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		-		Available	e Data			Details of Risks / O	pportunities		1		Now			2050s	Risk Asses	ment	2080s			Actions	Timescales	Comments
Threat Type 1	eat Type	e 2 Data Source	Data Type Current	2020s 2050s	2080s	UKCP18 Update	Asset Type	Projected direct or indirect impact	Risks and Opportunities	Consequences	Stakeholder Impacts	Likelihoo	Impact	Current Risk	Likelihood	Impact	Medium Term Risk	Likelihood	Impact	Long Term Risk	Status	Details	(planned & potential actions)	
Extreme Flood Event (fluv	oding vial)	EA Flooding Plain	Detailed site by site analysis	No future predictions a	available		Substations	Change in flood plains	Increased area of flood plain	Increased exposure as more sites encapsulated in	e Loss of substation equipment leading to loss of supplies	3 Possible	3 Moderate	9	3 Possible	3 Moderate	9	4 Likely	4 Significant	16 Ir	n place	Flood defence policy in place in line with ETR138		Northern Powergrid has implemented a flood defence programme in line
		Maps							Increased frequency/severity	flood plain. Flood defences at existing sites no	to customers Loss of substation equipment leading	3 Possible	3 Moderate	9	3 Possible	3 Moderate	9	4 Likely	4 Significant	16 Ir	n place	Flood defence policy in place in line with ETR138		with the recommendations of ETR138. ETR138 includes provision for
							Transformore	Change in flood	of flood events	longer adequate	to loss of supplies to customers	r 3 Unlikoly	3 Modorato		2 Possiblo	2 Moderato	9	4 Likoly	4 Significant	16		Eland defense policy in		currently no flood plain prediction data available for use. Flood defence
								plains	detailed above	due to floodwater (failure likely to be due to cable	leading to loss of supplies to customers	J J Onlinety				5 moderate	, í		, Significant		i pluce	place in line with ETR138		provision will be reviewed as and when future predictions for flood plains
										terminations, cooling fans, secondary wiring c	pr													are published.
							Circuit Breakers	Change in flood	Substation floods a	aux switches) s Switchgear fails	Loss of circuit	3 Unlikely	3 Moderate	9	3 Possible	3 Moderate	9	4 Likely	4 Significant	16 Ir	n place	Flood defence policy in		
								plains	detailed above	due to floodwater (failure likely to be due to cable	breakers leading to loss of supplies to customers											place in line with ETR138		
										secondary wiring c aux switches)	pr													
									Increased humidity following flood event	High levels of partial discharge.	Increased maintenance required,	2 Unlikely	3 Moderate	6				4 Likely	4 Significant	16 Ir	n place	Regular condition assessments of breakers carried out to prioritise		
											potentially shortened asset life.											replacement.		
							Overhead Lines	Change in flood plains	Increased area of flood plain	Clearances potentially reduce during flooding	Increased risk of d third party contact with overhead	2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	6				
										event Fast flowing river	lines.	2 Unlikely	2 Minor	4	3 Possible	2 Minor	6	4 Likely	2 Minor	8 P	Potential	Idenfity and relocate /		
										water erodes foundations Increased corrosio	overhead line fault: n Additional	s 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4		protect at risk structures		
										of footings leading to instability of poles / towers	overhead line fault Safety risk due to compromised	s												
							Underground Cables	Change in flood	Increased area of	Land surrounding	Additional cable	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4				
								plains	flood plain	cables is flooded o waterlogged	r faults occur leading to loss of supplies to customers	g												
										Fast flowing river water erodes	Cable left in mid air in tension	2 Unlikely	2 Minor	4	3 Possible	2 Minor	6	4 Likely	2 Minor	8 P	Potential	Idenfity and relocate / protect at risk structures		
							Destastion	Change in flood	Cubatation floods a	embankments or structures	presenting risk of additional faults	2 Dessible			2 Dessible	2 Madarata		4 Likely	A Circificant	16				
							Protection	plains	detailed above	to floodwater	operate during a fault leading to a unsafe conditions	3 Possible	3 Moderate	9	3 Possible	3 Moderate	9	4 Likely	4 Signincant	10				
							Earthing				on the network.													
							Emergency Response & Planning	Change in flood plains	Floodwater blocks site access	Personnel cannot access sites to assess / remedy	Extended fault durations	2 Unlikely	3 Moderate	6	3 Possible	3 Moderate	9	4 Likely	3 Moderate	12 P	otential	Review of emergency planning procedures	In line with publication of EA/SEPA fluvial	
							Vegetation Mgt	Change in flood plains		Tree roots undermined during	Additional faults on the network due to	n 2 Unlikely	2 Minor	4	3 Possible	2 Minor	6	4 Likely	2 Minor	8 P	otential	Targetted vegetation management of at risk		
							Routine Business (Maintenance,	Change in flood	Increased risk and	flooding event.	vegetation encroachment Planned work not	2 Unlikely	3 Moderate	6	3 Possible	3 Moderate	9	4 Likely	3 Moderate	12		trees		
							R&R, Capital Investment)	plains	severity of flooding events	routine activities due to re-allocatio of resources and	delivered on time. on Maintenance behind schedule													
							Customer Service	Change in flood	Floodwater blocks	access issues Personnel cannot	lack of	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2 Ir	n place	Widespread remote		
								plains	access to call centres etc	access sites to tak calls and provide customer contact	e communication, unable to report faults leading to	2 Unitively		2	2 Onlinety		Ĺ				in place	working in place for non operational staff		
											extended fault durations													
Flood (pluv	oding ıvial)	EA Flooding Plain Maps	Detailed site by site analysis	No future predictions a	available		Substations	Change in flood plains	Increased area of flood plain	Increased exposure as more sites encapsulated in	e Loss of substation equipment leading to loss of supplies	3 Possible	3 Moderate	9	3 Possible	3 Moderate	9	4 Likely	4 Significant	16 lr	n place	Flood defence policy in place in line with ETR138		Northern Powergrid has implemented a flood defence programme in line with the recommondations
		maps							Increased frequency/severity	Flood defences at existing sites no	Loss of substation equipment leading	3 Possible	3 Moderate	9	3 Possible	3 Moderate	9	4 Likely	4 Significant	16 Ir	n place	Flood defence policy in place in line with ETR138		of ETR138. ETR138 includes provision for climate change. There is
							Transformers	Change in flood	of flood events Substation floods a	longer adequate s Transformer fails	to loss of supplies to customers Loss of transformer	r 3 Unlikely	3 Moderate	9	3 Possible	3 Moderate	9	4 Likely	4 Significant	16 Ir	n place	Flood defence policy in		currently no flood plain prediction data available for use. Flood defence
								plains	detailed above	due to floodwater (failure likely to be due to cable	leading to loss of supplies to customers											place in line with ETR138		provision will be reviewed as and when future predictions for flood plains
										terminations, cooling fans, secondary wiring c	or													are published.
							Circuit Breakers	Change in flood	Substation floods a detailed above	s Switchgear fails due to floodwater	Loss of circuit breakers leading to	3 Unlikely	3 Moderate	9	3 Possible	3 Moderate	9	4 Likely	4 Significant	16 Ir	n place	Flood defence policy in place in line with ETR138		
								plans		(failure likely to be due to cable terminations,	e loss of supplies to customers													
										secondary wiring c aux switches)	pr													
									Increased humidity following flood event	High levels of partial discharge.	Increased maintenance required,	2 Unlikely	3 Moderate	6				4 Likely	4 Significant	16 Ir	n place	Regular condition assessments of breakers carried out to prioritise		
											potentially shortened asset life.											replacement.		
							Overhead Lines	Change in flood plains	Increased area of flood plain	Clearances potentially reduce during flooding	Increased risk of d third party contact with overhead	2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	6				
										event Fast flowing river water erodes	lines. Additional overhead line fault:	2 Unlikely s	2 Minor	4	3 Possible	2 Minor	6	4 Likely	2 Minor	8 P	otential	Idenfity and relocate / protect at risk structures		
							Underground Cables	Change in flood plains	-	foundations Increased corrosio of footings leading	n Additional overhead line fault	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4				
								Pano		to instability of poles / towers	Safety risk due to compromised structural integrity	,												
									Increased area of	Land surrounding	Additional cable	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4				
									tiood plain	waterlogged	to loss of supplies to customers	g												
										Fast flowing river water erodes	Cable left in mid air in tension	2 Unlikely	2 Minor	4	3 Possible	2 Minor	6	4 Likely	2 Minor	8 P	otential	Idenfity and relocate / protect at risk structures		
							Protection	Change in flood	Substation floods a	embankments or structures s Protection fails du	presenting risk of additional faults e Protection fails to	3 Possible	3 Moderate	9	3 Possible	3 Moderate	9	4 Likely	4 Significant	16				
								plains	detailed above	to floodwater	operate during a fault leading to a unsafe conditions													
							Earthing	Change in flood plains			on the network.													
							Emergency Response & Planning	Change in flood plains	Floodwater blocks site access	Personnel cannot access sites to assess / remedy	Extended fault durations	2 Unlikely	3 Moderate	6	3 Possible	3 Moderate	9	4 Likely	3 Moderate	12 P	otential	Review of emergency planning procedures	In line with publication of EA/SEPA fluvial	
							Vegetation Mgt	Change in flood		fault situations	Additional faults on	n 2 Unlikely	2 Minor	4	3 Possible	2 Minor	6	4 Likely	2 Minor	8 P	Potential	Targetted vegetation	flood risk data	
								plains		flooding event.	vegetation encroachment											trees		
							Routine Business (Maintenance, R&R, Capital Investment)	Change in flood plains	Increased risk and severity of flooding events	Disruption to routine activities due to re-allocatio	Planned work not delivered on time. Maintenance	2 Unlikely	3 Moderate	6	3 Possible	3 Moderate	9	4 Likely	3 Moderate	12				
										access issues	bennu schedule													
							Customer Service	Change in flood plains	Floodwater blocks access to call centres etc	Personnel cannot access sites to tak calls and provide	Lack of e communication, unable to report	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2 Ir	n place	Widespread remote working in place for non operational staff		
										customer contact	faults leading to extended fault durations													
Heav	avy Rain	UKCP09	Mean Annual: 2.2 precipitation Winter: 2.4 (central	Annual: Annual: All emissions All emissions scenarios: 2.2 scenarios: 2.2	Annual: All emissions scenarios: 2.2	Changes in precipitation levels across all scenarios are roughly in line with those predicted in UKCP09 for our region.	Substations	Change in flood plains	Increased area of flood plain	Additional substations flooded leading to loss of	Loss of substation d equipment leading to loss of supplies	3 Unlikely	3 Moderate	9	3 Possible	3 Moderate	9	3 Possible	3 Moderate	9 P	Potential	Review of sites with flood defences upon revision of predicted flood plains	In line with publication of EA/SEPA fluvial	
			estimate, mm/day)	Winter:Winter:All emissionsLow: 2.6scenarios: 2.5Med: 2.7	Winter: Low: 2.7 Med: 2.8	Significant variation can be found across the UK with the driest areas in the SE and the wettest in the west and highlands. In general			Increased frequency/severity	supplies Flood defences at existing sites no	to customers Loss of substation equipment leading	3 Possible	3 Moderate	9	3 Possible	3 Moderate	9	3 Possible	3 Moderate	9 P	Potential	Review of adequacy of flood defences at existing	flood risk data In line with publication of	
				nığıı. 2.7	Figh. 2.7	forecast. Prolonged rainfall events forecast to increase in frequency in the West of the UK (from once			of flood events	longer adequate	to loss of supplies to customers										:	sites upon revision of predicted flood plains	EA/SEPA fluvial flood risk data	
						per annum to twice per annum by the 2060s) with potential for small reduction in frequency in the East. Events expected to be	Transformers	Change in flood plains	Substation floods a detailed above	s Transformer fails due to floodwater (failure likely to be	Loss of transformer leading to loss of supplies to	r 3 Possible	3 Moderate	9	3 Possible	3 Moderate	9	3 Possible	3 Moderate	9 P	Potential	Review of substation flood defence policy as detailed above	In line with publication of EA/SEPA fluvial	
						tocussed in the autumn and winter months. Intense short duration rainfall events projected to increase in winter but not				due to cable terminations, cooling fans,	customers												flood risk data	
						precipitation expected to occur in the autumn months. Summer rainfall increases greater in the North of the UK.	Circuit Breakers	Change in C	Substation (secondary wiring of aux switches)		2 11.1	3 14-4		7 11-11	3 Moderate		3 Doorthin	3 Moderne		Otentici	Review of substant	In line with	
							L. CAIL DI CANCIS	plains	detailed above	due to floodwater (failure likely to be due to cable	breakers leading to loss of supplies to customers	o untikely	J moderate	9			0	- rossible		y P	Jenual	flood defence policy as detailed above	publication of EA/SEPA fluvial flood risk data	
										terminations, secondary wiring of aux switches)	or												uald	
									Increased humidity following flood	High levels of partial discharge.	Increased maintenance	2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	6	3 Possible	3 Moderate	9 Ir	n place	Regular condition assessments of breakers		
									event		potentially shortened asset life.											replacement.		
							Overhead Lines	Change in flood plains	Increased area of flood plain	Clearances potentially reduce	Increased risk of d third party contact	2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	6	3 Possible	3 Moderate	9				
										uuring flooding event	with overhead lines during a flood event													
							Underground Cables	Change in flood plains	Increased area of flood plain	Land surrounding cables is flooded o	Additional cable r faults occur leading	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	3 Possible	2 Minor	6				
										waterlogged	to loss of supplies to customers													
										Prolonged submersion in water causing	Additional cable faults occur leading to loss of supplies	g 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	3 Possible	2 Minor	6				
										water ingress	to customers) II	2 1112		2 11-11-1	2 Minor		3 Doroible	2 Minor					
										submersion in water causing water ingress to	occur leading to loss of supplies to customers			4			4			0				
							Protection	Change in flood	Substation floods a	link boxes	e Safety implications	2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	6	3 Possible	3 Moderate	9				
							Earthing	Change in flood	Increased area of	Prolonged	event Earthing	2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	6				
								אימווז		water causing corrosion of earth	leading to increased risk													
							Emergency Response & Planning	Change in flood plains	Increased number of at risk	Additional network and customers at	< Additional faults on the network.	n 2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	6	3 Possible	3 Moderate	9 P	otential	Review of emergency planning procedures	In line with publication of	
							Vegetation Mgt	Change in flood	areas	Tree roots	Additional faults on	n 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	3 Possible	2 Minor	6			LAT SEPA fluvial flood risk data	
								plains		undermined during flooding event.	the network due to vegetation encroachment													
							Routine Business (Maintenance, R&R, Capital Investment)	Additional rain leads to increasingly boggy	Access limited either by ground conditions or	Disruption to routine activities due to access	Routine activities delayed. Additional compensation	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	3 Possible	2 Minor	6				
								ເຮົາ ouna conditions	permission	5 issues.	damage.													
							customer Service	unange in flood plains	Increased number of at risk substations and areas	Additional network and customers at risk	Additional faults on the network.	1 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	3 Possible	2 Minor	6 P	otential	кеview of emergency planning procedures	in une with publication of EA/SEPA fluvial flood risk data	

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	Available Data														Risk Asse	ssment										
	1					Available Data				Details of Risks / O	pportunities	-	-	r	Now			2050s			2080s			Actions		Comments
nreat /pe 1	Threat Type	2 Data Source	Data Type	Current	2020s	2050s 2	2080s	UKCP18 Update	Asset Type	Projected direct or indirect impact	Risks and Opportunities	Consequences	Stakeholder Impacts	Likelihood	Impact	Current Risk	Likelihood	Impact	Medium Term Risk	Likelihood	Impact	Long Term Risk	Status	Details	Timescales (planned & potential actions)	
	Coastal Flooding	DEFRA Flood & Coastal Defence Appraisal	Net sea level rise (mm/yr): NW England, NE England,	2.5 (1990 - 2025)	7 (2025 - 2055	10 5) (2055 - 2085) (208	13 5 - 2115)	Sea level currently rising with central projections up to 1m by 2100. No change predicted in storm surge, any changes in extreme sea level are the result of sea level rise as opposed to atmospheric	Substations f	Rise in sea level	EA coastal defence fail	s Substations flooder leading to loss of supplies	d Loss of substation equipment leading to loss of supplies to customers	1 Very Unlikely	3 Moderate	3	1 Very Unlikely	3 Moderate	3	1 Very Unlikely	3 Moderate	3 Ir	n place !	Sea level rise over life of assets considered when implementing flood defences at site		The area of the Humbe estuary currently carries 6m flood risk. If the se defences were to fail the the entire area would b
		Guidance FCDPAG3	(north of Flamborough Head)					storminess.	-		Sea water overtop: EA coastal defence	s Substations flooders leading to loss of supplies	d Loss of substation equipment leading to loss of supplies to customers	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 lr	n place	Sea level rise over life of assets considered when implementing flood defences at site		under water. It is considered impossible t mitigate against as the c of defending our assets
									l ransformers	Rise in sea level	EA coastal defence fail	due to floodwater (failure likely to be due to cable terminations, cooling fans, secondary wiring c aux switches)	Loss of transformer leading to loss of supplies to customers	1 Very Unlikely	3 Moderate	3	1 Very Unlikely	3 Moderate	3	1 Very Unlikely	3 Moderate	3 Ir	n place	Sea level rise over life of assets considered when implementing flood defences at site		considered disproportionate.
											Sea water overtop EA coastal defence	s Transformer fails s due to floodwater (failure likely to be due to cable terminations, cooling fans, secondary wiring o aux switches)	Loss of transformer leading to loss of supplies to customers	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 Ir	n place	Sea level rise over life of assets considered when implementing flood defences at site		
									Circuit Breakers	Rise in sea level	EA coastal defence fail	s Switchgear fails due to floodwater (failure likely to be due to cable terminations, secondary wiring c aux switches)	Loss of circuit breakers leading to loss of supplies to customers	1 Very Unlikely	3 Moderate	3	1 Very Unlikely	3 Moderate	3	1 Very Unlikely	3 Moderate	3 Ir	n place	Sea level rise over life of assets considered when implementing flood defences at site		
											Sea water overtop: EA coastal defence	s Switchgear fails s due to floodwater (failure likely to be due to cable terminations, secondary wiring o aux switches)	Loss of circuit breakers leading to loss of supplies to customers	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 Ir	n place	Sea level rise over life of assets considered when implementing flood defences at site		
											Increased humidity following flood event	High levels of partial discharge.	Increased maintenance required, potentially shortened asset life.	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2 Ir	n place	Regular condition assessments of breakers carried out to prioritise replacement.		
									Overhead Lines	Rise in sea level	EA coastal defence fail	s Clearances potentially reduce during event	Increased risk of third party contact with overhead lines during a flood event	1 Very Unlikely	3 Moderate	3	1 Very Unlikely	3 Moderate	3	1 Very Unlikely	3 Moderate	3 Ir	n place	Sea level rise over life of assets considered when implementing flood defences at site		
											Sea water overtop EA coastal defence	s Clearances s potentially reduce	Increased risk of d third party contact	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 Ir	n place	Sea level rise over life of assets considered when		

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								during eve	nt with overh during a flo event	ead lines ood									implementing flood defences at site
						Underground Cables	Rise in sea level	EA coastal defences Prolonged fail submersion water caus water ingr	Additional faults occu sing to loss of s	cable 1 r leading upplies	Very Unlikely	2 Minor	2 1 Very Unlikely	2 Minor	2	1 Very Unlikely	2 Minor	2 In place	Sea level rise over life of assets considered when implementing flood defences at site
								Increased corrosion of	risk of Additional lue to faults occu	cable 1 r leading	Very Unlikely	2 Minor	2 1 Very Unlikely	2 Minor	2	1 Very Unlikely	2 Minor	2 In place	Sea level rise over life of assets considered when
								Prolonged	to loss of s to custome Link box fa	upplies ers ults 1	Very Unlikely	2 Minor	2 1 Very Unlikely	2 Minor	2	1 Very Unlikely	2 Minor	2 In place	defences at site Sea level rise over life of
								submersion water caus water ingr link boxes	n in occur leadi sing loss of supp ess to customers	ing to blies to									assets considered when implementing flood defences at site
								Increased corrosion t boxes due water	risk of Link box fa o link occur leadi to salt loss of supp customers	ults 1 ing to blies to	Very Unlikely	2 Minor	2 1 Very Unlikely	2 Minor	2	1 Very Unlikely	2 Minor	2 In place	Sea level rise over life of assets considered when implementing flood defences at site
								Sea water overtops Prolonged EA coastal defences submersion water cause	Additional faults occu to loss of s	cable 2 r leading upplies	Unlikely	2 Minor	4 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 In place	Sea level rise over life of assets considered when implementing flood
								corrosion o salt water	lue to faults occu to loss of s to custome	r leading upplies ers	Unikely	2 Millor	4 Z Unlikely	2 Minor	4	2 Unlikely			assets considered when implementing flood defences at site
								Prolonged submersion water caus	Link box fa in occur leadi ing loss of supp	ults 2 ing to blies to	Unlikely	2 Minor	4 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 In place	Sea level rise over life of assets considered when implementing flood
								link boxes Increased corrosion t	risk of Link box fa o link occur leadi	ults 2 ing to	Unlikely	2 Minor	4 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 In place	Sea level rise over life of assets considered when
						Protection	Rise in sea level	EA coastal defences Protection fail to floodwa	to salt loss of support customers fails due Safety import ter during a flo	lications 1 boding	Very Unlikely	3 Moderate	3 1 Very Unlikely	3 Moderate	3	1 Very Unlikely	3 Moderate	3 In place	implementing flood defences at site Sea level rise over life of assets considered when
								Sea water overtops Protection EA coastal defences to floodwa	fails due Safety impleter during a flo	lications 2	Unlikely	2 Minor	4 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 In place	implementing flood defences at site Sea level rise over life of assets considered when
						Earthing	Rise in sea level	EA coastal defences Prolonged	Earthing	1	Very Unlikely	2 Minor	2 1 Very Unlikely	2 Minor	2	1 Very Unlikely	2 Minor	2 In place	implementing flood defences at site Sea level rise over life of assets considered when
								water caus water ingr	sing leading to ess increased r risk of Earthing	risk 1	Very Unlikely	2 Minor	2 1 Very Unlikely	2 Minor	2	1 Very Unlikely	2 Minor	2 In place	implementing flood defences at site Sea level rise over life of
								Sea water overtops Prolonged	leading to increased r Earthing	risk 2	Unlikely	2 Minor	4 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 In place	implementing flood defences at site Sea level rise over life of
								EA coastal defences submersion water caus water ingr Increased	rini connection leading to ess increased r risk of Earthing	risk	Unlikely	2 Minor	4 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 In place	assets considered when implementing flood defences at site Sea level rise over life of
						Emergency Response & Plannir	ng Rise in sea level	Corrosion of salt water EA coastal defences Roads floo	lue to connection leading to increased r ded Additional	s fail risk faults on 1	Very Unlikely	3 Moderate	3 1 Very Unlikelv	3 Moderate	3	1 Very Unlikelv	3 Moderate	3	assets considered when implementing flood defences at site
								fail leading to difficulties reaching & repairing r	in etwork	·k.									
								Faults Sea water overtops Roads floo EA coastal defences leading to difficulties	ded Additional the networ	faults on 2 k.	Unlikely	2 Minor	4 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	
						Vegetation Mat		reaching & repairing r faults	etwork										
						Routine Business (Maintenance R&R, Capital Investment)	e, Rise in sea level	EA coastal defences Roads floo fail leading to difficulties ensuring	ded Routine ac delayed. in	tivities 1	Very Unlikely	2 Minor	2 1 Very Unlikely	2 Minor	2	1 Very Unlikely	2 Minor	2	
								availability spares Sea water overtops Roads floo	ded Routine ac	tivities 2	Unlikely	1 Limited	2 2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	
								EA coastal defences leading to difficulties ensuring availability spares	in of										
						Customer Service	Rise in sea level	EA coastal defences Roads floo fail leading to difficulties	ded Additional the networ	faults on 1 k.	Very Unlikely	2 Minor	2 1 Very Unlikely	2 Moderate	2	1 Very Unlikely	2 Minor	2	
								reaching & repairing r faults Sea water overtops Roads floo	etwork ded Additional	faults on 2	Unlikely	1 Limited	2 2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	
								EA coastal defences leading to difficulties reaching & repairing r	in etwork	k.									
CP09 Mean winter temperature (central	3.1°C All	l emissions scenarios: 4.4°C	L: 5.0°C M: 5.3°C H: 5.6°C	L: 5.6°C l M: 6.1°C f H: 6.7°C s	Under RCP8.5 and 6.0 scenarios, warming forecast in line with UKCP09 high and medium scenario for our region. Reduced warming	Substations	Combination of ice and wind causes damage to	e Substation Failure of equipment becomes equipment damaged or weather of	Loss of sub due to equipment falling to loss of s	station 2 leading upplies	Unlikely	1 Limited	2 2 Unlikely	1 Negligible	2	2 Unlikely	1 Limited	2	
estimate) Wind Speed	No fo the	o increase norecast in the severity t	No increase forecast in the severity	No increase forecast in the severity	forecast under lower scenarios. No trend to forecast increase in wind speeds. 50-80% increase in the days of strong winds over the UK by 2070-2100 compared to 1975-		substation building Ice build up causes access padlocks etc	gs exposed debris s Unable to access cc substations	to custome Increased f durations.	ers Fault 2	Unlikely	1 Limited	2 2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	
	in fre	events Possible ncrease in equence of fr	events Possible increase in requence of	of high wind a events Possible increase in frequence of		Transformers	to freeze Combination of temperature and wind conditions	Ice build up occurs Operation on transformers transforme compromis	of Loss of tran er leading to ed by supplies to	nsformer 2 loss of	Unlikely	1 Limited	2 2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	
	h	high wind events	high wind events	high wind events			condusive to ice formation	icing affec exposed m parts on ee in outdoor	ting customers oving quipment										
								compounds cooling far operation, radiator fi	blocked										
						Circuit Breakers	Combination of temperature and	Ice build up occurs Operation on switchgear switchgear	of Loss of circ moving breakers le	cuit 2 eading to	Unlikely	2 Minor	4 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 In place	Existing ENATS specifications include test with 10mm of icc. or all
						Overhead Lines	condusive to ice formation Combination of	Ice build up occurs Lines and	customers Additional	3	Possible	3 Moderate	9 3 Possible	3 Moderate	9	3 Possible	3 Moderate	9 In place	EU Research COST 727
							temperature and wind conditions condusive to ice loading	on Overhead Lines structures compromis loadings	ed by ice Safety risk compromis structural i	ine faults due to ed integrity									looked at snow/ice loading of overhead lines. Existing designs have adequate structural strength
							Atmospheric	Unable to operate Fault locat	ion time Fault durat	ions 2	Unlikely	2 Minor	4 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	
						Underground Cables	conditions not condusive to helicopter flight Water Ingress	helicopters to carry increased out fault location Freezing of water	increased of lengthened times.	due to location n faults 2	- Unlikelv	2 Minor	4 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	
							3. 222	due to free Water sepa	ezing cause loss supplies arates Failture ca ol of supplies	of Lange Lan	ý Unlikely	2 Minor	4 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	<u> </u>
								component Freexing w silicon oil terminatio	ithin Terminatio cause loss ns supplies	n faults 2 of	Unlikely	2 Minor	4 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	
								causing wa sink to hig area of terminatio	ns										
						Protection Earthing													
						Emergency Response & Plannir	ng Increased frequency of event	MIMP conditions MIMP begir ts occur on a more become bu regular basis usual	is to Resources siness as allocated n regularly le impact on	re- 2 nore eading to business	Unlikely	3 Moderate	6 2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	6 In place	Emergency plans in place.
						Vegetation Mgt	Combination of temperature and wind conditions	Vegetation suffers Additional due to conditions caused by trees	faults Additional broken due to veg encroachm	faults 2 etation ent	Unlikely	2 Minor	4 2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 In place	Veg Mgt programmes in place.
	. I						condusive to ice loading		Safety risk compromis structural	due to ed integrity									
									or broken										
						Routine Business (Maintenance R&R, Capital Investment)	e, Increased frequency of event	Routine Fault repa ts maintenance become a suffers as a result part of wo	or broken conductors irs Regulatory greater criticism as rkload planned is	s work not	Unlikely	3 Moderate	6 2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	6	
						Routine Business (Maintenance R&R, Capital Investment)	e, Increased frequency of event	Routine ts maintenance suffers as a result of additional faults	or broken conductors irs Regulatory greater criticism as rkload planned is completed diversion o to elsewhe	s work not due to f funds re	Unlikely	3 Moderate	6 2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	6	
						Routine Business (Maintenance R&R, Capital Investment) Customer Service	e, Increased frequency of event Combination of temperature and wind conditions condusive to snow build up	Routine ts maintenance suffers as a result of additional faults General snow & ice build up Fault repa become a part of wo Slow respo times due problemat	or broken conductors rs Regulatory greater criticism as planned is completed diversion o to elsewhe nse Increased f durations. c access Safety risk due to wea conditions	a work not due to f funds re ault 2 to staff ther	Unlikely Unlikely	3 Moderate 3 Moderate	6 2 Unlikely 6 2 Unlikely 6 2 Unlikely	3 Moderate 3 Moderate	6	2 Unlikely 2 Unlikely	3 Moderate 3 Moderate	6	

				Available Data]	Details of Risks / O	pportunities				Now	1		2050s	Risk Assessm	lent	2080s		Actions	Timescales	Comments
hreat ype 1	2 Data Source	Data Type Curren	t 2020s	2050s 208	Os UKCP18 Update	Asset Type	Projected direct or indirect impact	Risks and Opportunities	Consequences	Stakeholder Impacts	Likelihood	Impact	Current Risk	Likelihood	Impact	Medium Term Risk	Likelihood	Impact	Long Term Risk	Status Details	(planned & potential actions)	
Heavy Snow	UKCP09	Mean winter 3.1°C temperature (central	All emissions scenarios: 4.4°C	L: 5.0°C L: 5.0 M: 5.3°C M: 6. H: 5.6°C H: 6.	6°C Under RCP8.5 and 6.0 scenarios, warming 1°C forecast in line with UKCP09 high and medium 7°C scenario for our region. Reduced warming	Substations	Build up of snow on sites and roads	Substation building (particularly flat roofed structures)	s Buildings and structures fail	Falling debris or 2 exposure to snow causes substation	Unlikely 1	Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2			
	Met	estimate) Wind Speed	No increase forecast in the severity	No increase No incr forecast in foreca	forecast under lower scenarios. Downward rease trend in winter mean snowfall and lying snow st in through time with almost 100% reduction in verity lying snow in lowland areas by the end of the			and structures unable to take weight of snow build up		equipment to fail leading to loss of supplies.												
	Office		of high wind events Possible	of high wind of high events ever Possible Possi	wind century. Events may still occur though. hts No trend to forecast increase in wind speeds. ble 50-80% increase in the days of strong winds	Transformers	Build up of snow	Transformer	Transformer rating	gs Unable to meet 2	Unlikely 1	Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2			
			increase in frequence of high wind events	increase in increa frequence of frequer high wind high v	se in over the UK by 2070-2100 compared to 1975 nce of 2005 under worst case scenario vind		around outdoor equipment	and/or pumps and fans unable to operate due to snow	reduced or transformer fails	required demand. Customers off supply.												
				events even		Circuit Breakers	Build up of snow around outdoor	Switchgear moving parts unable to		Failure of 2 switchgear leads to	Unlikely 2	. Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 Ir	In place Existing ENATS specifications include tes	t	
						Overhead Lines	Combination of	operate due to snow Snow & Ice build up	Lines and	customers off supply. Additional 2	Unlikely 2	Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Moderate	4 Ir	in place EU Research COST 727	To be reviewed	
							temperature and wind conditions condusive to snow build up	lines	compromised by ic loadings	ce Safety risk due to compromised structural integrity										looking at we snow/ice loading of overhead lines Expectations are that existing designs have	completion of EU research COST 727	
										or broken conductors										adequate structural strength.		
						Underground Cables	Melt causes excess water	Water ingress to occurrs	Additional cable faults occur due to water ingress	Loss of substation 2 o equipment leading to loss of supplies	Unlikely 2	Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4			
									Additional Link Bo	to customers x Loss of substation 2 equipment leading 2	Unlikely 2	. Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4			
						Protection			to water ingress	to customers												
						Earthing	Melt causes excess water	Water ingress to occurrs	Earthing may become less	Safety risks 2	Unlikely 2	Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4			
						Emergency Response & Plannir	ng Combination of temperature and	General snow & ice build up	effective Additional faults with slow response	Increased number 2 e and duration of	Unlikely 3	Moderate	6	2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	<mark>6</mark> Ir	In place Review of emergency planning procedures	In line with ongoing climate	
							condusive to snow build up		problematic acces	due to weather conditions.											predictions	
						Vegetation Mgt	Combination of	Snow & Ice build up	Additional faults	Increased number 2	Unlikely 2	Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor		In place Veg mgt programmes in		
							wind conditions condusive to snow build up	vegetation	trees	Safety risk due to compromised structural integrity										pace		
						Routine Business (Maintenance	e, Combination of	General snow & ice	Access restricition	or broken conductors ns Unable to carry out 2	Unlikely 3	Moderate	6	2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	6			
						R&R, Capital Investment)	temperature and wind conditions condusive to snow	build up	and reduced workforce	business as usual due to access and travel difficulties.												
						Customer Service	Combination of temperature and	General snow & ice build up	Slow response times due to	Increased fault 2 durations.	Unlikely 3	Moderate	6	2 Unlikely	3 Moderate	6	2 Unlikely	3 Moderate	<mark>6</mark> Ir	In place Review of business as usual procedures	In line with ongoing climate	
							wind conditions condusive to snow build up		problematic acces	ss Safety risk to staff due to weather conditions.											change predictions	
Hurricane & other high	Met Office	Wind Speed	No increase forecast in	No increase No incr forecast in foreca	rease No trend to forecast increase in wind speeds. st in 50-80% increase in the days of strong winds	Substations	Increased frequency of high wind events		Damage occurs to substation building	Safety risk to staff 2 gs and public due to falling objects of	Unlikely 1	Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2 Ir	In place Substation inspections to ensure integrity of		
wind events			of high wind events Possible	of high wind of high events even Possible Possi	wind 2005 under worst case scenario hts ble		weakens or damages substation structure			compromised structures.										issues		
			increase in the frequency of high wind	increase in increa the frequency the freq of high wind of high	se in juency wind	Transformers	High winds cause		Debris falls onto	Transformer faults 2	Unlikely 1	Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2			
			events	events even		Circuit Breakers	High winds cause		causing damage and/or flashover	to customers.		Limited	2	2 Unlikely		2	2 Unlikely	1 Limited	2			
							falling debris		switchgear causing damage	g causing loss of supply to customers			2	2 Ontinety		2						
						Overhead Lines	Increased frequency of high wind events	More damage occurs to overhead line networks	Additional faults occur on overheac line networks	Increased overhead 3 d line faults. Safety risk to	Possible 3	Moderate	9	3 Possible	3 Moderate	9	3 Possible	3 Moderate	9 Ir	In place Refurbishment programme to ensure integrity of the overhead		
							weakens poles and fittings			public and staff due to falling and fallen poles and conductors									P	Potential Review specification in line with changes in	Ongoing - as changes are	
										conductors										environmental conditions	observed and firmer data published	
						Underground Cables Protection Earthing																
						Emergency Response & Plannir	ng Increased frequency of high wind events	Additional incident: occur	s Resources strained in order to meet demand on fault repairs	d Duration of faults 2 increased due to limited resources for repairs.	Unlikely 2	Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 P	Potential Review thresholds for major incident.	As required in line with observed trends.	
						Vegetation Mgt	Increased frequency of high wind events	More damage occurs to vegetation	Additional faults occur due to vegetation damage	Increased number 2 of faults due to e vegetation	Unlikely 1	Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2 Ir	In place Vegetation management programme in place		
						Routine Business (Maintenance	weakens vegetation	Routine activity	to lines	Routine activities 2	Unlikely 2	Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4	In place Additional work coming		
						R&R, Capital Investment)	certain types of routine activity	(specifically on overhead lines) delayed as a result	delayed	delayed.		. Millor		2 Unitery						through Repairs. Annual review of investment plan takes account of		
								of unsuitable weather conditions												these changes.		
							High winds cause additional faults	Routine activity delayed as a result of dealing with	Work declared as part of regulatory settlements	Regulatory 2 criticism as work planned is not	Unlikely 2	. Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4			
								additional faults	deferred in favour of repairs.	r completed due to diversion of funds to elsewhere												
						Customer Service	Increased frequency of high wind events	Additional faults occur, additional temporary repairs	Increased repair times due to additional workloa	Increased number 2 and duration of ad faults.	Unlikely 2	Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4			
								lacintated		due to weather conditions.												
Extreme prolonged	UKCP09	Mean 14.2°C summer	L: 15.6°C M: 15.5°C H: 15.5°C	L: 16.4°C L: 16. M: 16.5°C M: 17. H: 16.8°C H: 18	7°C RCP8.5 projects a greater increase in summe .5°C mean temperature than the UKCP09 high 4°C scenario for our region RCP6.0 is in line with	r Substations	Ambient temperature at a	Additional load placed on	Insufficient available capacity	Potential load 2 shedding or loss of	Unlikely 1	Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2 Ir	In place Current spec calls for full rating at 30° C ambient	in in the second	All Northern Powergrid equipment is built to
periods (heat wave)		(central estimate)	11. 15.5 C		the UKCP09 medium scenario and RCP4.5 wit the low scenario. Analysis has been done on the number of day	Transformers	Ambient	the connection of air conditioning		overload		Limitod	2		1 Limited	2	2 Unlikely	1 Limited				British standards which incorporate an amount of resilience. Due to the
					exceeding 28, 30 and 35 degrees celcius. In the current climate it is relatively rare for a day to exceed 30 degrees celcius in our region. The temperature exceeds 28 degrees	Transformers	temperature at a sustained high level	transformer reduced due to high ambient	available capacity for load	shedding or loss of transformer due to overload		Limited	Z	2 Untikely	1 Limited	Z	2 Untikety			of transformers against maximum demands to ensure adequate		current varied global conditions, all standards currently allow for the
					for 3 consecutive days on average 4 times pe annum. By mid century, the chance of a hot summer	r		temperature Overheating of tap	Tripping of tap	Loss of supplies 3	Possible 1	Limited	3	3 Possible	1 Limited	3	3 Possible	1 Limited	3 P	headroom on the networ	<	conditions which exceed those forecast to occur in the Northern Powergrid
					like 2018 will have increased from 10% to 50%. Largest increases in temperature will occur in South East England. By 2060, the hazards from temperature for our region are			changer control mechanism	changer											include sunscreen for new equipment. Retro fit scheme for existing.	д	regions over the time period under consideration.
					expected to be equivalent to SE England today.			Additional load placed on transformer due to	Insufficient available capacity for load	Potential load 2 shedding or loss of transformer due to	Unlikely 1	Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2 Ir	In place Annual review of loading of transformers against maximum demands to		
								connection of air conditioning		overload										ensure adequate headroom on the networ	¢	
						Circuit Breakers	Ambient temperature at a sustained high level	Additional load placed on I switchgear due to	Insufficient available capacity for load	Potential load 2 shedding or loss of switchgear due to	Unlikely 1	Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2			
						Overhead Lines	Ambient	air conditioning Capacity of	Insufficient	Potential load 2	Unlikely 1	Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2 P	Potential Review of capacity of		
							sustained high level	l reduced due to high ambient temperature	for load	circuit due to overload										fit for purpose in light of climate change predictions. Further		
																				explore dynamic load ratings - monitor on-site conditions and calculate		
								Additional load	Insufficient	Potential load 2	Unlikely 1	l imited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2 P	Potential Review of capacity of		
								placed on circuit due to connection of air conditioning	available capacity for load	shedding or loss of circuit due to overload										overhead lines to ensure fit for purpose in light of climate change		
																				explore dynamic load ratings - monitor on-site conditions and calculate		
																				real time rating		
								Increased sag	Insufficient clearances	Additional risk of 2 third party contact with overhead line	Unlikely 1	Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2 P	Potential Review of spec for overhead line rebuilds to ensure fit for purpose in light of climate charge		
						Underground Cables	Increase in ground	Change in	Reduction in	Potential load 2	Unlikely 1	Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2 P	Potential Review of cable ratings in light of climate change	1	
							ee inperatul e	ישרי נוכא UI SOIL	due to changes in soil temperature	circuit due to overload		Minor		2 Holikela	2 Minor		2 Unlikely	2 Minor		Planned Elevibility toot for it is		
									movement causes stress on cables and joints	cable failures leading to loss of supplies							entinety			to be included in specifications		
									Mechanical movement causes stress on link boxe	Additional link box 2 failures leading to loss of supplies	Unlikely 2	Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4			
						Protection Earthing																
						Emergency Response & Plannir	ng Ambient temperature at a sustained high level	High staff absence due to sickness	Reduced internal workforce	Staff re-allocation 2 across the business required	Unlikely 2	Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4			
						Vegetation Mgt	Ambient temperature at a	Extended growing season	Additional encroachement of	Additional faults 2 f due to vegetation	Unlikely 1	Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2 Ir	In place Veg Mgt programmes in place. Need to review in	$\left \right $	
							sustained high level		vegetation into overhead lines	ienci oacnment										ugnt of implication of climate change predictions on the growing season.		
						Routine Business (Maintenance R&R, Capital Investment)	e, Ambient temperature at a sustained high lovel	Raised temperatures mear that current PDF :-	Routine work delayed due to weather condition	Planned work not 2 delivered on time. Ins Capital work and	Unlikely 2	Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4			
								unsuitable, particularly for live line work.		maintenance behind schedule												
						Customer Service	Ambient temperature at a	High staff absence due to sickness	Reduced internal workforce,	Cost of work 2 increases due to	Unlikely 2	Minor	4	2 Unlikely	2 Minor	4	2 Unlikely	2 Minor	4 Ir	In place Plans in place to ensure business as usual during		

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CE Electric UK Adaptation to Climate Change Draft Risk Assessment

															-			Risk Assess	ment			1			
					Available	e Data			Details of Risks / Op	oportunities				Now			2050s			2080s			Actions		Comments
2	Data Source Data Type	e Cui	urrent	2020s	2050s	2080s	UKCP18 Update	Asset Type	Projected direct or indirect impact	Risks and Opportunities	Consequences	Stakeholder Impacts	Likelihood	Impact	Current Risk	Likelihood	Impact	Medium Term Risk	Likelihood	Impact	Long Term Risk	Status	Details	Timescales (planned & potential actions)	
U	UKCP09 Mean winte temperatur (central estimate)	er 3. re	8.1°C	All emission scenarios: 4.4°C	L: 5.0°C M: 5.3°C H: 5.6°C	L: 5.6°C M: 6.1°C H: 6.7°C	Under RCP8.5 and 6.0 scenarios, warming forecast in line with UKCP09 high and medium scenario for our region. Reduced warming forecast under lower scenarios.	Substations	Ambient temperature at a sustained low level	Increased loading on substations due to additional heating and electrical appliances in use	Insufficient available capacity for load	Potential load shedding or loss of substation due to overload	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2			i	All Northern Powergrid equipment is built to international, European and British standards which incorporate an amount of resilience. Due to the
								Transformers	Ambient temperature at a sustained low level	Increased loading on networks due to additional heating and electrical appliances in use	Insufficient available capacity for load	Potential load shedding or loss of transformer due to overload	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	In place	Annual review of loading of transformers against maximum demands to ensure adequate headroom on the network		current varied global conditions, all standards currently allow for the equipment to operate in conditions which exceed those forecast to occur in the Northern Powergrid
								Circuit Breakers	Ambient temperature at a sustained low level	Increased loading on networks due to additional heating and electrical appliances in use	Insufficient available capacity for load	Potential load shedding or loss of circuit breaker due to overload	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2				regions over the time period under consideration
								Overhead Lines	Ambient temperature at a sustained low level	Increased loading on networks due to additional heating and electrical appliances in use	Insufficient available capacity for load	Potential load shedding or loss of circuit due to overload	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	Potential	Review of specification & capacity of overhead lines to ensure fit for purpose in light of climate change predictions		
										Higher mechanical tension in lines	Vibration and accelerated ageing of conductors	Asset life reduced leading to early replacement of conductors.	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	In place	Regular inspections carried out to assess condition of lines and prioritise replacement.		
								Underground Cables	Ambient temperature at a sustained low level	Increased loading on networks due to additional heating and electrical appliances in use	Insufficient available capacity for load	Potential load shedding or loss of circuit due to overload	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	Potential	Review of specification & capacity of cables to ensure fit for purpose in light of climate change predictions		
								Protection																	
								Earthing																	
								Emergency Response & Plannir	ng Ambient temperature at a	Increased loading on networks due to	Additional faults	Resources re- allocated more	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2	2 Unlikely	1 Limited	2		1		

1 Limited

1 Limited

2 Unlikely

2

2

1 Limited

2 2 Unlikely

1 Limited

2 In place Vulnerable customer identified on network

Lightning protection is

sustained low level additional heating

Ambient

Vegetation Mgt

Customer Service

Future predictions are uncertain. Cautious Substations

Routine Business (Maintenance, R&R, Capital Investment)

and electrical appliances in use

temperature at a vulnerable any vulnerable sustained low level customers become customers as

a greater issue priority

regularly leading to impact on business

as usual.

Loss of supplies to Need to reconnect Potential impact on 2 Unlikely

any vulnerable

Increased lightning
stormsIncreased number
of lightning strikesAdditional faults
occurCustomers off
supply2Unlikely

customer service

indicators

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Threat
Type 1Threat Type 2Data
SourceData TypeCurrent

Extreme prolonged temperature

periods (cold

spell)

Lightning

4

	predictio ns currently					approach to assume a small increase in lightning days until further research is presented		storms	of lightning strike	es occur	supply											F	rovided extensively on our network, with attention
	available					presenteu.	Transformers	Increased lightni storms	ing Increased number of lightning strike	r Additional faults es occur	Customers off 2 supply	Unlikely	1 Limited	2						In pla	ce Lightning protection provided across the network, targetted at	h	otspots. Provision includes Arc Suppression Coils and Triggered Spark Gaps
							Circuit Breakers	Increased lightni	ing Increased number	r Additional faults	Customers off 2	Unlikely	1 Limited	2						In pla	known lightning hotspots		Network performance is continually assessed and any new initiatives which
								storms	of lightning strike	es occur	supply										provided across the network, targetted at known lightning hotspots		are considered to provide adequate cost-benefit will be implemented on the
																				Poten	ntial Utilise I2T monitoring to		network at appropriate locations.
																					understanding of condition		
							Overhead Lines	Increased lightni storms	ing Increased number of lightning strike	r Additional faults es occur	Customers off 2 supply	Unlikely	2 Minor	4						In pla	ce Lightning protection provided across the overhead network.		
							Underground Cables Protection Earthing																
							Emergency Response & Plannin Vegetation Mgt	ng Increased lightni storms	ing Increased number	r Additional damag	ge Additional faults 2	Unlikely	1 Limited	2									
											/ contact with vegetation												
							Routine Business (Maintenance R&R, Capital Investment)	2,															
Gradual Temperature Warming Increase	UKCP09 Mean summer	14.2°C	L: 15.6°C M: 15.5°C	L: 16.4°C M: 16.5°C	L: 16.7°C M: 17.5°C	RCP8.5 projects a greater increase in summer mean temperature than the UKCP09 high	Customer Service Substations Transformers	Temperature rise	se Reduction in	Capacity of	Network 2	Unlikely	1 Limited	2	2 Unlikely 1	Limited	2	2 Unlikely	1 Limited	2 In pla	ice Network capabilities &		All Northern Powergrid equipment is built to
	temperature (central estimate)		H: 15.5°C	H: 16.8°C	H: 18.4°C	scenarion for our region. RCP6.0 is in line with the UKCP09 medium scenario and RCP4.5 with the low scenario.			ratings	transformers reduced	capabilities reduced leading to need for additional										loadings regularly reviewed to identify any potential reinforcement	ir	British standards which incorporate an amount of
						exceeding 28, 30 and 35 degrees celcius. In the current climate it is relatively rare for a day to exceed 30 degrees celcius in our	Circuit Breakers	Temperature rise	se Reduction in	Capabilities of	Network 2	Unlikely	1 Limited	2	2 Unlikely 1	Limited	2	2 Unlikely	1 Limited	2 In pla	ice Network capabilities &		current varied global conditions, all standards currently allow for the
						region. By mid century, the chance of a hot summer like 2018 will have increased from 10% to			ratings	switchgear reduc	ced capabilities reduced leading to need for additional										loadings regularly reviewed to identify any potential reinforcement		equipment to operate in conditions which exceed those forecast to occur in
						50%. Largest increases in temperature will occur in South East England. By 2060, the hazards from temperature for our region are	Quarkered Lines	Tomorrations via	Deduction in	Conchilition of	reinforcement.	Unkloak				l inside d			4 Limited	2 la sis	requirements	p	the Northern Powergrid regions over the time eriod under consideration.
						expected to be equivalent to SE England today.	Overnead Lines	remperature rise	ratings	overhead line network reduced	maintenance window reduced.	υπικειγ		2		Limited	2			z in pla	loadings regularly reviewed to identify any		
											Network capabilities reduced leading to									Poten	requirements		
											need for additional reinforcement.										overhead conductors at regular intervals to ensure sufficiency for		
									Reduction in ground clearance	Safety clearances infringed, leading	s Risk of prosecution 2 g for infringement of	Unlikely	1 Limited	2	2 Unlikely 1	Limited	2	2 Unlikely	1 Limited	2 In pla	ice Condition & sag of overhead lines inspected		
										to increased risk third party conta	of clearances. act Additional faults									Poten	and reported at regular intervals.		
											occur due to increased third party contact									roten	poles at regular intervals to ensure that height is sufficient		
							Underground Cables	Temperature ris	se Change in soil	Reduction in rati	ng Network 2	Unlikely	1 Limited	2	2 Unlikely 1	limited	2	2 Unlikely	1 Limited	2 Poten	ntial Review specification for		
									properties	of cables due to change in soil resistivity	capabilities reduced.	ontinety									cables to ensure sufficiency for standard loadings		
							Protection Earthing																
							Vegetation Mgt	Temperature rise	se Extended growing season	g Additional encroachement o	Negative impact on 2 of customer service	Unlikely	1 Limited	2	2 Unlikely 1	Limited	2	2 Unlikely	1 Limited	2 In pla	ice Veg Mgt programmes in place. Need to review in		
										overhead lines	Indicators										climate change predictions on the growing season.		
							Routine Business (Maintenance R&R, Capital Investment)	2,													5.0		
Drought (soil	UKCP09 Mean	14.2°C	L: 15.6°C	L: 16.4°C	L: 16.7°C	Changes in precipitation levels across all	Customer Service Substations	Change in soil	Subsidence	Substation subject	ct Risk to staff and 2	Unlikely	1 Limited	2	2 Unlikely 1	Limited	2	2 Unlikely	1 Limited	2 In pla	ce Existing substations		
drying & movement)	summer temperature (central		M: 15.5°C H: 15.5°C	M: 16.5°C H: 16.8°C	M: 17.5°C H: 18.4°C	scenarios are roughly in line with those predicted in UKCP09 for our region. Significant variation can be found across the		condition of foundations		to instability.	public should the building become unsafe										subjected to inspections to ensure integrity. Ensure soil type and		
	estimate) (A 1°C increase in air temp is					UK with the driest areas in the SE and the wettest in the west and highlands. In general there is little reduction in seasonal rainfall															suitability is considered in locating new substations.		
	reflected by a 0.75°C increase in					forecast. Summer rainfall increases greater in the North of the UK. RCP8.5 projects a greater increase in summer	Transformers	Change in soil condition of	Subsidence	Transformer subject to	Risk to staff should 2 the transformer	Unlikely	1 Limited	2	2 Unlikely 1	Limited	2	2 Unlikely	1 Limited	2 In pla	ce Existing substations subjected to inspections		
	depths of between					scenario for our region. RCP6.0 is in line with the UKCP09 medium scenario and RCP4.5 with the low scenario		Toundations		Instability	unsafe										Ensure soil type and suitability is considered in locating new substations.		
	Mean summer					Analysis has been done on the number of days exceeding 28, 30 and 35 degrees celcius. In the current climate it is relatively rare for a	Circuit Breakers	Change in soil	Subsidence	Switchgear	Risk to staff should 2	Unlikely	1 Limited	2	2 Unlikely 1	Limited	2	2 Unlikely	1 Limited	2 In pla	ice Existing substations		
	precipitation (central estimate,	2.1	L: 2.0 M: 1.9 H: 2.0	L: 1.8 M: 1.7 H: 1.7	L: 1.7 M: 1.6 H: 1.5	day to exceed 30 degrees celcius in our region. The temperature exceeds 28 degrees for 3 consecutive days on average 4 times per		condition of foundations		mountings subjec to instability	t the switchgear mountings become unsafe										subjected to inspections to ensure integrity. Ensure soil type and		
	mm/day)					annum. By mid century, the chance of a hot summer like 2018 will have increased from 10% to															suitability is considered in locating new substations.		
						occur in South East England. By 2060, the hazards from temperature for our region are expected to be equivalent to SE England	Overhead Lines	Change in soil condition of foundations	Subsidence	Poles / towers become unstable	Risk to staff and 2 public should the pole/tower become	Unlikely	1 Limited	2	2 Unlikely 1	Limited	2	2 Unlikely	1 Limited	2 In pla	ce Existing poles/towers subjected to inspections to ensure integrity.		
						today.	Underground Cables	Change in water	r Adverse effect on	n Reduction in ratio	iunsafe ng Insufficient 2	Unlikely	1 Limited	2	2 Unlikely 1	Limited	2	2 Unlikely	1 Limited	2 Poten	ntial Review of cable ratings in		
									Solutesitivity	change in soil resistivity	network										predictions		
										Mechanical movement causes stress on cables	Additional joint / 2 s cable failures leading to loss of	Unlikely	2 Minor	4	2 Unlikely 2	Minor	4	2 Unlikely	2 Minor	4 Plann	ed Flexibility test for joints to be included in specifications		
										Mechanical Movement causes	Additional link box 2 s failures leading to	Unlikely	2 Minor	4	2 Unlikely 2	Minor	4	2 Unlikely	2 Minor	4			
							Protection			stress on link box	kes loss of supplies												
							Earthing	Change in water content of soil	r Adverse effect on soil resitivity	n Earthing may become less effective	Risk to safety if 2 equipment not adequately earthed	Unlikely	2 Minor	4	2 Unlikely 2	Minor	4	2 Unlikely	2 Minor	4 Poten	ntial Review of earthing policy in light of climate change predictions		
							Emergency Response & Plannin Vegetation Mgt	ng Change in water	r Change in natural	l Type of vegetatio	on Vegetation mgt 2	Unlikely	1 Limited	2	2 Unlikely 1	Limited	2	2 Unlikely	1 Limited	2 Poten	ntial Review of vegetation	As required in	
								content of soil	nabitats of different species	In an area change Location of habitats change	es. itargetted in incorrect areas.										management programmes in light of changes to habitat	une with observed trends.	
							Routine Business (Maintenance R&R, Capital Investment)	2,															
Wildfire	Not					Increasing rick of wildfire in faither its faither	Customer Service																
wittenine	considere d					Increased severity and frequency of fire weather conditions, increased fuel loading and flammability bazard of vegetation result	Transformers	Fire occurs	Transformers cato fire	ch If filled with oil t could ignite	his Loss of supplies 1	Very Unlikely	2 Minor	2	1 Very Unlikely 2	Minor	2	1 Very Unlikely	2 Minor	2 Poten	ntial Look to utilise synthetic esther in place of oil in at		
						in increased risk of wildfire. Can be exacerbated by extreme temperatures, drought and wind.	Circuit Breakers Overhead Lines	Fire occurs	Damage to ohl an	nd Poles damaged by	y Failures leading to 1	Very Unlikely	2 Minor	2	1 Very Unlikely 2	Minor	2	1 Very Unlikely	2 Minor	2 In pla	ice Use of preservative on		
							Underground Cables	Fire occurs	ohl equipment Damage to cable	fire Cable termination	customers off supply ns Additional failures 1	Very Unlikely	2 Minor	2	1 Very Unlikely 2	Minor	2	1 Very Unlikely	2 Minor	2	wood poles helps to prevent fire damage		
									and cable equipment	damaged by fire Disruptive Failure	occur leading to loss of supply e Additional failures 1	Very Unlikelv	2 Minor	2	1 Very Unlikely 2	Minor	2	1 Very Unlikely	2 Minor	2			
										of cable terminations occu	occur leading to urs loss of supply												
									Intense heat in vicinity of cables	De-rating occurs due to the heat o the fire	Network 1 of capabilities reduced	Very Unlikely	2 Minor	2	1 Very Unlikely 2	Minor	2	1 Very Unlikely	2 Minor	2			
									Damage to link bo	ox Link box damaged by fire	d Additional failures 1 occur leading to loss of supply	Very Unlikely	2 Minor	2	1 Very Unlikely 2	Minor	2	1 Very Unlikely	2 Minor	2			
										Disruptive failure of link box occurs	e Additional failures 1 s occur leading to	Very Unlikely	2 Minor	2	1 Very Unlikely 2	Minor	2	1 Very Unlikely	2 Minor	2			
							Protection Earthing																
							Emergency Response & Plannin Vegetation Mgt Routine Business (Maintenance	ng															
							R&R, Capital Investment)																