

# Nordex Group IBRTF Feedback NOGRR245

Rev.00 14.04.2023 Malte Laubrock , Head of Grid Integration



Frequency ride through performance requirements

RMS voltage ride through performance requirements

Instantaneous voltage ride through performance requirements

Models

MFRT







Frequency ride through performance requirements

1. Does the OEM believe that the current and new generators can meet the frequency ride through performance requirements proposed in NOGRR245?

\* If not, provide specifics including which models or quantity of installed capacity cannot meet the requirements.

\* How long would it take to implement the needed changes with details explaining any extended durations





#### 2.6.2.1 Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs)

- (f) · (iii )	Minimum Ride-Through Time
Frequency (f) in (Hz)	(seconds)
f > 61.8	No ride-through requirement
61.6 < f ≤ 61.8	299
61.2 < f ≤ 61.6	540
58.8 ≤ f ≤ 61.2	continuous
58.4 ≤ f < 58.8	540
57.0 ≤ f < 58.4	299
f < 57.0	No ride-through requirement

Before 2023	>1.01.2023
ok	ok



4 |



- 1. Does the OEM believe that the current and new generators can meet the frequency ride through performance requirements proposed in NOGRR245?
  - \* If not, provide specifics including which models or quantity of installed capacity cannot meet the requirements.
    - \* How long would it take to implement the needed changes with details explaining any extended durations
  - > NX : Already covered by current settings





RMS voltage ride through performance requirements

2. Does the OEM believe that the current and new generators can meet the RMS voltage ride through performance requirements (Table A) proposed in NOGRR245?

\* If not, provide specifics including which models or quantity of installed capacity cannot meet the requirements.



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# RMS voltage ride through performance requirements

#### 2.9.1 Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs)

(1) All IBRs interconnected to the ERCOT Transmission Grid shall ride through the rootmean-square voltage conditions in Table A and the instanteneous phase voltage conditions in Table B, as measured at the IBR's Point of Interconnection Bus (POIB) \*)

Root-Mean-Square Voltage (p.u. of nominal)	Minimum Ride-Through Time (seconds)
V > 1.20	No ride-through requirement
1.10 < V ≤ 1.20	1.0
$0.90 \le V \le 1.10$	continuous
0.70 ≤ V < 0.90	3.0
0.50 ≤ V < 0.70	2.5
0.25 ≤ V < 0.50	1.2
V < 0.25	0.16

#### Table A

RMS	Min (s)	Before 2023 *)	> <b>1.01.2023</b> *)
V > 1.20	No ride-through requirement	ok	ok
1.10 < V ≤ 1.20	1.0	ok	ok
$0.90 \leq V \leq 1.10$	continuous	ok	ok
0.70 ≤ V < 0.90	3.0	ok	ok
$0.50 \le V \le 0.70$	2.5	ok	ok
0.25 ≤ V < 0.50	1.2	ok	ok
V < 0.25	0.16	ok	ok

## \*) Protection located on Generator / LV Level.





Instantaneous voltage ride through performance requirements

3. Does the OEM believe that the current and new generators with an SGIA after 1/1/23 can meet the instantaneous voltage ride through performance requirements (Table B) proposed in NOGRR245?

\* If not, provide specifics including which models or quantity of installed capacity cannot meet the requirements.

\* How long would it take to implement the needed changes with details explaining any extended durations?









Instantaneous voltage ride through performance requirements

1.5

0.5

0

-0.5

-1.5

0.01

- > Why are instantaneous voltage requirements "different" to rate and state compliance
- Protection is normally realised on RMS algorithms / assessment
- 2. Design range and capability is also based on RMS quantities for a majority of elements

















Instantaneous voltage ride through performance requirements



### Table B

Instantaneous Phase Voltage (p.u. of nominal)	Minimum Ride-Through Time (milliseconds)
V > 1.80	No ride-through requirement
1.70 < V ≤ 1.80	0.2
1.60 < V ≤ 1.70	1.0
1.40 < V ≤ 1.60	3.0
1.20 < V ≤ 1.40	15.0

## Table A

> 1.3 up to 1 cycle

> 1.2 min 1 cycle

Root-Mean-Square Voltage	Minimum Ride-Through Time
(p.u. or norminal)	(seconds)
V > 1.20	No ride-through requirement
1.10 < V ≤ 1.20	1.0
$0.90 \leq V \leq 1.10$	continuous
$0.70 \le V < 0.90$	3.0
0.50 ≤ V < 0.70	2.5
$0.25 \le V < 0.50$	1.2
V < 0.25	0.16



## Instantaneous voltage ride through performance requirements



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## Instantaneous voltage ride through performance requirements





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## Instantaneous voltage ride through performance requirements



It will not be possible to secure the capability for all components

- Concentrate on components that mainly influence ride trough and check / optimise performance
- → Main Converter , Pitch , Yaw , Generator
- → Requirements are outside current requirements and design and must be assessed new





4. Does the OEM believe that they can provide accurate models that reflect any changes are necessary to meet the frequency and voltage ride through requirements?

\* If not, provide specifics including which models or quantity of installed capacity cannot properly model the changes.

\* How long would it take to provide the updated models with details explaining any extended durations?

\* Can the updated model's be provided prior to implementing the changes?

> NX : Already covered by current settings within > Some crosschecks for Units older > 10 years Models for Freugency and RMS Voltages

NX : Instantaneous Voltages are covered by impact on RMS Protection within PSCAD





- (7) The IBR shall ride through multiple excursions outside the continuous operation range in Table A in paragraph (1) above, unless the conditions and situations specified below exist, in which the IBR may trip to protect equipment from the cumulative effect of successive voltage deviations:
  - (a) More than four voltage deviations at the POIB outside the continuous operation zone within any ten second period.
  - (b) More than six voltage deviations at the POIB outside the continuous operation zone within any 120 second period.
  - (c) More than ten voltage deviations at the POIB outside the continuous operation zone within any 1,800 second period.
  - (d) Voltage deviations outside of continuous operation zone in Table A in paragraph
     (1) above following the end of a previous deviation by less than twenty cycles of system fundamental frequency.
  - (e) More than two individual voltage deviations at the POIB below 50% of the nominal voltage (including zero voltage) within any ten second period.
  - (f) More than three individual voltage deviations at the POIB below 50% of the nominal voltage (including zero voltage) within any 120 second period.
  - (g) For wind turbine IBRs, individual wind turbines may trip for consecutive voltage deviations resulting in stimulation of mechanical resonances exceeding equipment limits.

> Are pro active Measures possible to avoid reaching mechanical limits ?

E.g. slow down active power ramp up
 to 3s for second fault within 10s especially for severe
 faults below 50%



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