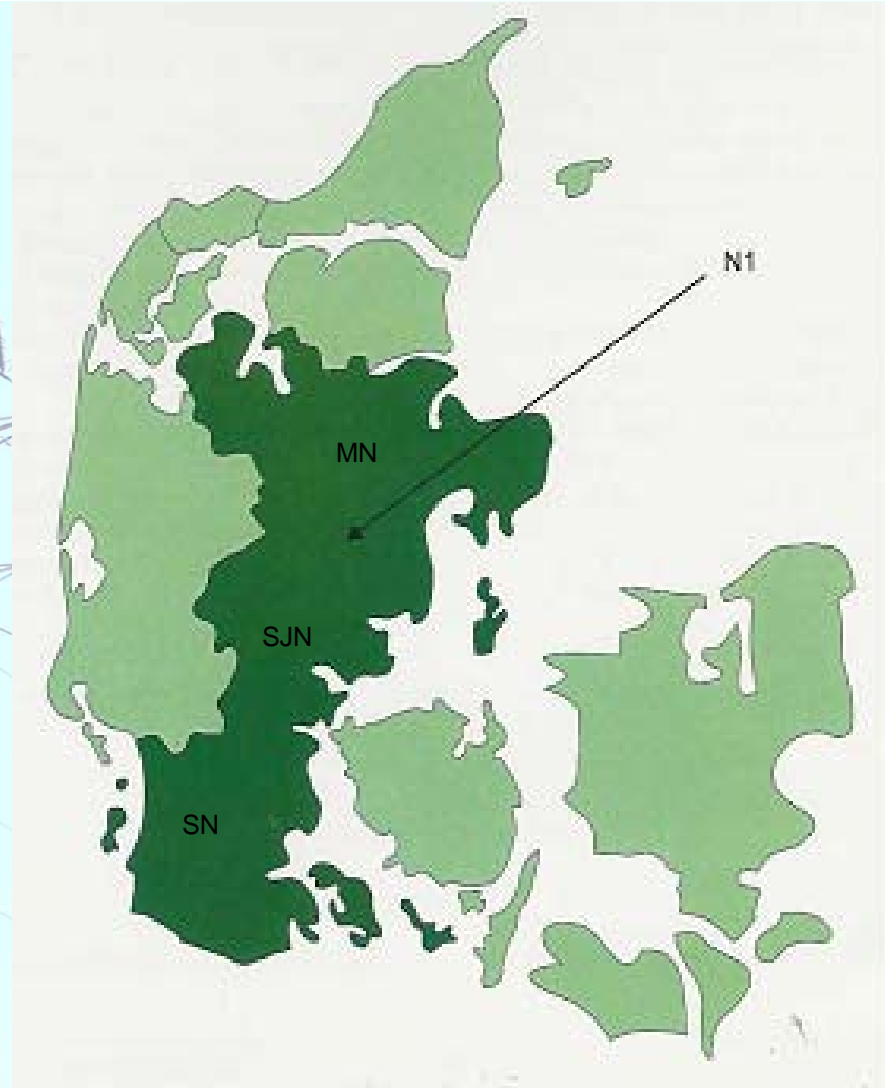
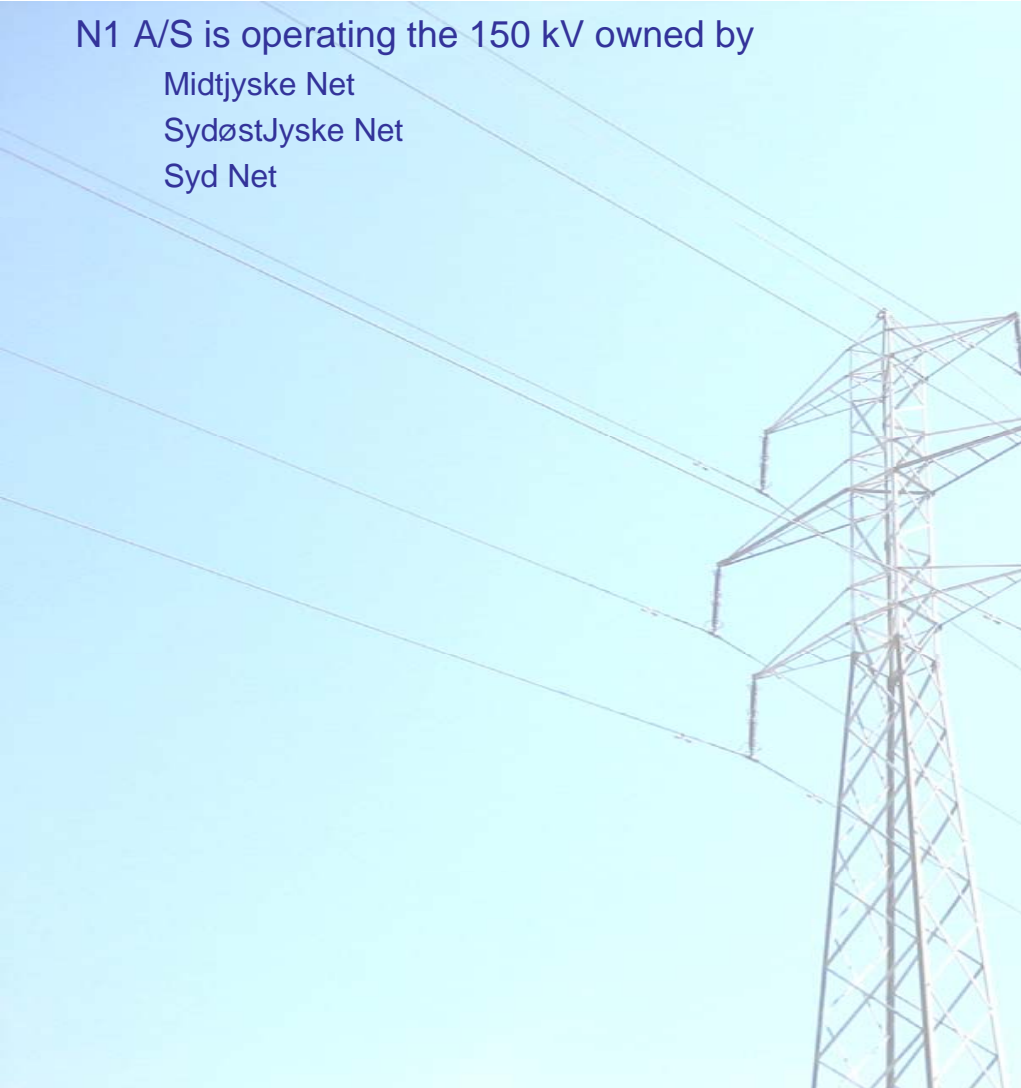


Introducing ACSS in Denmark

N1 A/S is operating the 150 kV owned by
Midtjyske Net
Sydøstjyske Net
Syd Net



Why ACSS in Denmark?

Impossible to build new OHL in Denmark

Principle decision was made that the future in DK is cable

Maximizing use of existing route

Improved transmission capacity

Reduced active losses

Less expensive to upgrade than to go underground

Refurbishment and upgrade round 10 % of cable-price

Need for more capacity

ACSS chosen

Well known materials

Reduced active losses

The economical solution



150 kV Tange-Trige Cardinal ACSS/TW HS285

1962: 2 system ACSR Condor
36 km
2 x 982 A @ 80 °C

Need for upgrade to 2 x 1500 A

2005: Cable 2 x 1600 mm²/Phase
1,6 km
1500 A

2005 2 Twin Cat-1 mounted
To get to know CAT-1 at known conductor
To get knowledge of the new conductor

2006: 2 system ACSS/TW Cardinal
2 x 1500 A at 150 °C



150 kV Bredebro-Ribe-Lykkegaard Cardinal ACSS/TW HS285



1968: 2 system ACSR Condor
13 + 31 km
2 x 982 A at 80 °C

2005: Cable 1 x 1600 mm²/Phase
2,4 km
980 A

Need for renewal of conductor

2008: 2 system ACSS/TW Cardinal
2 x 1500 A at 150 °C

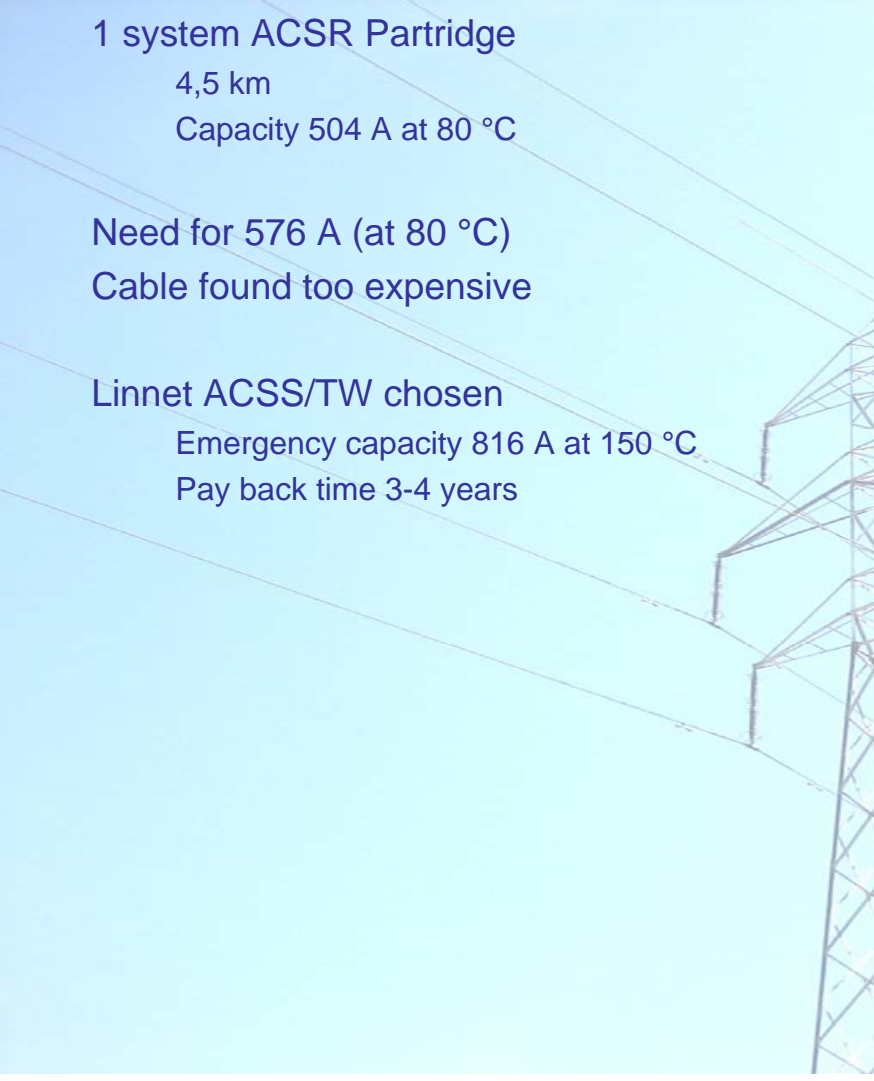


50 kV Kimmerslev-Spanager Linnet ACSS/TW HS285

1 system ACSR Partridge
4,5 km
Capacity 504 A at 80 °C

Need for 576 A (at 80 °C)
Cable found too expensive

Linnet ACSS/TW chosen
Emergency capacity 816 A at 150 °C
Pay back time 3-4 years



Experiences from the projects

Installation a lot like ACSR but

Risk of birdcages by prestressing

Use 2 clamps when prestressing

Different termination

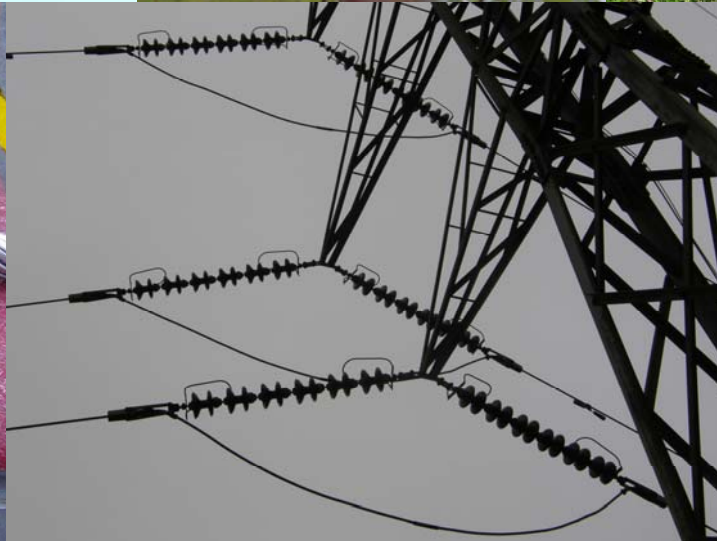
... a question of learning

Still no long time experience

Corrosion? (no grease)

3.6 km test conductor 2007

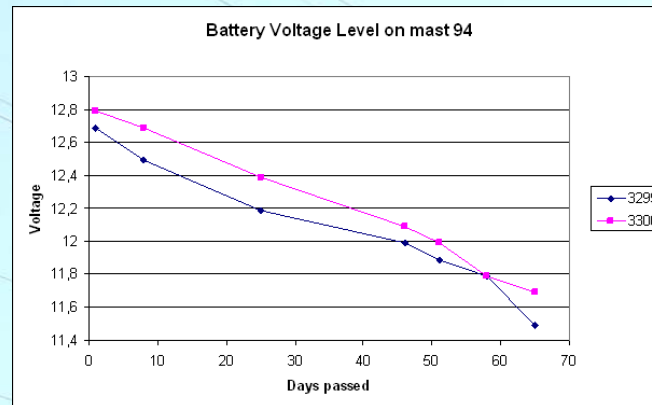
No complaints about rattling



CAT-1

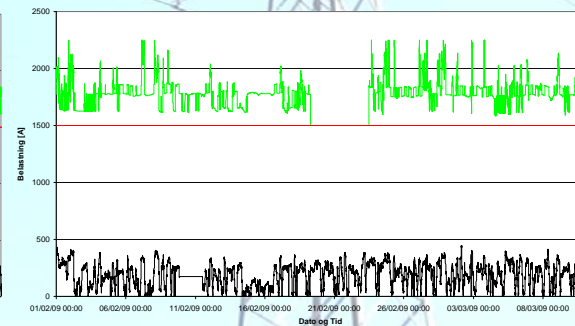
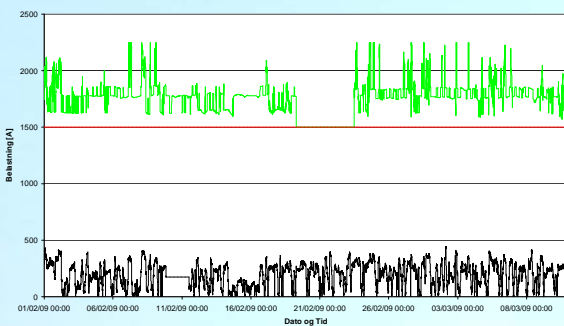
Experience

No wired communication
The sun is shining too little in Denmark



Sydlinje Trige Tange Udnyttelse

Nordlinje Trige Tange Udnyttelse



The future

We thought we had found a solution

Environmentally...

Economically...

The management of SN (the grid owner of the last project) gave the go

But the extra investment is not yet given by DERA (The Danish Energy Regulatory Authority)

Now the political situation has changed

Right now working on how to take down all 150 kV OHL in Denmark based on remaining life time and few other criterias.

Report to the government 31. martz

Political decision expected this year

Time frame expected to be 30 or perhaps 20 years

Political decision about how to pay for the investment is also to be taken



West Denmark Transmission in the future (20 or 30 years)

