Challenges of Overhead Lines in the new era of Renewables

by

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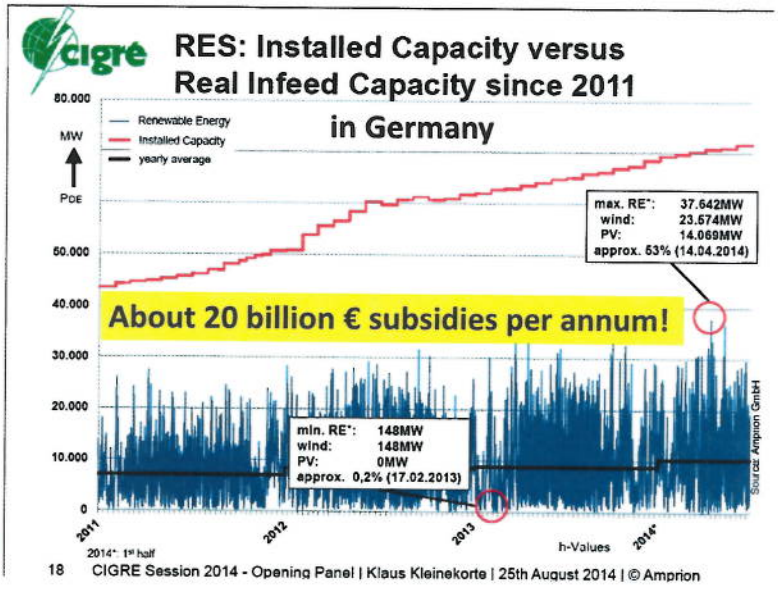
World Energy Outlook (WEO) 2014

Key statements in the «World Energy Outlook 2014» by the International Energy (IEA)

- 20% of the world's population have no access to electricity
- The worlwide electricity demand will increase from 2012- 2035 by 80%
- The share of renewables in total power generation rises from 21% in 2012 to 33% in 2040, as they supply nearly half of the growth in global electricity generation
- Sunsequently will be related investments until 2040 in the order of $ 21 trillion (!); more of 40 % thereof (i.e. $8 trillion) will go into Transmission and Distribution!

The example of Germany

- The amount of Renewables will reach by 2020 impressive 38 % in the total enrgy consumption
- For the period 2005 to 2015 the so-called Dena-study I has identified the necessity of additional 850 km HV (Overhead) Lines in the German HV grid
- According to the more recent Dena-study II another 3600 km of lines are necessary until 2020
- The related investments are in the region of more than $ 20 billion



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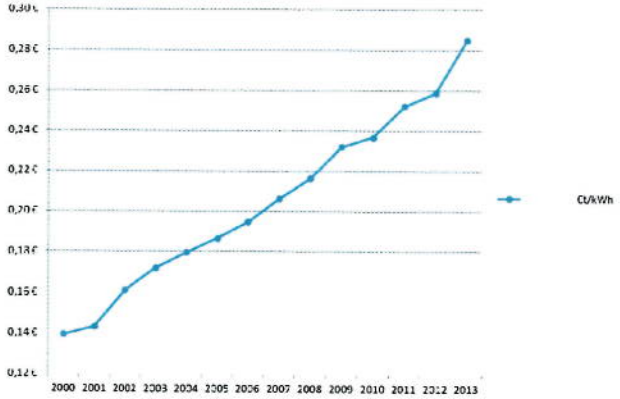
Tarif (residential) in Germany in €/kWh



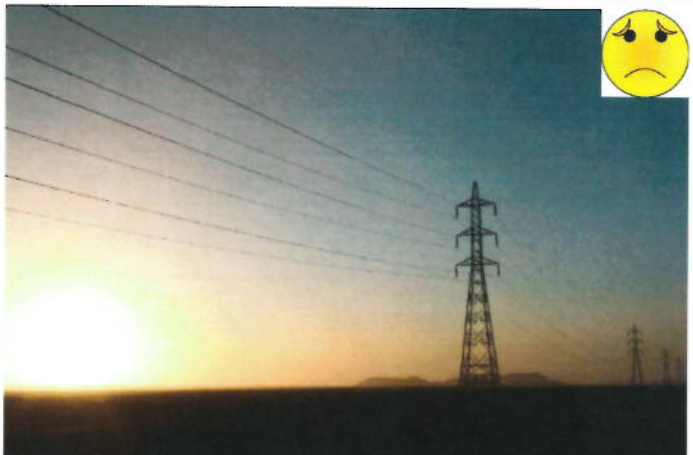
Today's big issues in the world of OHL

- There is a big demand for new lines
- There are many old lines which need refurbishment

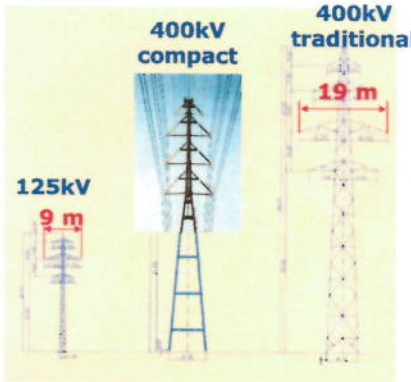
But:

- The public (and thus the politicians!) do not like lines because of their environmental impact, mainly **aesthetics and EMF**
- and often insist to **replace overhead lines by underground cables**

1st myth: OHL aesthetics

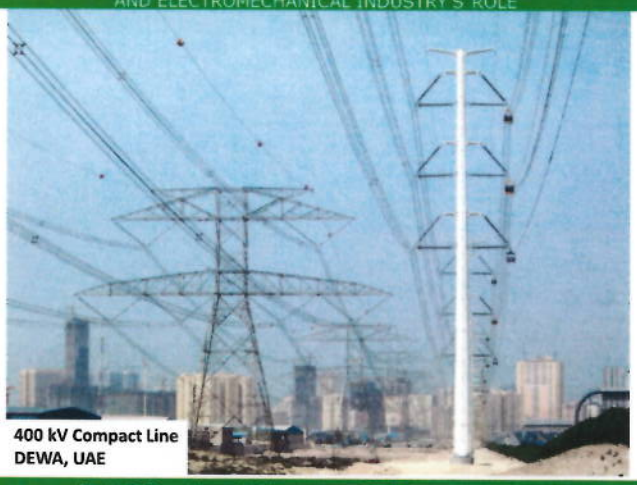


How a new 400 kV OHL got approved in CH



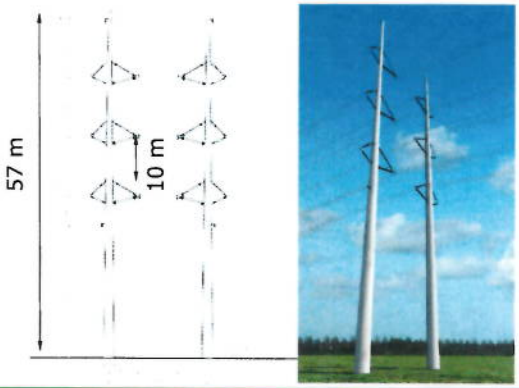
Steel lattice tower of 125kV-line and Swiss compact tower for 400kV/132kV-line as well as standard design

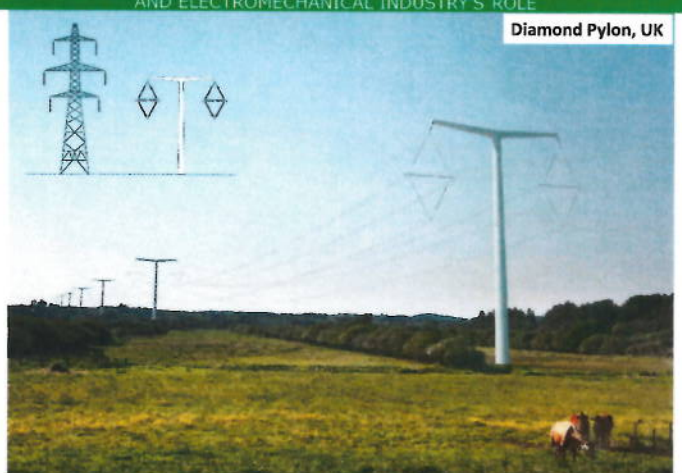
First 400 kV Compact Line
EOS, Switzerland



400 kV Compact Line
DEWA, UAE

400kV/150kV Wintrack-Line, NL
(suspension tower 400 m span)

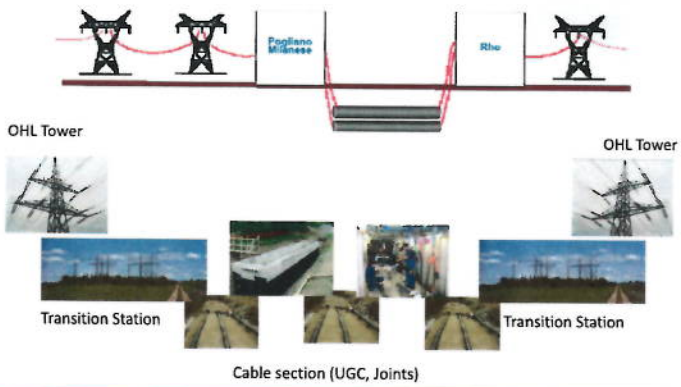




2nd myth: Overhead Lines or Underground Cables

Overhead Lines ~~or~~ and Underground Cables

Partial undergrounding („Siphon-Lines")



3rd myth: EMF

Typical values of magnetic fields in μT of houshold appliances

Appliance	3 cm	30 cm	1 m
Hairdryer	6 – 2000	0,001 – 7	0,01 – 0,3
Electric razor	15 – 1500	0,08 – 9	0,01 – 0,3
Electric drill	400 – 800	2 – 3,5	0,08 – 0,2
Vacuum cleaner	200 – 800	2 – 20	0,13 -2

http://www.bbc.co.uk/news/health-26068363

What is of interest to the international OHL-community?

SCB2 2014 SESSION

2014 SC B2 CAG Progress Report

2014 Target Group Survey – Industry Challenges

Challenges (from the Survey Pick List):

- Increase Capacity and Reliability Of the Existing Lines: 125
- New Materials For Use With Overhead Lines: 113
- Condition Assessment and Estimating Remaining Asset Life: 110
- Methods to Optimize Design: 108
- Best Construction and Maintenance Techniques and Procedures: 105
- Public Acceptance Of Overhead Lines: 77
- Foundations For Difficult Soil Conditions: 44

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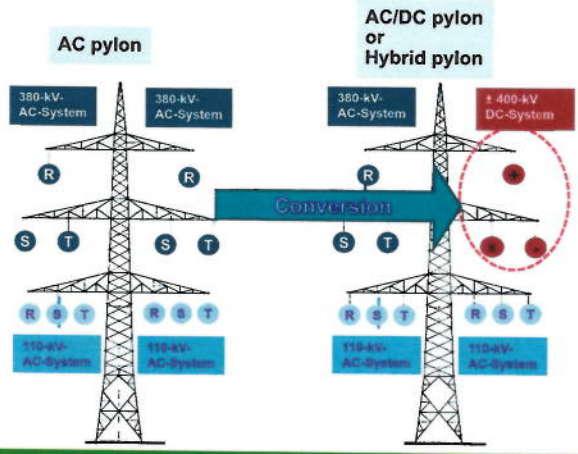
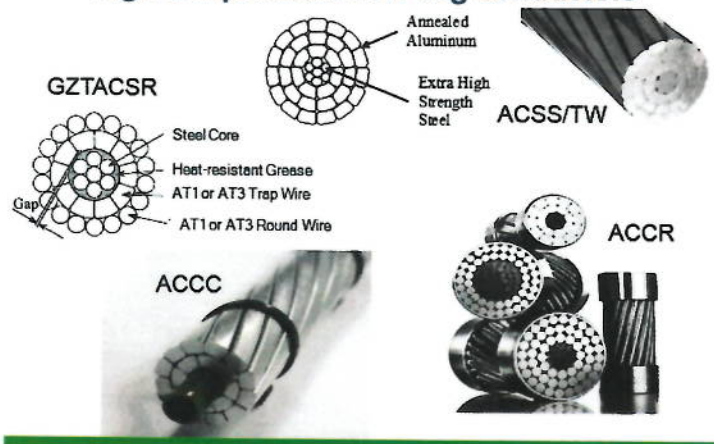
Increase capacity of Overhead Lines
e.g. conversion of an AC to a DC circuit using composite insulators



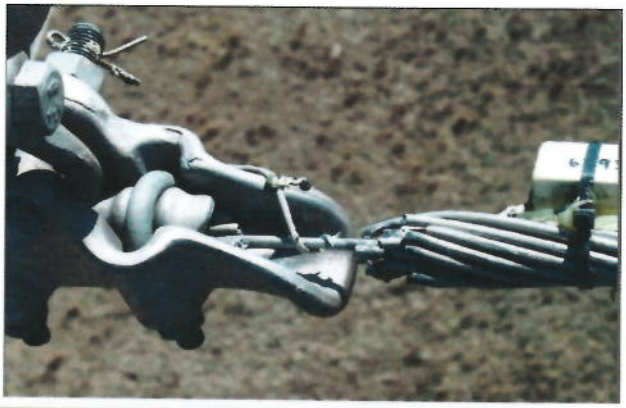
New materials for use with Overhead Lines
e.g. High Temperature Low Sag (HTLS) conductors

High Temperature Low Sag Conductors

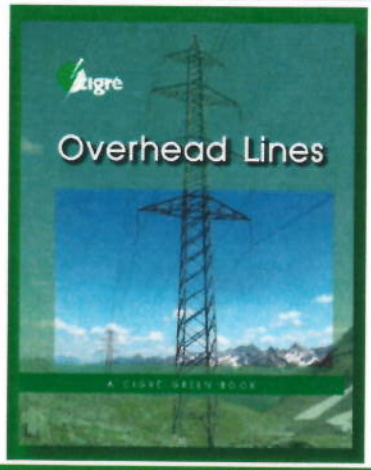


Condition assessment and estimating remaining asset life
e.g. Conductor Vibrations

Conductor fatigue due to Aeolian vibrations



....but this is another story!



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