Paris Session 2022

A3-PS1-Q3: e.m. & e.s. switching in case of combined overhead lines

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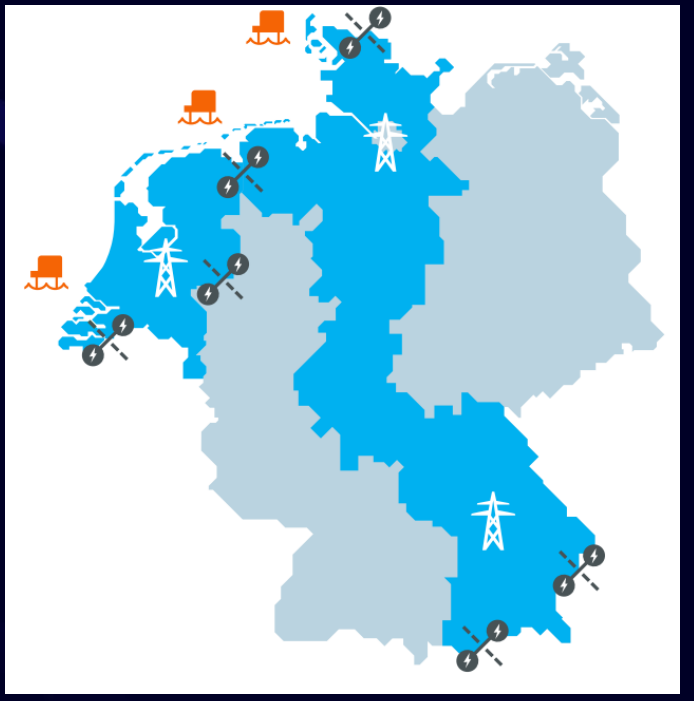
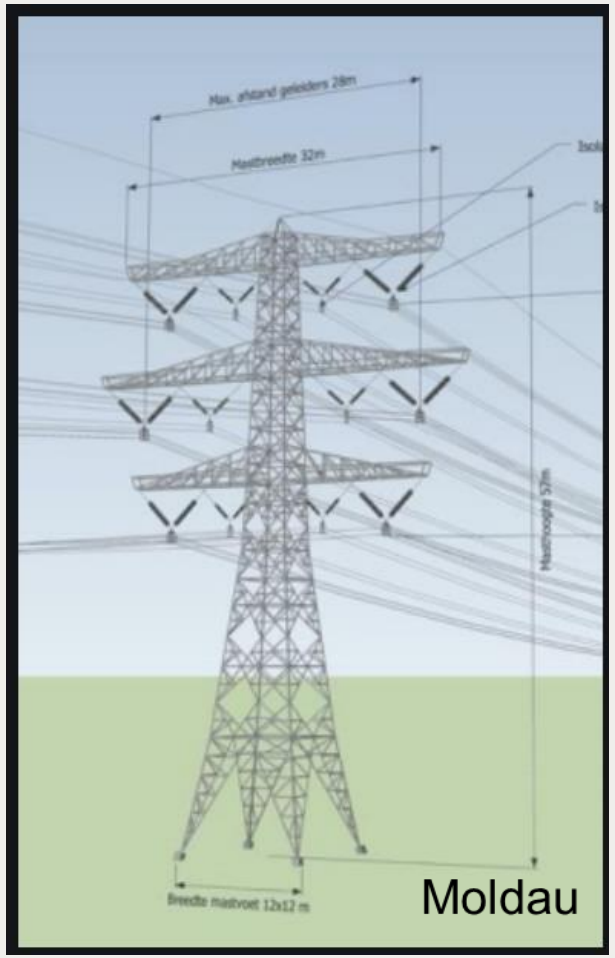


To reduce number of overhead lines, while increasing tranport of (green) energy:

Combine different circuits on one pylon

- Over long length
- Different voltage levels (420 kV/170 kV)
- Increased current (up to 4 kA)
- Partly untransposed

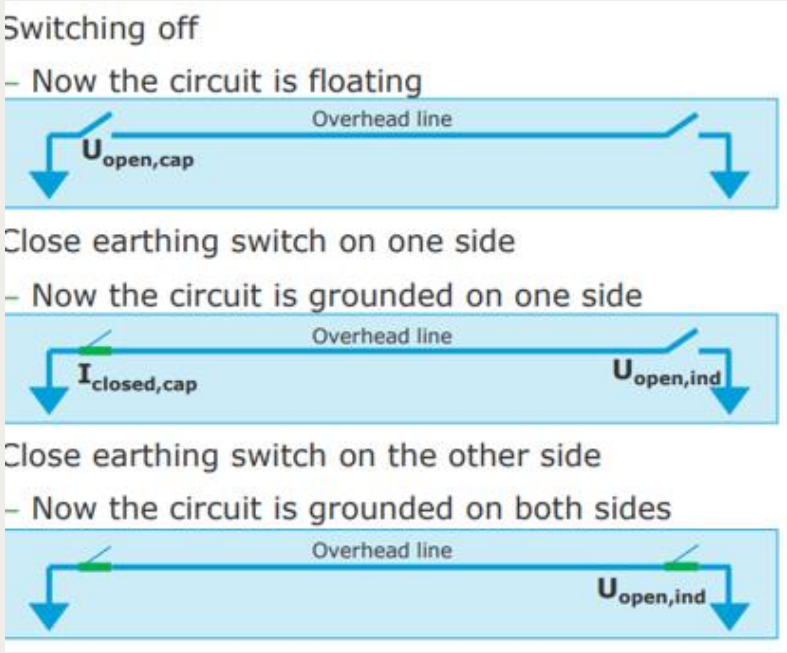


Capacitive induced (e.s.) and inductive induced (e.m.) current and voltage higher than IEC rates.

Calculated for

- Moldau type pylon, 50 km
- Max current 4kA/1,95kA
- Untransposed and transposed

Calculations combined with other issues



	IEC rating	**Calculated non-transposed, both 380 kV as 150 kV**	**Calculated transposed (non-ideal: RLL-GTB-TLB) and 150 kV**
Source	IEC 72271-102 Tab 8, Class B	**2021-02-22** First parameter variations RS4_Rev02.pdf	**2021-04-01** RLL_TLB Findings RS3-RS4-RS5 Rev03.pdf
380 kV			
e.s.	20 kV / 18 A	12,5 kV / 2 A	4.3 kV / 35 A
e.m.	10 kV / 160 A	5 kV / 296 A	7.4 kV / 172 A
150 kV			
e.s.	9 kV / 3 A	56 kV / 9 A	2.3 kV / 14 A
e.m.	2 kV / 80 A	14 kV / 820 A	2.0 kV / 165 A

Conclusions based on calculations

- Calculated values are seriously higher than as specified by IEC and TenneT
- Switching becomes an issue for line side earthing switches, both for GIS as for AIS
- Transposition helps (not sufficient) but hardly impossible for Moldau en Wintrack

Wintrack with combi already installed in NL

TenneT strives for more combi

e.m. induced is independent of line length

e.s. depends on line length but is not the major issue

Possible solutions

- Develop suitable earthing switch:
  - Especially for TenneT-NL (only), as (all) other TSO's transpose
  - For both AIS ás for GIS
  - Future-proof. As AIS might be replaced by GIS in the future
  - (Re)test existing e.s.
- One (unambiguous) procedure for all e.s.'s (at all or combi-lines only)
- Transfer the switching from the e.s. to the c.b. (like for other reasons also is done at MV)
- Start with a PoC

Switching by circuit breaker