Assumptions Log

This assumptions log contains the assumptions of both SHE-T and SPT in a combined form.

- Where an assumption is shared by both TO’s, the assumption is coloured in Black.

- Where an assumption is specific to SHE-T only, the assumption is coloured in Blue.

- Where the Assumption is Specific to SPT only, the assumption is coloured in Green.

CBRM ASSUMPTIONS

No	Section	Parameter affected	Assumptions	Plan to reduce or eliminate
1.	CBRM	Average Life value	Assumed value: assets are very rarely run to failure	
2.	CBRM	PoF	Asset failures are independent of other assets	
3.	CBRM	PoF	Failure modes are independent	Review during calibration, testing, and validation.
4.	CBRM	PoF	Assets can be grouped into similar categories that share similar characteristics	Refine groupings to improve agreement between model and expected events

5.	CBRM	PoF	Failure modes can be grouped into categories of similar impact.	Review during calibration, testing, and validation.
6.	CBRM	PoF	Asset groups are independent of each other.	
7.	CBRM	PoF	It is assumed that interventions, when carried out, are carried out fully and successfully.	Review whether any interventions have been found to have failed to improve asset life expectancy.
8.	CBRM	PoF	The probability of each failure mode occurring can be represented via a single value.	Review during calibration, testing, and validation.
9.	CBRM	PoF	Assume that certain failures will only materialise under specific operating conditions (eg a circuit breaker interrupter failure will only manifest itself as a failure when the circuit breaker attempts to break current).	Review during testing, validation and calibration process

PROBABILITY OF FAILURE ASSUMPTIONS

No	Section	Parameter affected	Assumptions	Plan to reduce or eliminate
1.	End of Life Modifier	EOL Mod	Unknown failure modes will not manifest often enough to render the model too inaccurate for use.	
2.	End of Life Modifier	EOL Mod and PoF curve	Assumed that end of life curves follow a logarithmic scale.	Review during calibration, testing, and validation.
3.	End of Life Modifier	Factor Values	Factor Values set to a default value (normally 1, to have no multiplicative impact) in the absence of data.	Review during calibration, testing, and validation.
4.	End of Life Modifier	Factor Values	Individual Factor Values are independent of each other.	Review during calibration, testing, and validation.

5.	End of Life Modifier	All Assets	Assets will behave in a manner consistent with their history, making predicting future behaviour possible by examining past behaviour.	
6.	End of Life Modifier	All Assets	Family/Type issues can be represented via a single value (Generic Reliability)	Review during calibration, testing, and validation.
7.	End of Life Modifier	All Assets	EOL modifier can accurately be represented (up to a value of 5.5) by age and LSE factors when actual condition information is not available.	Review during calibration, testing, and validation.
8.	End of Life Modifier	All Assets	Brand New assets will always have a default value of EoL 0.5 to take into consideration infant mortality.	
9.	End of Life Modifier	All Assets	It is assumed that routine maintenance and inspections are carried out.	Review during calibration, testing, and validation.

10.	End of Life Modifier	All Assets	SHE-T use larger situation factors to represent the harsher environment imposed on the assets in the highlands and islands of Scotland	
11.	End of Life Modifier	All non-lead Assets	It is assumed that modelling the risk of a lead asset sensibly aggregates the risks posed by supporting non-lead assets.	Review during calibration, testing, and validation.
12.	End of Life Modifier	All EOL modifiers	The age of an asset is given by current year- installation year. Where installation year is uncertain an estimate of the likely year is determined from available data.	
13.	End of Life Modifier	All EoL Modifiers	Max operating temperature is recorded against each transformer as this is assumed to have more impact on the expected life of the asset then average demand	
14.	End of Life Modifier	Data input	It is assumed historical data being put in (eg old DGA results) are accurate.	Review during calibration, testing, and validation.

15.	End of Life Modifier	Cables	Duty data not currently collected. Current EOL mod values thus assumed to be accurate without.	Investigating ability to collect.
16.	End of Life Modifier	Cables	EoL life is carried out per KM of cable between assets and is not combined to give an overall EoL between asset locations	
17.	End of Life Modifier	OHL conductors	Conductor sampling results can be represented by a single value (Conductor Sample HI).	Review during calibration, testing, and validation.
18.	End of Life Modifier	OHL Steel Towers	These lead assets can be shared by multiple circuits	
19.	End of Life Modifier	OHL Steel Towers	Tower legs, Step Bolts, Bracings, Crossarms, Peak and Paintwork can all be represented by single scores.	

20.	End of Life Modifier	Transformers	Assumes that the approximate relationship between furfuraldehyde presence and degree of polymerisation is accurate enough to give a good EoL FFA Value.	
21.	End of Life Modifier	Transformers	Assumes bushing degradation as a sub component of the main transformer tank and not as its own asset with its own EoL modifier.	We are investigating the merits of including these as their own assets and how that affects EoL as a whole
22.	End of Life Modifier	Transformers	Oil Condition; Assumes that relative humidity, breakdown voltage, Tan Delta and Acidity can all be represented by single scores.	
23.	End of Life Modifier	Circuit Beaker	SF6 condition can be accurately represented via a single score (Gas Condition Factor)	Review during calibration, testing, and validation.
24.	End of Life Modifier	Circuit Beaker	SF6 leakage only impacts EOL modifier at values above 20kg.	Values are currently subject to ongoing review.

25.	End of Life Modifier	Circuit Beaker	SF6 gas circuit breakers installed on shunt reactive compensation are subject to very high numbers of operations per year. To assist with asset replacement planning these circuit breakers are assigned a reduced operating life.	
26.	End of Life Modifier	Circuit Beaker	SHE-T do not own Bulk – Oil Circuit breakers and thus Oil Condition score is removed from determination of a factor value	
27.	End of Life Modifier	Underground cabling	Assumes that non-invasive analysis of the cable (no physical testing due to cost and likelihood of further damaging the cable) is an accurate enough measure of End of Life.	

CONSEQUENCE ASSUMPTIONS

No	Section	Parameter affected	Assumptions	Plan to reduce or eliminate
1.	System Consequence	X	Methodology only considers the loss of customers who are disconnected by the least number of circuits which includes the asset in question (X=Xmin)	Areas where it is suspected that this assumption leads to significant error could be examined and the customer disconnection events considered be extended beyond X=Xmin
2.	System Consequence	M_N	The equation for M_N assumes that the quantity and importance of customers lost at each site within the lost area are equal	Example areas could be tested with explicit calculation of all loss events vs the method used to test validity of assumption
3.	System Consequence	P_l	Both potential values of P_l assume that circuit capacities are designed to SQSS requirements with no additional spare capacity	A survey of circuit capacities vs design requirements could potentially modify the values of P_l to take into account any average spare capacity

4.	System Consequence	P_{oc}	The probability of disconnection is independent of the duration of asset unavailability due to the failure mode. It is assumed that if customer disconnection does not occur at the inception of the fault, it will not occur later.	P_f could be modified to include a term that involves D_f
5.	System Consequence	P_{oc}	The probability of disconnection is independent of the health of assets neighbouring the asset in question. Often neighbouring assets will be of similar condition and health to the asset in question	P_f could be modified to include a term that involves the health of the asset
6.	System Consequence	D	Disconnection duration is calculated by the minimum of all the mean restoration times of the events that have led to the disconnection. The restoration time will be of a function that is a composite of all the individual event restoration time functions.	Data could be gathered to construct the individual event restoration times. The probabilistic function for minimum restoration could then be created and the mean of that function taken
7.	System Consequence	VOLL	VOLL is assumed to be constant across GB except where Vital Infrastructure is connected.	If more research on locational VOLL was available, then this data could be incorporated in the model

8.	System Consequence	C_n	It is assumed that the boundary transfer impact of each circuit that is material to a boundary is comparable.	If boundary impacts of each circuit were calculated by the SO the costs could be scaled accordingly
9.	System Consequence	C_n	It is assumed that asset failures are equally likely across the year	If data on the seasonality of a failure mode and the seasonality of boundary costs were available, then each season could be treated separately
10.	System Consequence	P_Y	The probability of coincident faults is independent of the health of assets neighbouring the asset in question. Often neighbouring assets will be of similar condition and health to the asset in question	P_Y could be modified to include a term that involves the health of the asset
11.	System Consequence	R_{RC}	It is assumed that alternative voltage support can be obtained through the ancillary services when compensation assets are unavailable. In reality this is sometimes not the case.	If research on the cost impacts of overvoltage on TOs and customers were available these could be included in the model
12.	System Consequence	R_{RC}	It is assumed that the full capacity of a compensation asset is purchased when it is unavailable	If the SO could provide data on the relationship between asset availability and SO costs this could be incorporated

13.	System Consequence	C_{MVArh}	It is assumed that the cost to procure MVArh across the network is equal	If the SO could provide locational cost data this could be incorporated
14.	Safety Consequence	Probability of injury	The probability of injury is assessed on a per person basis, i.e. one individual. The probabilities add up to 1.	Review during testing, validation and calibration process
15.	Safety Consequence	Probability of injury	Probabilities assume an individual within the vicinity of the asset when event occurs. The vicinity of an asset is 50m as described in TGN 227	Review during testing, validation and calibration process
16.	Safety Consequence	Civil Fines	Mean value used for civil damage results; enough information from reference book to normally distribute fines	Review during testing, validation and calibration process
17.	Safety Consequence	Probability of injury	Probability values based on expert opinion.	Review and refine during testing, validation and calibration process as data becomes available
18.	Safety Consequence	Probability of injury	For probability of injury for a category 4 - possibility of fatality event. Use calculations from a high pressure bushing disruptive failure. Full text in Knock C., Horsfall I, and Champion S.M (2013). *Development of a computer model to prefict risks from an electrical bushing failure.* Elsevier. This includes a spreadsheet of research carried out by Cranfield University, analysing the probability of fatality, being lacerated/penetrated by shrapnel with permanent injury (Major), and being lacerated/penetrated by shrapnel with no sustained injury (LTI). The analysis averaged (mean) their	Review during testing, validation and calibration process

			values across the different 'zones' for a vertical bushing, which related to the areas around a bushing ie directly in front, to the side etc, and averaging (mean) their values for a person at 15m,25m,35m,45m,and 55m.	
19.	Safety Consequence	Probability of injury	Probability of injury attributed to maximum injury sustained	Review during testing, validation and calibration process
20.	Environment Consequence	Probability of environmental impact	Expert opinion used to create values	Review during testing, validation and calibration process
21.	Environment Consequence	Probability of environmental impact	Probability of environmental impact relates to maximum impact occurred	Review during testing, validation and calibration process
22.	Environment Consequence	Probability of environmental impact	Category 3 based on CB failures - majority of gas CB failures have resulted in category 1 (major) SF6 loss	
23.	Environment Consequence	Probability of environmental impact	All CB probabilities of environmental impact based on gas CBs	
24.	Environment Consequence	Probability of environmental impact	All cable probabilities of environmental impact based on oil-filled cables	

REBASING ASSUMPTIONS

Any future assumptions will be added to this section as the methodology is finalised.

RISK TRADING MODEL ASSUMPTIONS

Any future assumptions will be added to this section as the methodology is finalised.

CTV ASSUMPTIONS

Any future assumptions will be added to this section as the methodology is finalised.