



# USE OF HTLS IN NEW LINE DESIGNS

R. STEPHEN (ESKOM SOUTH AFRICA)

D. DOUGLASS (DPC LLC USA)

G. SIBILANT (EPRI USA)



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## CONDUCTOR SELECTION

- Line design issues
  - Conductor Strength
  - Corona/Audible noise
  - Clearances – performance, legal
  - Life cycle cost
  - Thermal rating
  - Sufficient capacity for the life of the line
- Conductor Parameters
  - Areas & Tensile Strengths
  - Outside Diameter
  - CTE
  - Resistance & Material Cost
  - Aging Limits
  - Cross sectional area, bundle design





## DISTANCE vs CAPACITY

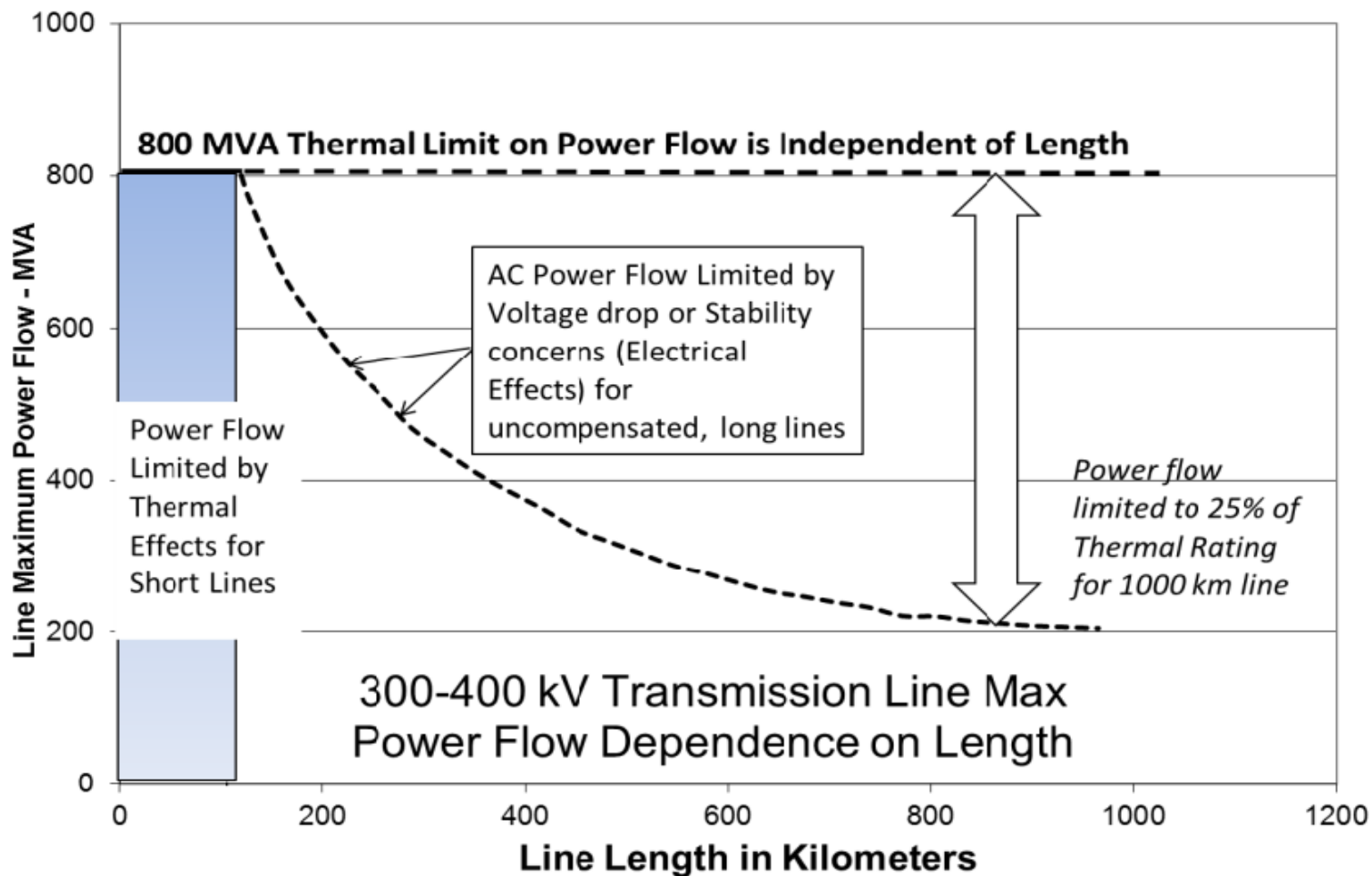


Figure 3 - Power Flow Capacity Limits versus Line-Length



## HTLS HIGH RATING FOR LOWER MATERIAL COST

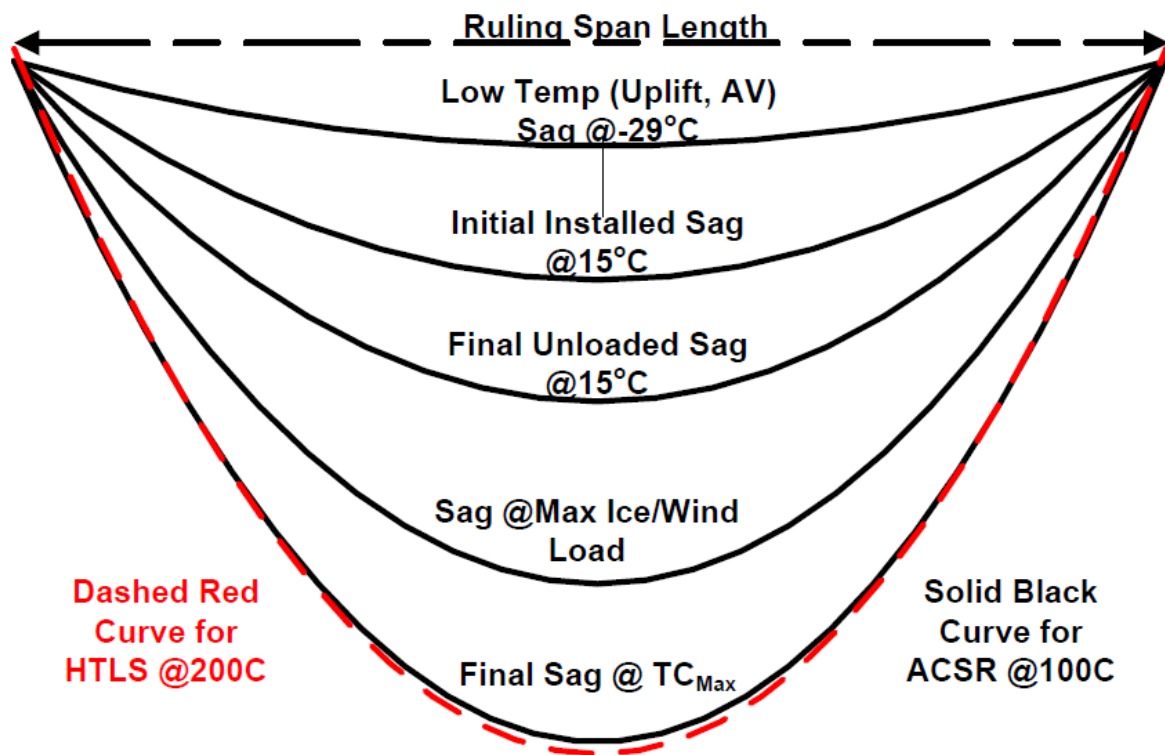


Figure 1 - How HTLS conductors limit sag at high temperature



## THERMAL RATING vs TEMPERATURE

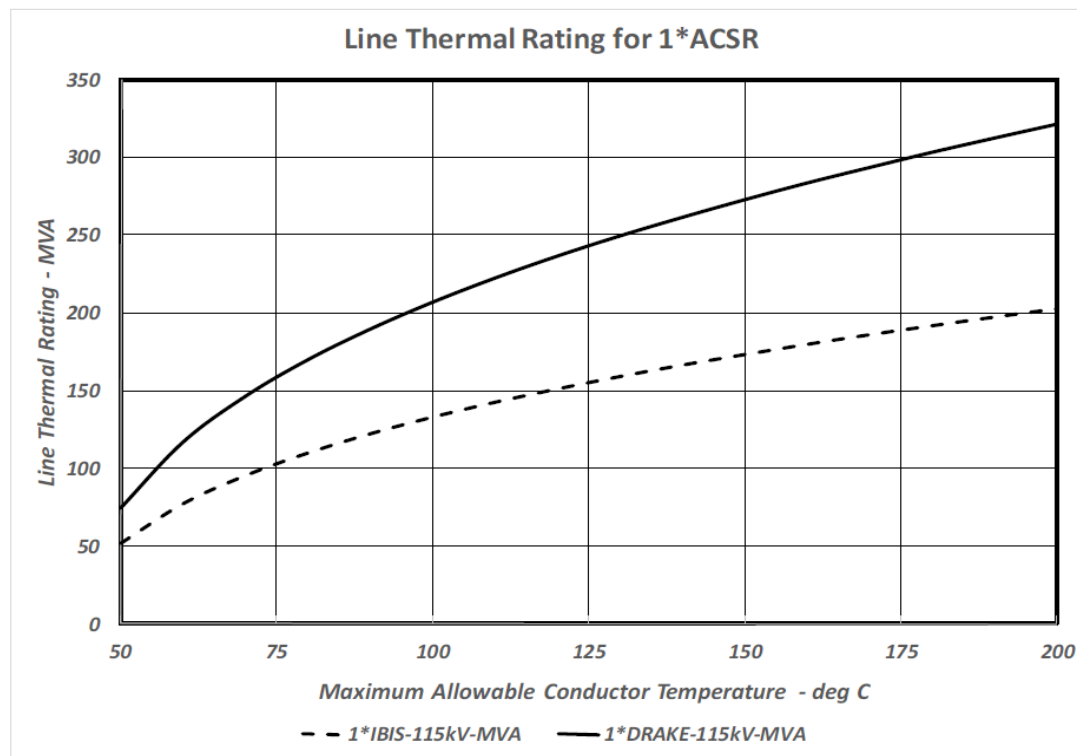


Figure 2- 115 kV Line Thermal Rating vs MACT for Single Ibis (397.5 kcmil) and Drake(795kcmil)



## WHERE TO USE HTLS

- New Lines HTLS not suitable
  - High load factor lines
  - >100miles stability or voltage drop limited lines
  - N-1 flows less than 150% of normal power flow
- New Lines HTLS suitable
  - Large variation in daily load profile – e.g. wind farm connectors
  - Embedded AC transmission where n-1 flows are far higher than normal transfer
  - <100mile lines with loads difficult or simply impossible to predict.



## CASE STUDIES

- Eskom-South Africa – used HTLS for lighter towers due to right of way constrictions
- AES Brazil – high capacity low mechanical load conductor required for 138kV short line.
- Elia – Belgium – 380kV line compact tower with insulated cross arms. Z strand ACPR used.
- CREZ Lines – Texas - 345 kV in Wind Farm Region with Steel Poles (2-Falcon ACSS)



## CONCLUSION

- HTLS suitable for thermal limited lines
- Uncertain maximum capacity requirements
- Peaky load profiles (low load factors)
- Light mechanical load but high thermal capacity
- Not suitable for high load factor
- Not suitable for stability limited lines.

