

- Comparison between NRS 097-2-1 Ed1 and Ed2 -





NRS 097-2-1 Updates

- Edition 1 (2010) based on IEC 61727
- Edition 2 (2017) updated using several international standards
 - VDE-AR-4105 (most prominent)



NRS 097-2-1 Updates

- Key differences from edition 1 to edition 2
 - Maximum size increased: 100 kW -> 1'000 kVA
 - Category updates
 - Recommended to GCAC
 - Do not include voltage level
 - Power factor
 - Wider range
 - Allow capacitive
 - Allow for preset characteristic curve to follow (provided by utility)
 - Out of bound trip times
 - Category A1 and A2
 - Category A3 same requirements as Category B (RPP Grid Code)
 - LVRT
 - Dip ride-through (X1-type dips), OR
 - Category B and C curve (A3)
 - Add over frequency output reduction characteristic
 - Reconnection ramp-rate (>100 kVA)



Other

- Overall clarification of many aspects
- Safety requirements specified in more detail
 - More may be added
 - Dependent on SANS 10142-3 development
- Section for UPS removed
 - If UPS can generate back into network, to comply with NRS 097-2-1
- EMC clause added
 - Reference: IEC 62578 & SANS/IEC 50065-1

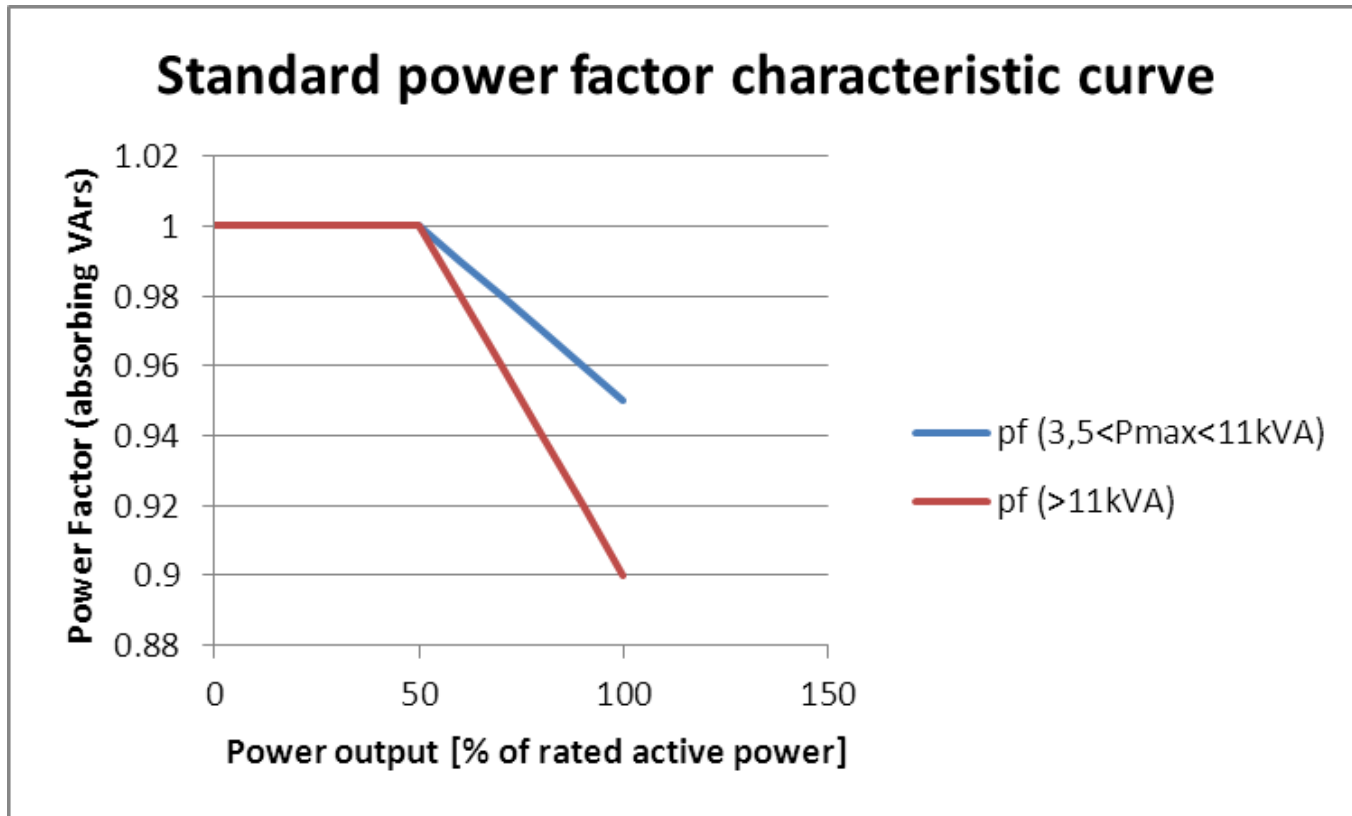


Category updates

- Grid Code for Renewable Power Plants
 - High-level requirements for category A
 - Sub-categories:
 - A1: 0 -13.8kVA (4.6kVA/phase)
 - A2: 13.8-100kVA
 - A3: 100kVA – 1MVA (including smaller units connected to a dedicated MV/LV transformer)
- Proposals from NRS097 WG:
 - move smaller units connected to dedicated MV/LV to category A1 or A2
 - move all LV connected generators to category A (if point of supply at MV, units smaller than 1MVA currently category B)



VDE 4105 Standard power factor characteristic curve



Recommended: applicable to >100kVA
Smaller units to remain above 0.98



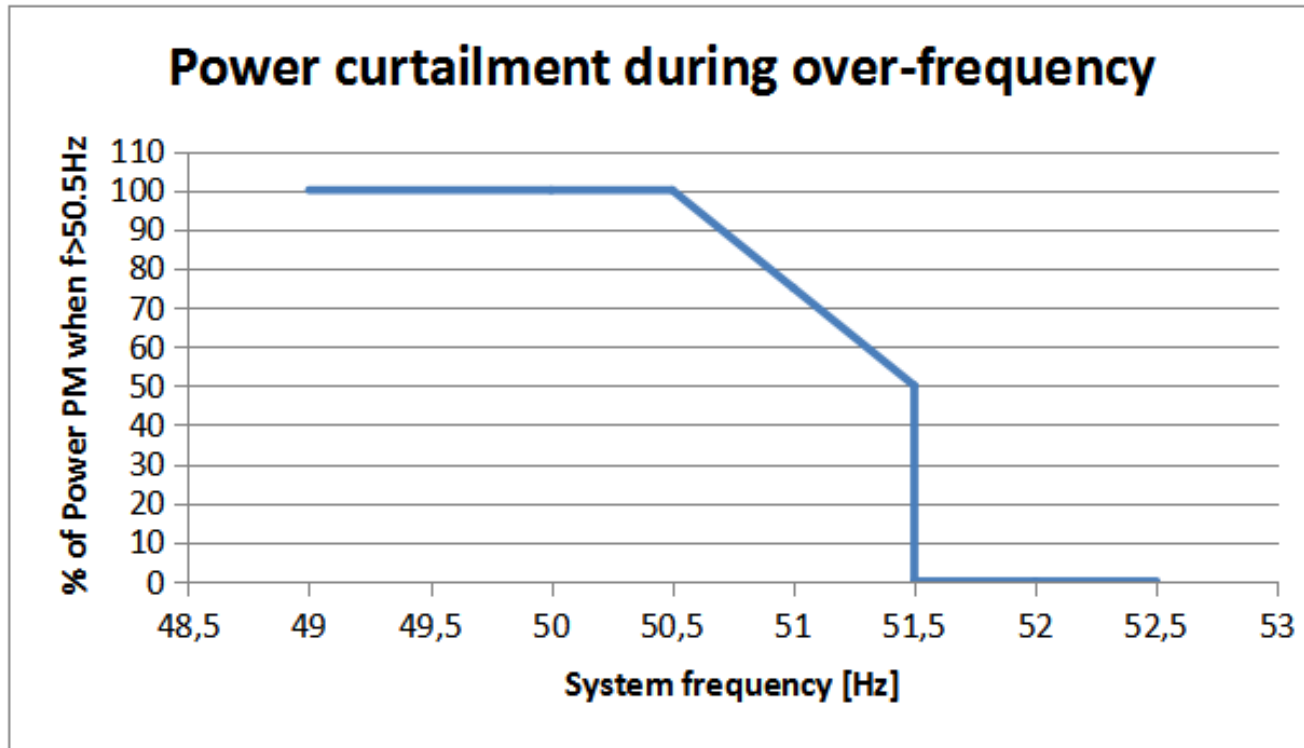
Out of bound trip times

Voltage range (at point of utility connection)	Maximum trip time s
$V < 50 \%$	0,2 s
$50 \% \leq V < 85 \%$	2 s
$85 \% \leq V \leq 110 \%$	Continuous operation
$110 \% < V < 120 \%$	2 s
$120 \% \leq V$	0,16 s
Voltage range (at point of utility connection)	Maximum trip time s
$V < 50 \%$	0,2 s
$50 \% \leq V < 85 \%$	10 s
$85 \% \leq V \leq 110 \%$	Continuous operation
$110 \% < V < 115 \%$	40 s / 2 s¹
$115\% \leq V < 120\%$	2 s
$120 \% \leq V$	0,16 s

¹ If extra voltage level control not possible, 2 s disconnection required



Over-Frequency





UPS with embedded generation Clause

- Clause 4.4 removed for Edition 2:
 - 4.1.1.13 Any UPS/generating device that operates in parallel with the grid may only connect to the grid when it complies fully with the requirements of this part of NRS 097. This includes UPS configurations with or without EG.
- NOTE The requirement is applicable irrespective of the duration of parallel operation.



Conclusion

- Summary of key changes to NRS 097-2-1 in edition 2
- Discussion