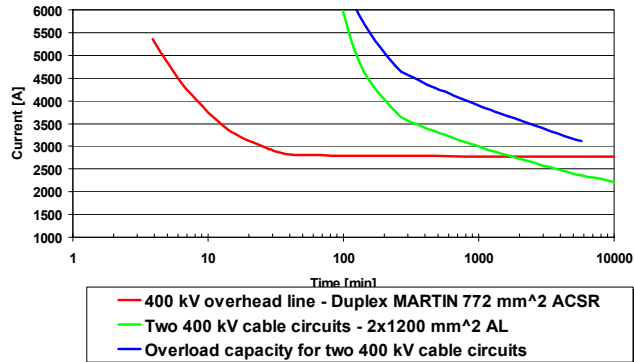
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Thermal Dimensioning

Comparison of short-time ampacity of 400 kV overhead line and 400 kV cables,
Preload = 700 A (=500 MVA)

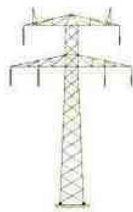


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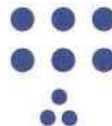


Hornbæk - Katbjerg and Selling - Tebbestrup (Donau Tower)



1 x 400 kV
1 x 150 kV

Total : 3.6 Million DKK/km



2 x 400 kV
1 x 150 kV

Total : 13.2 Million DKK/km

Cost Factor

Cable / Overhead line
for 4 km of part section

4.3

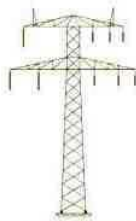
Total price for terminations :
9 Million DKK

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Mosbæk - Ferslev and Trige - Selling (Donau Tower)



1 x 400 kV
2 x 150 kV

Total : 3.9 Million DKK/km



2 x 400 kV
2 x 150 kV

Total : 15.0 Million DKK/km

Cost Factor

Cable / Overhead line
for 4 km of part section

4.5

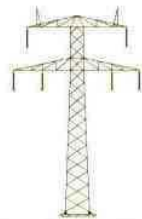
Total price for terminations :
10 Million DKK

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Ferslev - Skudshale (Donau Tower)



2 x 400 kV

Total : 3.9 Million DKK/km



4 x 400 kV

Total : 22.8 Million DKK/km

Cost Factor

Cable / Overhead line
for 4 km of part section

6.9

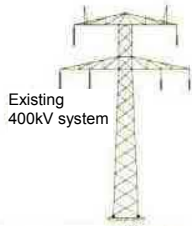
Total price for terminations :
16 Million DKK

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Haverslev - Ferslev (Top on Donau Tower)



Existing
400kV system

1 x 150 kV

Total : 0.9 Million DKK/km



1 x 150 kV

Existing 400 kV overhead line remains
in service

Total : 1.8 Million DKK/km

Total price for terminations :
1 Million DKK

Cost Factor

Cable / Overhead line
for 4 km of part section

2.3

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Bramslev - Haverslev (Design tower + 150 kV cable)



1 x 400 kV + 20%
1 x 150 kV cable

Total : 5.6 Million DKK/km



2 x 400 kV
1 x 150 kV

Total : 13.2 Million DKK/km

Total price for terminations :
9 Million DKK

Cost Factor

Cable / Overhead line
for 4 km of part section

2.8

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Conclusion

- These cost ratios are only applicable for this specific project
- Thermal dimensioning is the most important parameter.
- Innovative laying techniques allow cost reduction
- Undergrounding in some sections can reduce the overall cost of a project, by reducing the time to get permit



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