THEME-A: Session-3: CLIMATE PROOFING OF FUTURE GRIDS AND ADVANCED MATERIALS FOR EXTREME WEATHER EVENTS

Overloading of Power Transformers

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Motivation

- Lifetime performance of a power transformer strongly depends on the temperatures its materials have been exposed to
- Unsteady character of output of a windfarm often results in peak loading of the feeding windfarm transformer
- Objective: Estimation of a noncritical overload depending on the ambient temperature

➢ Development and validation of a simple model for integration in an online monitoring system to display the thermal operating state sufficiently

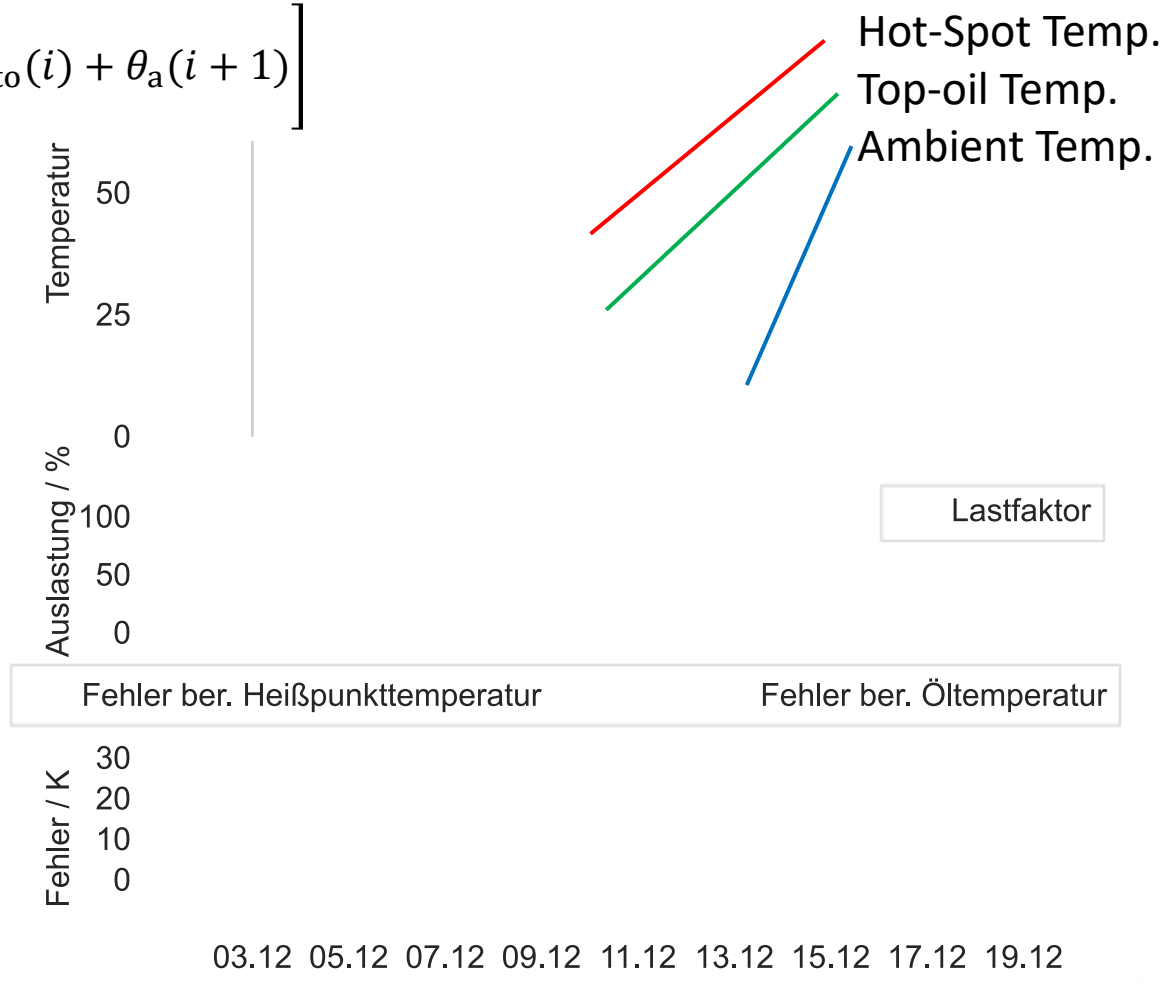
Thermal Model acc. IEC 60076-7

$$\theta_{\mathrm{to}}(i+1) = \theta_{to}(i) + \frac{\Delta t}{K_{11} \cdot \tau_{\mathrm{to}}} \cdot \left[\Delta\theta_{\mathrm{to,R}} \cdot \left(\frac{(P_{\mathrm{sc}} \cdot K(i+1)^2 + P_0)}{P_{\mathrm{sc}} + P_0} \right)^x - \theta_{\mathrm{to}}(i) + \theta_{\mathrm{a}}(i+1) \right]$$

Measured values:

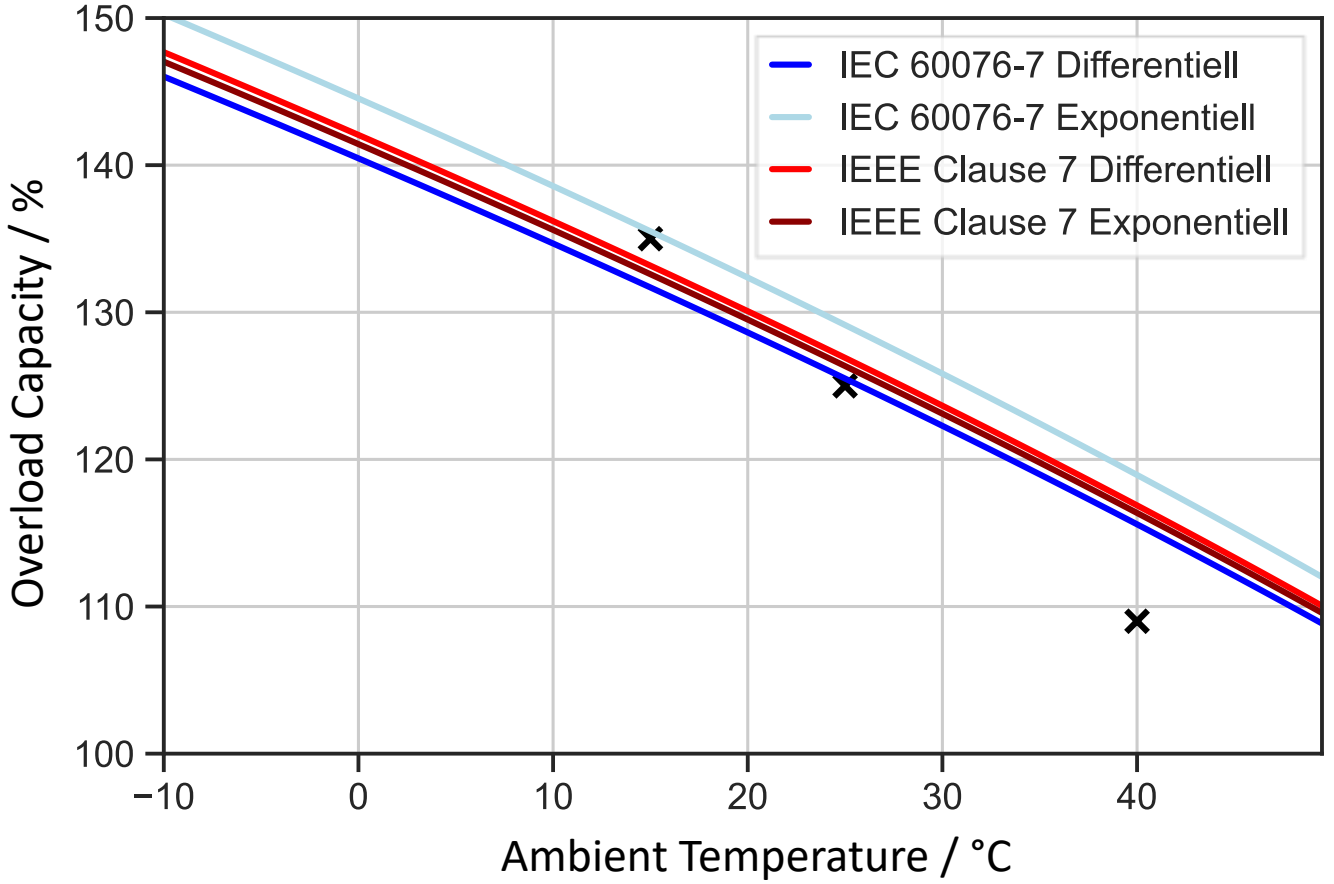
- Load factor K
- Ambient temp. θ_{a}
- Top-oil temp. θ_{to}

- Determination of parameters K_{11} and τ_{to} by fitting of measured data

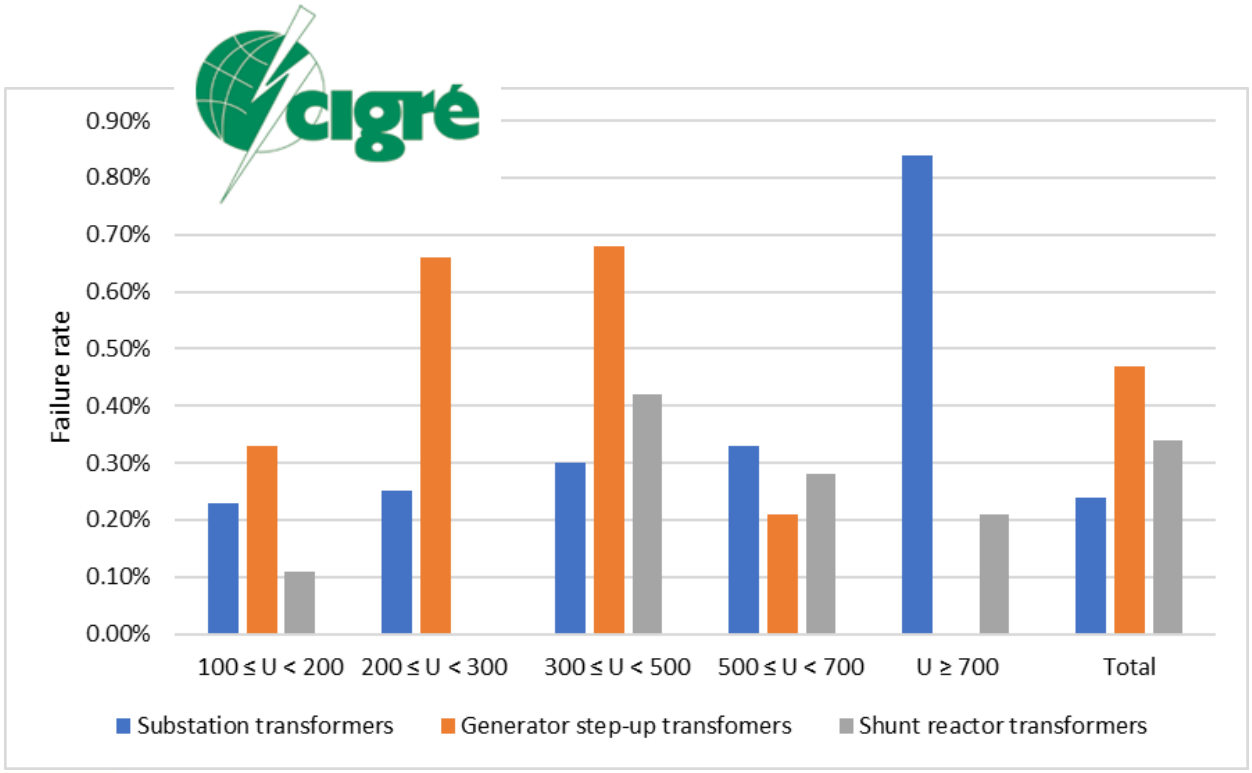


Estimation of long-term overload dependent on ambient temperature

Determination of long-term overload depending on ambient temperature with a given maximum hot-spot temperature
(e.g. 120°C, resulting in nominal aging rate)



Reliability of Transformers
Analysis of DTR failures



- Analysis of DTR failure causes with classification of reasons for understanding the reasons for high DTR failure rate (12 – 15%) in India
- Recommendations for measure(s) to reduce the DTR failure rate based on the analysis of selected DISCOMs.

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Thank You

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