Paris Session 2022

Clearance of OHL taking into account correlation between weather conditions and lightning strike probability

SC C4; PS 2: Challenges & advances in IC & LI research
Q10: Can new and more accurate methods be developed for the evaluation of the LI performance of OHL?

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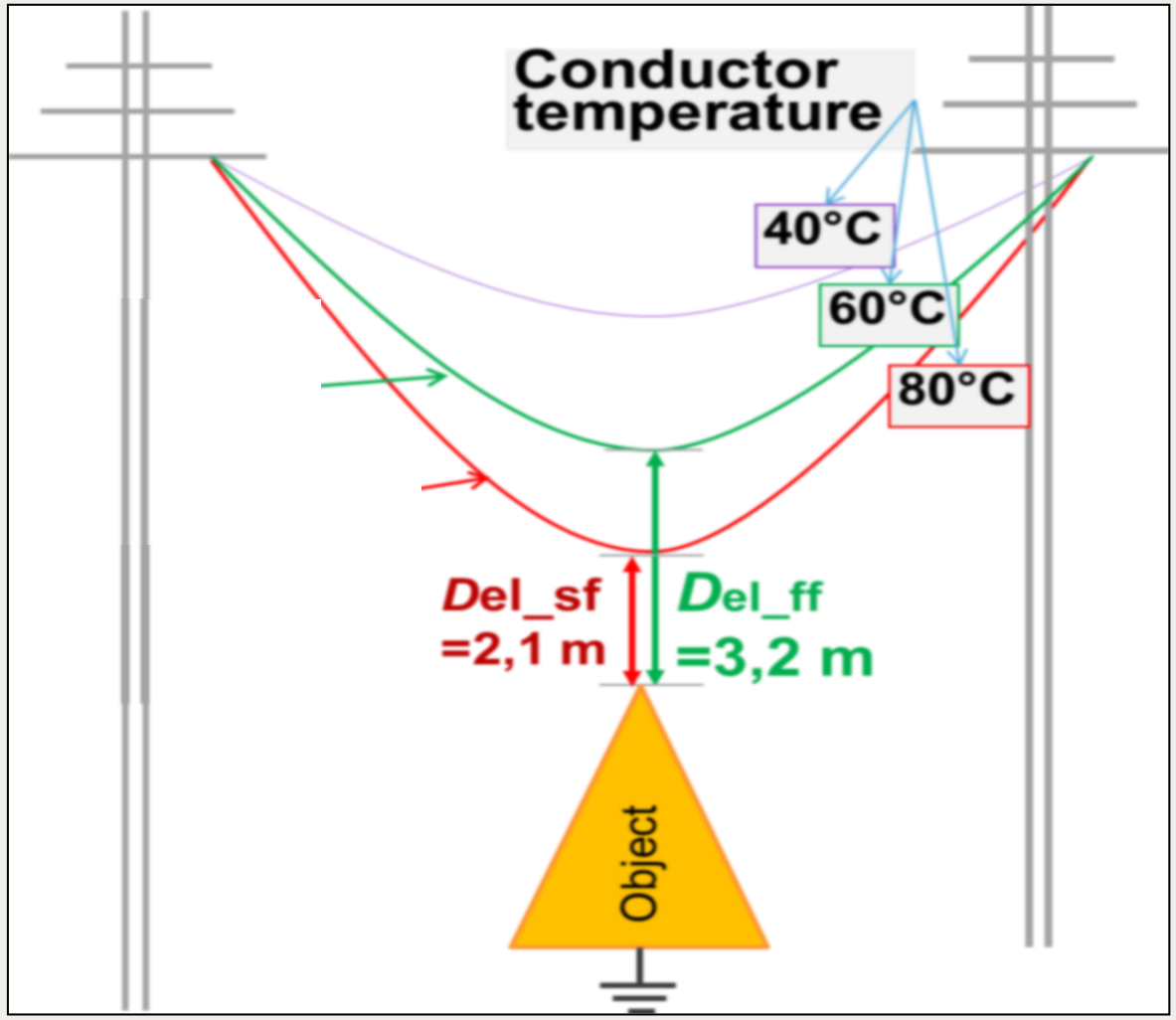
Basic design of air clearances of OHL to earthed objects

- Design of air clearances to earthed objects => summer weather conditions, i.e. 35°C ambient temperature, 0.6 m/s wind speed, 900 W/m² solar radiation, typical maximal conductor temperature of 80°C for LIWV accord. to EN 50341-1 & IEC 60071-1
- At these weather conditions no lightning strikes => no LIOV, i.e. no FFOV

➢ Air clearances according to IC for SFOV sufficient.

➢ Surplus to be exploited for increasing the ampacity of OHL under normal weather conditions



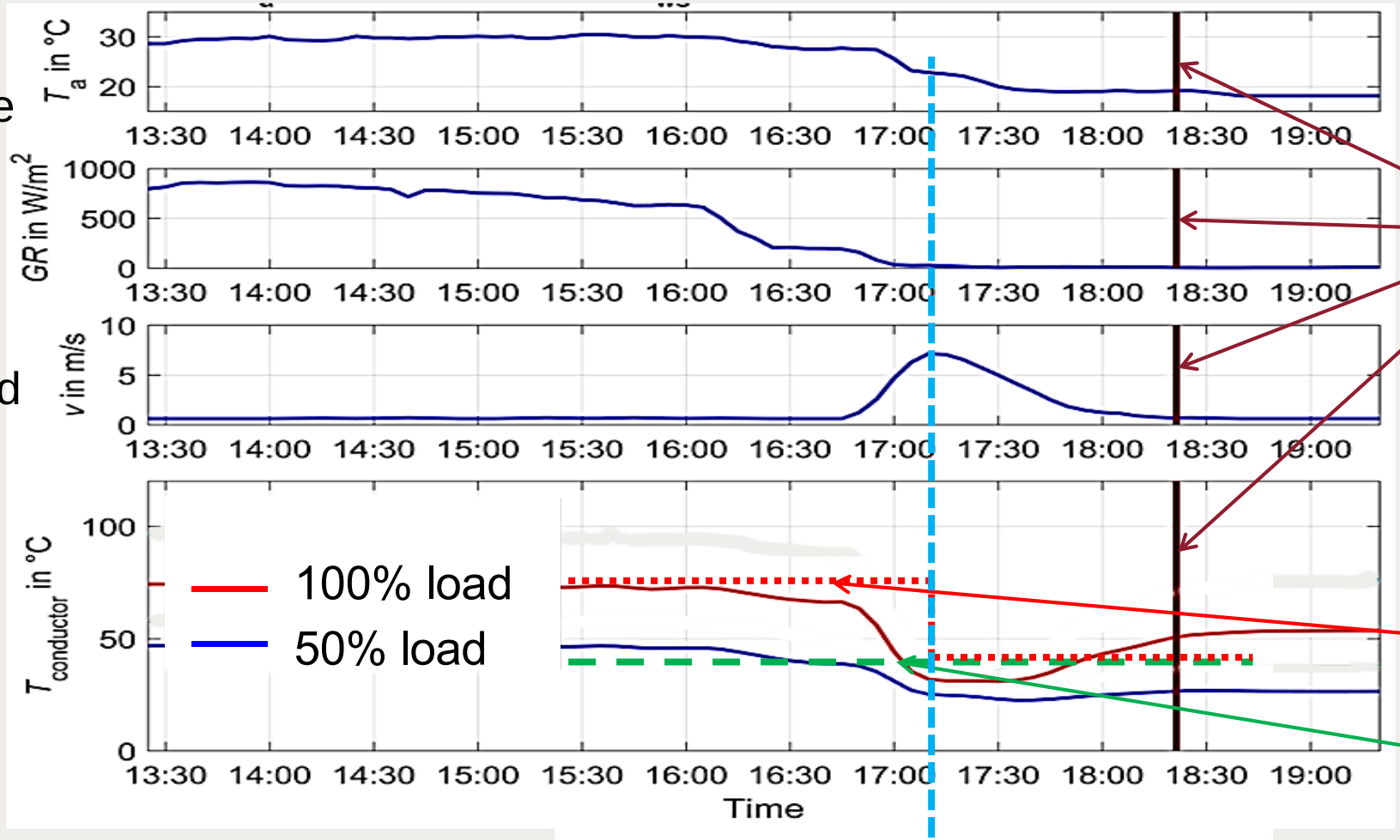
Conductor cooling at period during lightning incidences

ambient temperature

solar radiation

wind speed

Conductor temperature



Lightning incidence

New approach

Standard dimensioning

Consideration of **SFOV** sufficient

FFOV to be considered

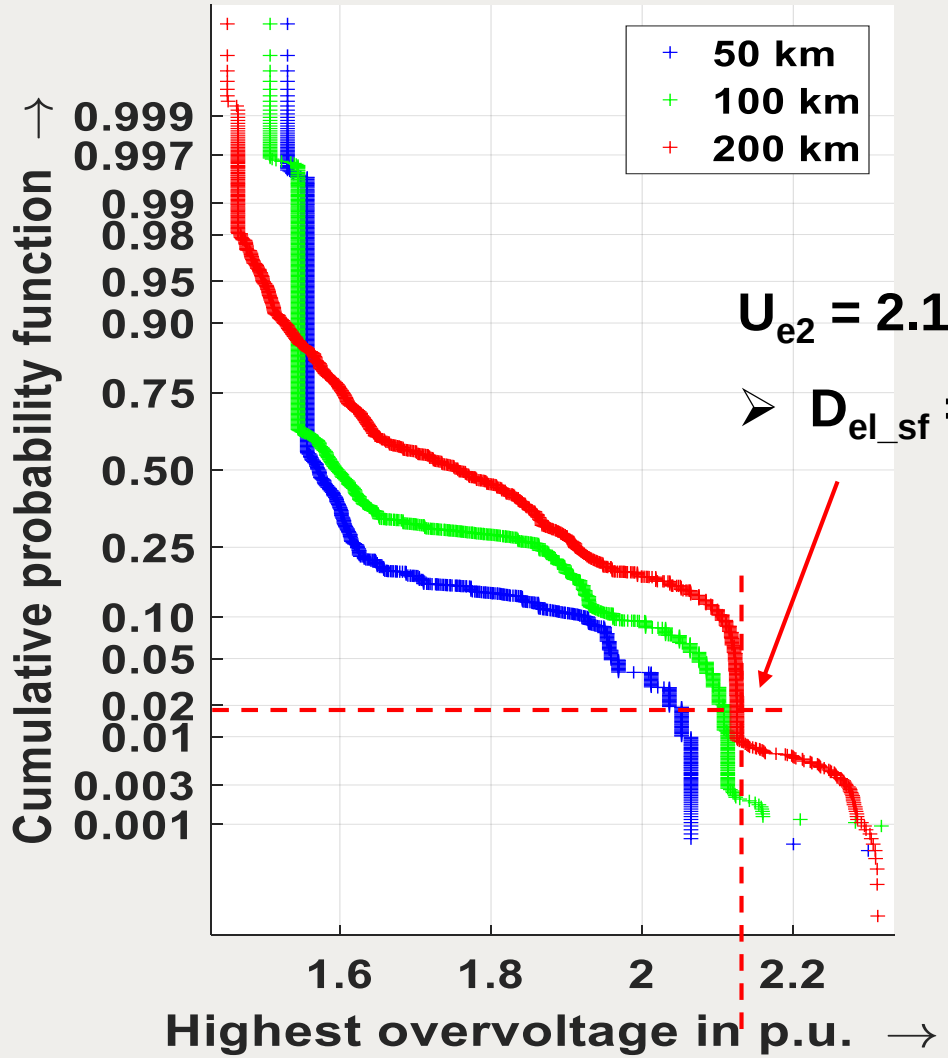
Main outcome & further improvements

- Change in weather conditions => better cooling of the conductor => decrease of conductor temperature for about 20°C
  - ➢ Reduction of conductor sag for about 46 cm … 70 cm depending on the span length of 200 m…500 m; (longer span length are more of interest)
  - ➢ Utilisation for improvements in ampacity

- A more sophisticated IC based on statistical consideration for adjustment of air clearance to earthed objects
  - ➢ Required air clearance for SFO => D_{el_sf}
  - ➢ Required air clearance for FFO => D_{el_ff}

Required air clearance for SFO & FFO

SFO:



U_{e2} = 2.1 p.u.

➢ D_{el_sf} = 2.1 m

FFO: D_{el_ff} = ?

If D_{el_sf} = 2.1 m

➢ $D_{el\_ff} = 2.1\ m + \Delta s$

Δs = 0,46…0,7 m *)

Worst case estimation:

$D_{el\_ff} = D_{el\_sf} = 2.1$ m

➢ SFFOR = 0.06 1/100km*a (N_g=2.5 1/km²*a)

➢ BFR = 0 ($R_f < 10\ \Omega$)

*) Due to conductor temperature drop of 20°C

Resumee

- Consideration of the correlation between weather conditions and occurrence of FFO can be applied for optimisation of the design of OHLs
  - Improvements in ampacity
  - Insulation coordination