

Übersicht - Stand der Umsetzung der technischen Anforderungen des NC RfG

Aspect	Non-Exhaustive Requirement	Non-Mandatory Requirement	Article	Definition	Type A	Type B	Type C	Type D	Comment	DE		
										Proposal	Status	
		NA	7.4	RSO/TSO	x	x	x	x	Proposal of requirements of general applications	Proposal	Status	
FREQUENCY RELATED PARAMETERS	FREQUENCY RANGES		13.1.a.(i)	TSO	x	x	x	x	time period for operation in the frequency ranges: Continental Europe: 47.5 - 48.5 Hz and 48.5 - 49 Hz; Nordic: 48.5 - 49 Hz GB: 48.5 - 49 Hz Ireland: 48.5 - 49 Hz Baltic: 47.5 - 48.5 Hz and 48.5 - 49 Hz and 51 - 51.5 Hz	30 min	2 - preliminary shared with stakeholders	
	RATE OF CHANGE OF FREQUENCY (ROCOF) WITHSTAND CAPABILITY		13.1.(b)	TSO	x	x	x	x	maximum ROCOF for which the Power Generating Module (PGM) shall stay connected	2 Hz/s	1 - TSO internal consideration	
				RSO TSO	x	x	x	x	specify ROCOF of the loss of main protection	to be defined project-specific		
	LIMITED FREQUENCY SENSITIVE MODE (LFSM)			13.2.(a)	TSO	x	x	x	x	frequency threshold and droop settings	adjustable ranges for frequency threshold and droop; default values: 50,2 Hz and 5%	2 - preliminary shared with stakeholders
		X			TSO	x	x	x	x	requirements in case of expected compliance on an aggregate level	n/a to type D PGMs	
		X		13.2.e	TSO	x	x	x	x	expected behaviour of the PGM once the minimum regulating level is reached	to continue operation at this level	2 - preliminary shared with stakeholders
	ADMISSIBLE ACTIVE POWER REDUCTION FROM MAXIMUM OUTPUT WITH FALLING FREQUENCY			13.4	TSO	x	x	x	x	admissible active power reduction from maximum output with falling frequency	10%P _{max} /Hz starting at 49,5 Hz	2 - preliminary shared with stakeholders
				13.5	TSO	x	x	x	x	definition of the ambient conditions applicable when defining the admissible active power reduction	PGM owner to provide information to the network operator for approval	2 - preliminary shared with stakeholders
	FREQUENCY STABILITY			15.2.(a)	TSO		x	x	x	time period for frequency stability to be reached	to be defined project-specific	
	LFSM-U			15.2.c	TSO			x	x	definition of the frequency threshold and droop	adjustable ranges for frequency threshold and droop; default values: 49,8 Hz and 5%	
					TSO			x	x	definition of Pref	- sync. PGM: P _{ref} = P _{max} - PPM: P _{ref} = P _{act} at overfrequency	2 - preliminary shared with stakeholders
	FREQUENCY SENSITIVE MODE			15.2.d.(i)	TSO			x	x	parameters of the Frequency Sensitive Mode (FSM)		
			- active Power range related to Maximum capacity			2%	2 - preliminary shared with stakeholders					
			- frequency response insensitivity			10 mHz	2 - preliminary shared with stakeholders					
			- frequency response dead band			0 - 200 mHz	2 - preliminary shared with stakeholders					
			15.2.d.(iii)	TSO			x	x	maximum admissible full activation time	adjustable range 2 - 12%	2 - preliminary shared with stakeholders	

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		15.2.d.(i v)	TSO			X	X	maximum admissible initial delay for power generating modules with inertia	as short as possible, to be justified if > 2 s	2 - preliminary shared with stakeholders
	X	15.2.d.(i v)	TSO			X	X	maximum admissible initial delay for power generating modules without inertia	1 s	2 - preliminary shared with stakeholders
		15.2.d.(v)	TSO			X	X	time period for the provision of full active power frequency response	> 15 min	2 - preliminary shared with stakeholders
	REAL-TIME MONITORING OF FSM	15.2.g	RSO or TSO			X	X	list of the necessary data which will be sent in real time	to be defined project-specific	
	RATES OF CHANGE OF ACTIVE POWER OUTPUT	15.6.e	RSO TSO			X	X	definition of the minimum and maximum limits on rates of change of active power output (ramping limits) in both an up and down direction, taking into consideration the specific characteristics of the prime mover technology	> 4% P _{max} /min in case of instructions for system security	2 - preliminary shared with stakeholders
	FAULT RIDE THROUGH CAPABILITY	14.3.a	TSO		X	X	X	voltage-against-time profile	n/a to type D PGMs	
		14.3.b	TSO		X	X	X	voltage-against-time profile for asymmetric faults	n/a to type D PGMs	
		16.3.a.(i)	TSO				X	voltage-against-time profile	- sync. PGM: U _{ret} : 0 U _{clear} : 0,25 U _{rec1} : 0,7 U _{rec2} : 0,85 t _{clear} : 0,15 s t _{rec1} : 0,3 s t _{rec2} : 0,5 s t _{rec3} : 3 s - PPM: U _{ret} : 0 U _{clear} : 0 U _{rec1} : 0 U _{rec2} : 0,85 t _{clear} : 0,15 s t _{rec1} : 0,15 s t _{rec2} : 0,15 s t _{rec3} : 3 s	2 - preliminary shared with stakeholders
		16.3.c	TSO				X	voltage-against-time profile for asymmetric faults	- sync. PGM: U _{ret} : 0 U _{clear} : 0,25 U _{rec1} : 0,6 U _{rec2} : 0,75 t _{clear} : 0,22 s t _{rec1} : 0,45 s t _{rec2} : 0,6 s t _{rec3} : 3 s - PPM: U _{ret} : 0 U _{clear} : 0 U _{rec1} : 0 U _{rec2} : 0,75 t _{clear} : 0,15 s t _{rec1} : 0,15 s t _{rec2} : 0,15 s t _{rec3} : 3 s	2 - preliminary shared with stakeholders
		15.2.a	RSO or TSO			X	X	time period to reach the adjusted active power set point	to be defined project-specific	
							tolerance applying to the new set point and the time to reach it.	to be defined project-specific		

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VOLTAGE RELATED PARAMETERS

AUTOMATIC DISCONNECTION DUE TO VOLTAGE LEVEL		15.3	RSO TSO			X	X	voltage criteria and technical parameters at the connection point for automatic disconnection	admissible disconnection at $U > 1,1pu$ (400 kV) or $U > 1,15pu$ (220 kV), or $U < 0,85pu$	2 - preliminary shared with stakeholders
VOLTAGE RANGES		16.2.a.(i)	TSO				X	for Continental Europe time period for operation in the voltage range 1,118 pu-1,15 pu for PGM connected between 110kV and 300 kV	30 min	2 - preliminary shared with stakeholders
	X	16.2.a.(ii)	TSO				X	determination of shorter time periods in the event of simultaneous overvoltage and under frequency or simultaneous under voltage and over frequency	to be defined project-specific	
	X	16.2.a.(iii)	TSO				X	for Spain time period for operation in the voltage range 1,05 pu-1,0875 pu for PGMs connected between 300kV and 400 kV may be specified as unlimited	n/a	
	X	16.2.a.(v)	TSO				X	for Baltic voltage ranges and time period for operation may be specified in line with continental Europe for facilities connected for 400 kV	n/a	
REACTIVE POWER CAPABILITY FOR SYNCHRONOUS PGM	X	17.2.a	RSO		X	X	X	capability to supply or absorb reactive power	n/a to type D PGMs	
SUPPLEMENTARY REACTIVE POWER FOR SYNCHRONOUS PGM	X	18.2.a	RSO			X	X	definition of supplementary reactive power to compensate for the reactive power demand of the high-voltage line or cable when the connection point is not located at the HV side of the step-up transformer	to be defined project-specific	
REACTIVE POWER CAPABILITY AT MAXIMUM CAPACITY FOR SYNCHRONOUS		18.2.b.(i)	RSO TSO			X	X	definition of a U-Q/Pmax-profile at maximum capacity	under discussion	
VOLTAGE STABILITY FOR SYNCHRONOUS PGM		19.2.b.(v)	TSO				X	power threshold above which a PSS function is to be specified	all type D sync. PGM	2 - preliminary shared with stakeholders
REACTIVE POWER CAPABILITY FOR PPM	X	20.2.a	RSO		X	X	X	capability to supply or absorb reactive power	n/a to type D PGMs	
FAST FAULT CURRENT INJECTION FOR PPM	X	20.2.b	RSO TSO		X	X	X	Specifications of: - how and when a voltage deviation is to be determined as well as the end of the voltage deviation - fast fault current characteristics - timing and accuracy of the fast fault current, which may include several stages during a fault and after its clearance	- fault identification: phase-to-phase $U < 90\%$ or $> 110\%$ - end of fault: $90\% < U < 110\%$ - fault current: $\Delta i = k \cdot \Delta u$; $2 \leq k \leq 6$ - fault current rise time: ≤ 30 ms - fault current settlement time: ≤ 60 ms	2 - preliminary shared with stakeholders
	X	20.2.c	RSO TSO		X	X	X	specifications for asymmetrical current injection, in case of asymmetric faults (1-phase or 2-phase)	fault current specification applies to positive and negative sequence current	2 - preliminary shared with stakeholders
SUPPLEMENTARY REACTIVE POWER FOR PPM	X	21.3.a	RSO			X	X	definition of supplementary reactive power for a PPM whose connection point is not located at the high-voltage terminals of its step-up transformer nor at the terminals of the high-voltage line or cable to the connection point at the PPM, if no step-up transformer exists	to be defined project-specific	
REACTIVE POWER CAPABILITY AT MAXIMUM CAPACITY FOR PPM		21.3.b	RSO TSO			X	X	definition of a U-Q/Pmax-profile at maximum capacity	under discussion	
REACTIVE POWER CAPABILITY BELOW MAXIMUM CAPACITY FOR PPM		21.3.c.(i) 21.3.c.(ii)	RSO TSO			X	X	definition of a P-Q/Pmax-profile below maximum capacity	under discussion	
								for Continental Europe time period for operation in the voltage range 1,118 pu-1,15 pu for PGM connected between 110kV and 300 kV	30 min	2 - preliminary shared with stakeholders

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	VOLTAGE RANGES FOR OFFSHORE PPM		25.1	TSO					- Parameters and settings of the components of the voltage control system - Specifications of the AVR	to be defined project-specific to be defined project-specific	
	VOLTAGE RANGES		25.1	TSO					For Continental Europe time period for operation in the voltage range 1,118 pu-1,15 pu, 1,05pu-1,10pu for PGM For Nordic time period for operation in the voltage range 1,05pu-1,10pu for PGM	30 min n/a	2 - preliminary shared with stakeholders
X		16.2.a.(iii)	TSO						For Spain time period for operation in the voltage range 1,05 pu-1,0875 pu for PGMs connected between 300kV and 400 kV may be specified as unlimited	n/a	
X		16.2.a.(v)	TSO						For Baltic voltage ranges and time period for operation may be specified in line with continental Europe for facilities connected for 400 kV	n/a	
	REACTIVE POWER CAPABILITY AT MAXIMUM CAPACITY FOR OFFSHORE PPM		25.5	TSO					Definition of the U-Q/Pmax-profile at Pmax	under discussion	
SYSTEM RESTORATION	CAPABILITY OF RECONNECTION AFTER AN INCIDENTAL DISCONNECTION CAUSED BY A NETWORK DISTURBANCE		14.4.a	TSO		X	X	X	conditions for reconnection to the network after an incidental disconnection caused by network disturbance	47,5 Hz ≤ f ≤ 51,5Hz 198 kV ≤ U ≤ 250 kV 360 kV ≤ U ≤ 430 kV	2 - preliminary shared with stakeholders
			14.4.b	TSO		X	X	X	conditions for automatic reconnection	48,5 Hz ≤ f ≤ 50,1 Hz 210 kV ≤ U 370 kV ≤ U	2 - preliminary shared with stakeholders
	OPERATION FOLLOWING TRIPPING TO HOUSELOAD		15.5.c.(iii)	RSO TSO			X	X	minimum operation time within which the PGM is capable of operating after tripping to house load	2 h	2 - preliminary shared with stakeholders
	ACTIVE POWER RECOVERY FOR SYNCHRONOUS PGM		17.3	TSO		X	X	X	definition of the magnitude and time for active power recovery	as fast as possible and < 6s if U ≤ 20%; < 3s if U > 20%	2 - preliminary shared with stakeholders
	POST FAULT ACTIVE POWER RECOVERY FOR PPM		20.3.a	TSO		X	X	X	specifications of the post-fault active power recovery Following specifications: - when the post-fault active power recovery begins, based on a voltage criteria - a maximum allowed time for active power recovery - a magnitude and accuracy for active power recovery	as fast as possible and < 1s	2 - preliminary shared with stakeholders
OTHER ASPECTS	INFORMATION EXCHANGES		14.5.d	RSO or TSO		X	X	X	content of information exchanges and precise list and time of data to be facilitated.	to be defined project-specific	
	LOSS OF ANGULAR STABILITY OR LOSS OF CONTROL		15.6.a	RSO PGFO TSO			X	X	criteria to detect loss of angular stability or loss of control	to be defined project-specific	
	INSTRUMENTATION	X	15.6.b.(i)	RSO			X	X	definition of the quality of supply parameters	under discussion	
			15.6.b.(ii)	RSO PGFO TSO			X	X	settings of the fault recording equipment, including triggering criteria and the sampling rates	to be defined project-specific	
			15.6.b.(iii)	RSO TSO			X	X	specifications of the oscillation trigger detecting poorly damped power oscillations	to be defined project-specific	
			15.6.b.(iv)	RSO PGFO TSO			X	X	protocols for recorded data.	to be defined project-specific	
	SIMULATION MODELS	X	15.6.c.(iii)	RSO TSO					specifications of the simulation models	under discussion	
SYNCHRONISATION		16.4	RSO PGFO				X	settings of the synchronisation devices	to be defined project-specific		
SYNTHETIC INERTIA CAPABILITY FOR PPM	X	21.2	TSO			X	X	definition of the operating principle of control systems to provide synthetic inertia and the related performance parameters		0 - no consideration	