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Safety, Resilience, and Reliability Working Group

Meeting 2 – NARM and CNAIM

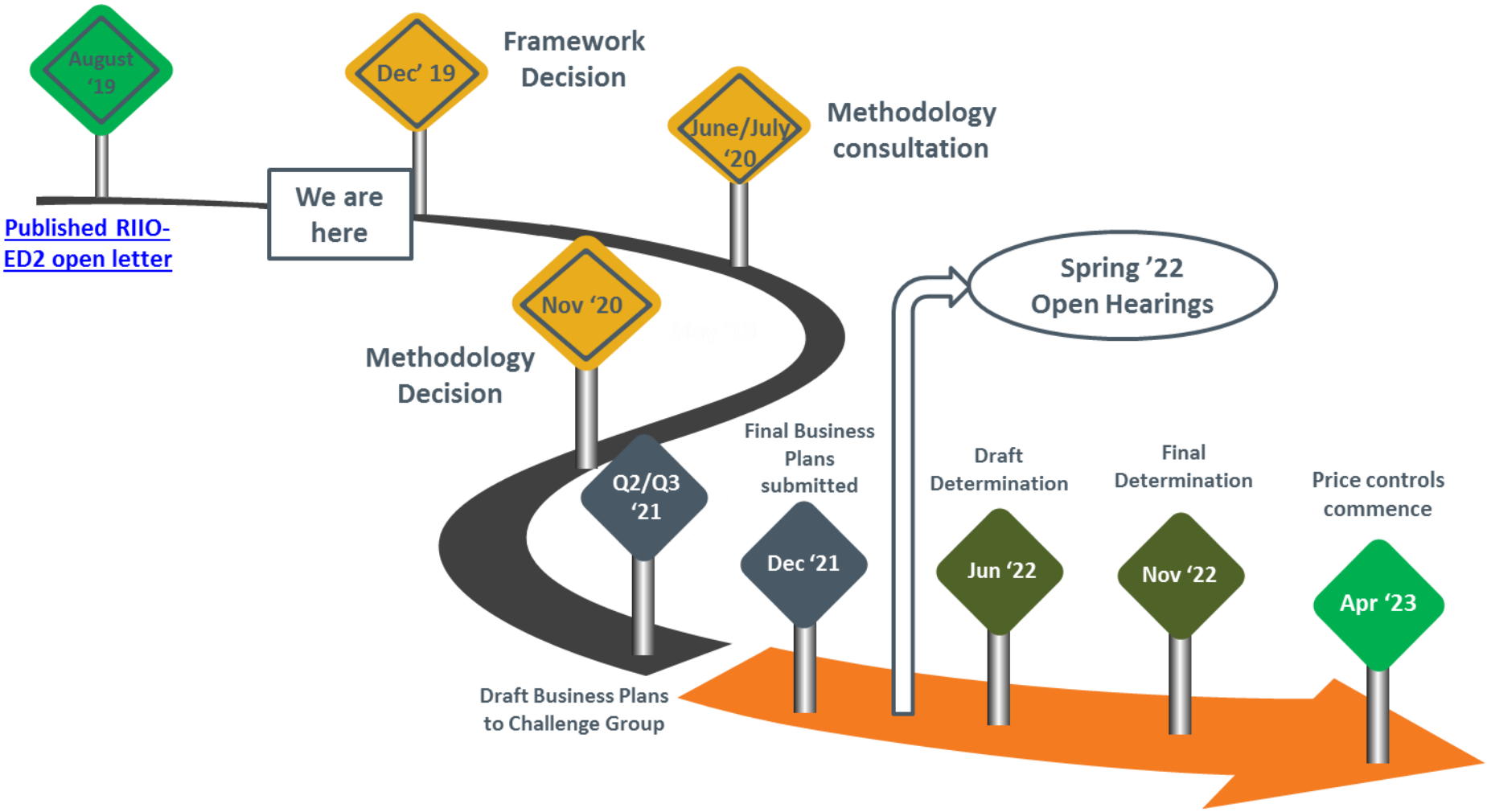
RIIO Electricity Distribution
05/12/2019

Safety, Resilience, and Reliability Working Group

- Welcome and introduction from Ofgem
- Good practice guidance documents
- CNAIM v1.1 planned review areas for v2.0 to incorporate RIIO-ED2
- Whole Life Risk – examples and update presentation
- SRR Priorities and future plans for the SRRWG and its work streams
- Terms of Reference
- Actions, Next Steps, AOB

What we are seeking to achieve

Pathway to ED2



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What are we seeking to achieve in RIIO-ED2?

Our objectives	Meaning we have DNOs that ....
A high-quality and reliable service to all network users and consumers, including those who are in vulnerable situations	• Deliver great customer service • Help fuel-poor households, and those that are most vulnerable from a loss of supply Support new customers in getting connected to the grid efficiently • Enable people to produce their own energy and sell it easily
A safe and resilient network that is efficient and responsive to change	• **Are amongst the safest and most reliable in the world**
Enable the transition to a smart, flexible, low cost, and low carbon energy system for all consumers and network users.	• Support the target of net-zero carbon emissions for 2050 by enabling the rapid roll-out of low carbon technologies, including electric vehicles, and the development of a charging network to support them

Keeps network charges on bills as low as possible

We will achieve through our price control toolkit

In setting the price control

- Business plan incentive to encourage ambition and discourage gaming
- Cost assessment to root out inefficient costs
- Financial package to allow fair returns and maintain investor confidence
- Uncertainty mechanisms to mitigate the 'known unknowns'

In delivering the plan

- Totex incentives to drive the companies to beat the plan
- Flexibility solutions as alternatives to network investment
- Innovation to drive down costs
- Competition to use markets to set prices
- Enabling the best 'whole system' solution
- Return adjustment mechanisms to guard against 'unknown unknowns'

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What are some of the key issues? (a sample)

A high-quality and reliable service to all network users and consumers, including those who are in vulnerable situations	• Cost of energy system transition may fall disproportionately on those most vulnerable, how does the price control provide a fairer balance? • How should we distinguish between DNO and DSO roles in relation to funding and incentives?
A safe and resilient network that is efficient and responsive to change	• **Are reductions in the 'average' duration/length of interruptions still appropriate when short interruptions are increasingly disruptive? What about the worst served?** • **How do we ensure the networks are investing wisely for future resilience?**
Enable the transition to a smart, flexible, low cost, and low carbon energy system for all consumers and network users.	• How is the energy consumer benefit defined in relation to decarbonisation? What does this mean for the role of networks and the scope of the price control; strategic investment ahead of need; and strategic innovation funding? • Should we promote the interests of low carbon technologies over non-renewables, for example by socialising more of the connection costs for low carbon electric vehicles? • How do we future proof the networks to anticipate demands in 2050? How do we manage risks of stranding and closing down alternative pathways?
Keeps network charges on bills as low as possible	• Electrification of heat and transport likely to require significant additional expenditure • How do we ensure flexibility and DER is fully utilised, and that markets between DER and network infrastructure are neutrally facilitated?

open, digitised data… cyber resilience… innovation… whole system solutions... interaction with govt (central, devolved, local)..

Ground to be covered across all work streams

Terms of reference

- Membership
- Output
- Programme and key deliverables
- Publication of minutes and escalation of issues

What do we have in ED1?

- Map out current arrangements
- What was stated intent?
- How effective? (performance, cost, resource involved)
- ED2 factors necessitating change

What are the options for change?

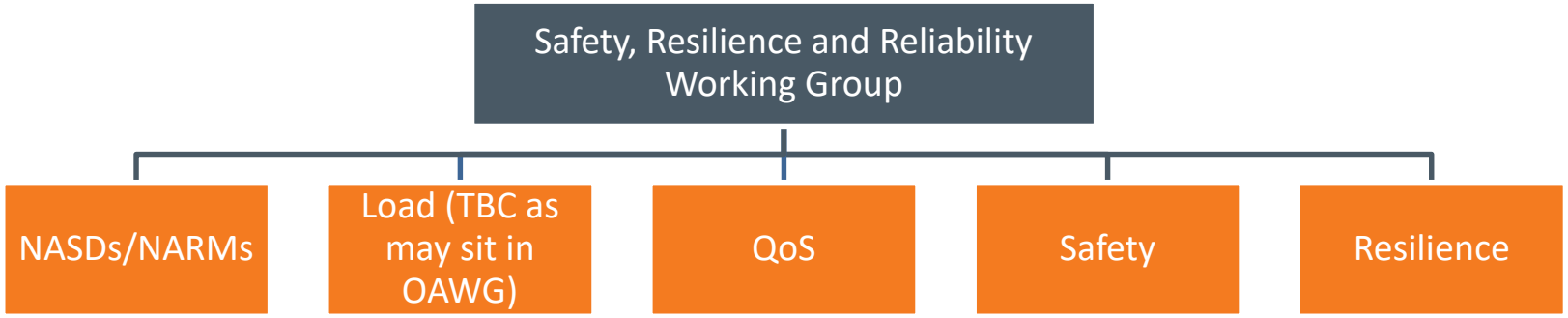
- Analysis required to establish impacts
- Interlinkages
- Criteria for appraisal
- Key risks and unknowns
- Stakeholder views

Sector Methodology consultation proposals

- These are **working** groups. Membership is not granted because of interest in the topic but because you can provide information and analysis that will support policy development
- Not all working groups will run through to Summer, some may be short sprints feeding into other working groups
- We may have to adapt our approach once these are up and running

Safety, Resilience and Reliability Working Group - Overview

Areas of interest:



Proposed dates and topics for RSSWG

- We propose to hold a WG session approximately every other week with feedback sessions to make sure all ground is covered and prioritised appropriately..
- We plan to run sessions in the Glasgow and London Ofgem offices.
- Depending on room availability, we may need to restrict the number of representatives that each member organisation sends to meetings of the Group

Date	Location	Summary	Items to cover
27 November 19	London	First session	ToR, Priorities
05-Dec-19	London	NARM/CNAIM	
09-Jan-19	London	Quality of Supply	
16-Jan-20	Glasgow	NARM/CNAIM	
30-Jan-20	London	Resilience	
12-Feb-20	London	NARM/CNAIM	
18-Feb-20	London	Quality of Supply	
03-Mar-20	Glasgow	Resilience	
18-Mar-20	London	NARM/CNAIM	
31-Mar-20	Glasgow	Quality of Supply	
07-Apr-20	London	Resilience	

NASDs / NARMs – Stakeholder views on elements to consider

Our proposed position is that the **Network Asset Risk Metric (NARM) will apply to RIIO-ED2**, as part of a toolbox approach to justifying and assessing network companies' (proposed) investments and preferences for chosen strategies. In developing the detailed arrangements for NARM, we will **build on the progress already made in developing NASDs in RIIO-ED1**.

Some of the proposed priority work areas for RIIO-ED1 and RIIO-ED2, and some key stakeholder feedback:

Commonality of assets across NASD

- Fundamental to ensure consistency of NASD approach in ED2.
- Opportunity for all licensees to increase assets within their scope of CNAIM reported assets. All DNOs reporting on the same type of assets?
- The move to commonality should be based upon the existing scope of CNAIM, because models have already been developed.
- In terms of commonality, when we have models already in use, how do we treat DNOs who do not have data to operate those specific models?

Extension to further assets

- Focus should be on expansion within CNAIM framework, ahead of expanding to other asset types.
- Extension may not be possible using the CNAIM approach because this requires specific age and condition data about assets.
- This needs to be considered together with non-NARM assets.

Cost categorisation and alignment

- If overall £/point is going to be used it needs to be clear what cost component aligns with the risk forecasts.
- How do we record and report consequence-led interventions as these are not accommodated in the current reporting structure.
- Granularity of NARM and RRP needs to be consistent to allow volumes to be comparable across reporting areas and for costs to be comparable to NARMs outputs.

Non-NASD/NARM assets

- Alternative risk metrics may need to be developed for non-CNAIM assets. These could use a different way of determining risk, but provided that it was a monetary value, it could be tradable with CNAIM assets.
- Substantial component of investment plan. Needs to be linked with associated cost assessment process for these assets to determine key inputs.

NASDs / NARMs – Stakeholder views on elements to consider

Mid Period Review of NASD

- Clarity required ahead of July submission for ED1, including further detail on Ofgem's assessment post submission and interaction with Engineering Hub.
- This should be limited to that required to discharge the licence requirement.

BPDT NARM templates

- ED2 cross sector team is proposing a significantly different approach to the provision of BPDT data. This may require extensive reworking of established reporting in ED and will remove the ability for longer term analysis across ED1 and ED2.

Incentive structure

- The approach to dealing with under/over delivery of NARM needs to be determined.
- Asymmetrical approach used for ET, GT and GD where downside penalty is greater. Approach to be determined for ED2.

CBA models and NARM

- Elements of the CBA are similar to those in CNAIM, however there are differences in how the CBA and CNAIM show risk/benefits.
- The CBAs have a wider role than CNAIM, so it should be recognised that there will not be alignment between the models.

Use of lifetime risk measures

- ED2 cross sector work for ET, GT and GD requires the specification of delivery targets in terms of lifetime risk.
- Cross sector work has explored numerous possible approaches and no consistent approach has been derived.
- Ofgem proposed a 'survivor' approach which do not believe is compatible with CNAIM and therefore an alternative approach is required, assuming that lifetime risk is also required in ED.
- DNOs to present on whole life risk proposals.

BPDT Asset Replacement and Refurbishment templates

- The absence of NASD specific tables in ED1 BPDTs made it difficult to identify the proposed cost forecasts associated with NASD, requiring retrospective analysis for the derivation of incentive rates.
- If benchmarking / analysis is required then the BPDT should be structured in a way that enables the costs associated with NARM to be explicitly identified.

Deadbands

- Deadbands has been parked for ED1 closeout. Is the concept of a Deadband around targets to be considered for ED2.

The Voice of the Networks

Energy Networks Association

Engineering Guidance on data input to the Common Network Asset Indices Methodology (CNAIM) v1.1

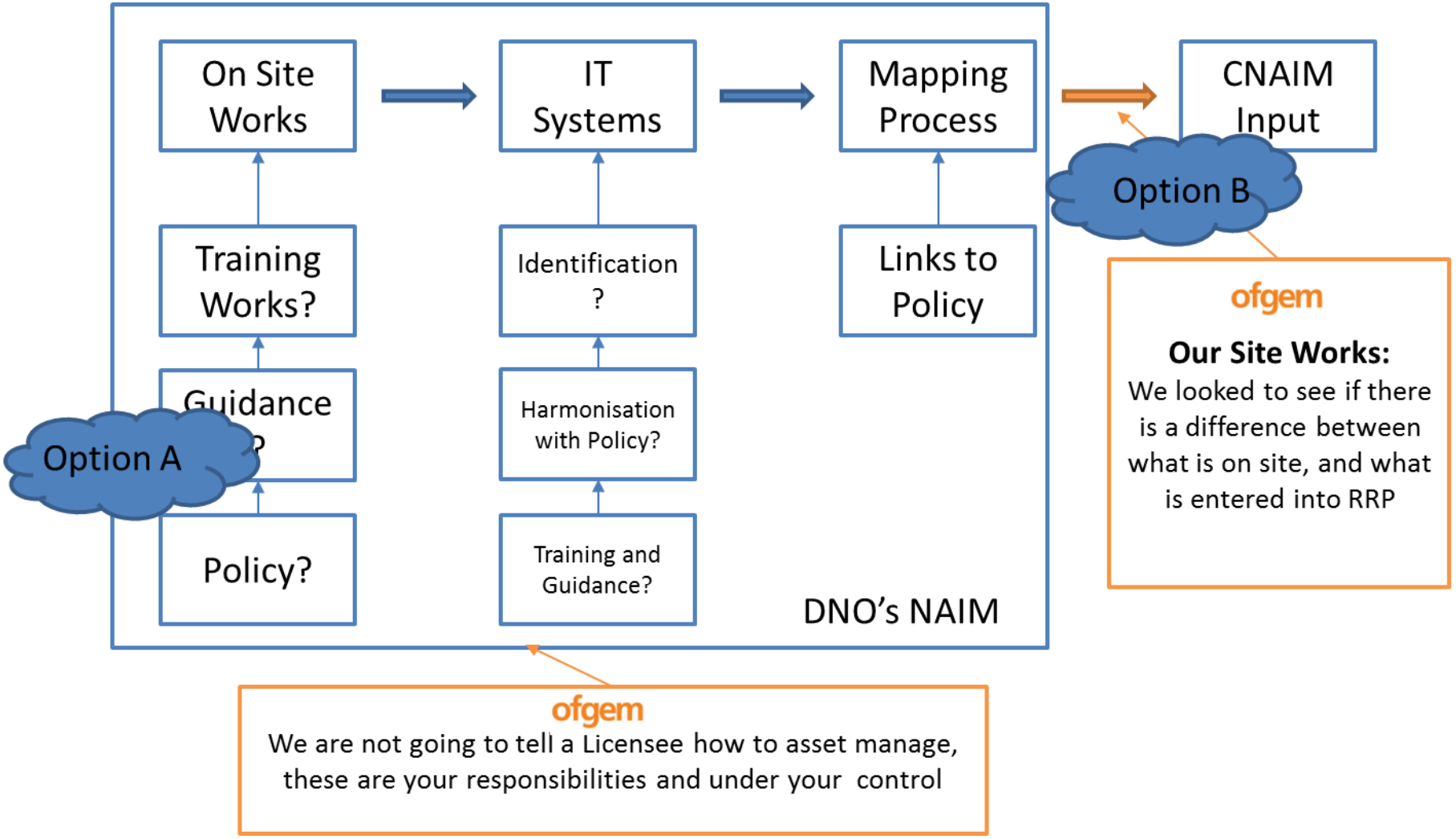
5 December 2019

Considerations & timescales

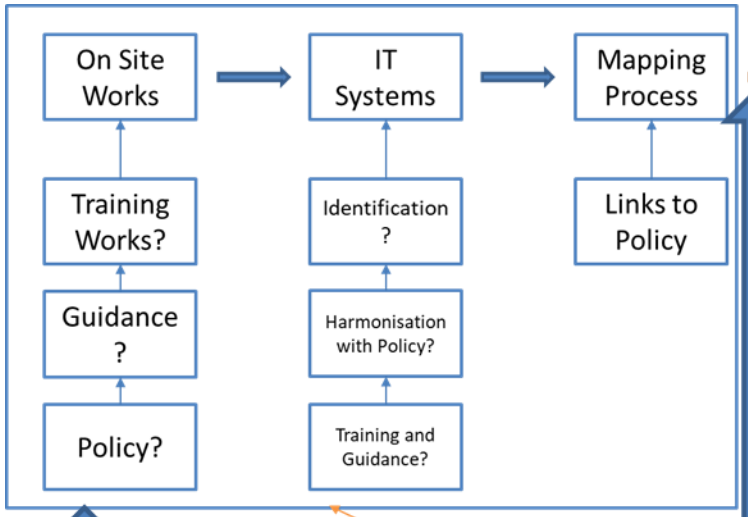
- Considerations
  - DNO Known & identified areas requiring clarification & guidance
  - Scope of good practice guidance already established by DNOs
    - Including request for consistency on approach for GM observed conditions – Engineering Centre
- Development timescales – Ofgem requested:
  - Ground Mounted plant next 0 – 6 months
  - Followed by all asset data inputs covered in CNAIM by the start of ED2
  - During ED2 ironing of all other ambiguities /interpretations

Ofgem – DNO boundaries

- Where are the Boundaries?



Proposed solution - Option B



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Our Site Works: We looked to see if there is a difference between what is on site, and what is entered into RRP

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We are not going to tell a Licensee how to asset manage, these are your responsibilities and under your control

Engineering Guidance proposal addresses the need for a common understanding of data input for CNAIM.

Annual Audit

It allows own DNO process and guidance to be audited against own DNO documentation and reviewed where appropriate for alignment to Engineering Guidance.

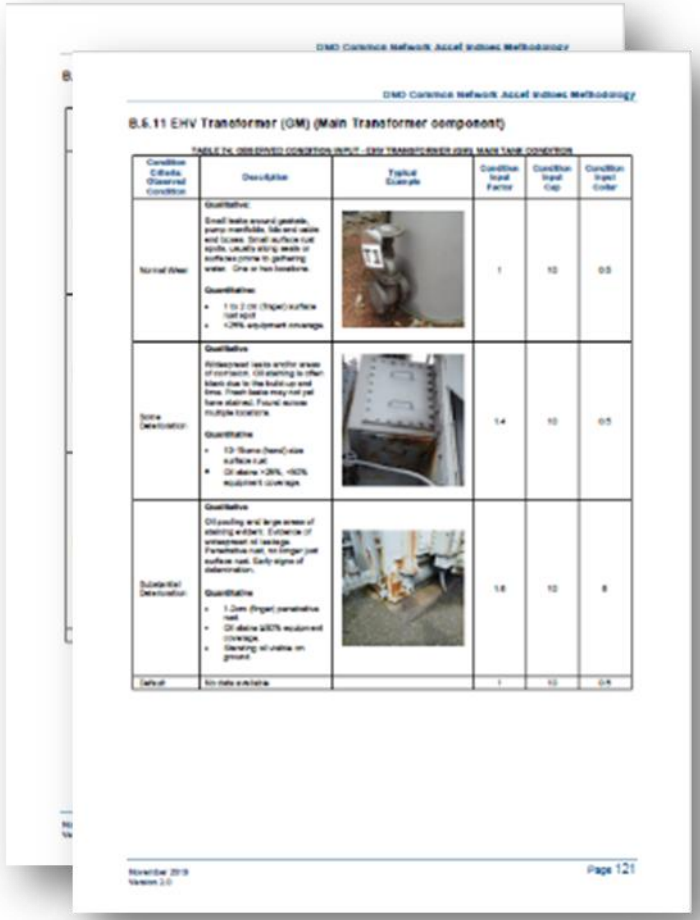
Observed Condition Guidance

Proposal:

Additional description/definition detail, and reference images to supplement the definitions and descriptions within CNAIM Appendix B.5 – Observed Condition Factors.

- Initial guidance will be applicable to CNAIM version 1.1.
- Provides reference baseline for DNO guidance, procedures and work instructions, reducing ambiguity in application.
- Maintains integrity of DNO specific internal asset management processes.

To be included within Engineering Guidance document.



Recommendation

- Development of Engineering Guidance on the data inputs to the CNAIM v1.1
- This will allow all DNOs to review and establish internal review of NAIMs and supporting internal documentation in preparation for data quality auditing
- Further updated to reflect changes for RIIO-ED2 once agreed
- Publication of Engineering Guidance with main consultation on CNAIM v2.0 once finalised

The Voice of the Networks

Energy Networks Association

Review of Common Network Asset Indices Methodology (CNAIM) v1.1

5 December 2019

High level CNAIM Review areas

Following a series of initial meetings of the NEDWG Technical Working Group, there is broad agreement to review CNAIM v1.1 in relation to all the following areas:

- Calibration
- Methodology Review (split into a couple of PoF and a few CoF issues)
- Editorial Review - make things clearer
- Future Alignment - This is to the ED2 RIGS and values of allowed Costs etc.
- Revision of Scope - Should be include/exclude current or future assets types for ED2

This review will make an assessment based on our experience of the past 4 years within RIIO-ED1 if the current application of CNAIM is a 'fit for purpose' and where it is identified as requiring modification recommendations will be presented for discussion to seek agreement by all DNOs prior to tabling our proposals with Ofgem.

Ofgem representatives will be invited to attend these sessions to assist in understanding the background to these discussions before presentation to the SRRWG.

ENA - Future Risk Improvement

The Voice of the Networks

Energy Networks Association

NETWORK ASSET INDICES:

Further Consideration Of The Proposed Methodology For Reporting Future (Whole Life) Risk Improvement

5th December 2019

Phil Mann

Proposed ED2 Reporting Framework (Recap)

- The present value of 'future risk', from CNAIM, can be determined from:-

$$[PV\ of\ Future\ Risk_{0\text{-}n} = [(PoF_0 \times DF_0) + (PoF_1 \times DF_1) + (PoF_2 \times DF_2) + \ldots\ldots\ldots (PoF_n \times DF_n)] \times CoF$$

where:
PoF_0 = the expected number of functional failures in the current year;
PoF_1 = the expected number of functional failures in year 1; etc.
CoF = the Consequences of Failure (£);
DF_0 = the discount factor applicable to year 0, the current year;
DF_1 = the discount factor applicable to year 1, i.e. one year into the future; etc.
{note: the discount factor applicable for year n = $(1+r)^{-n}$, where r is the discount rate}

- Our proposal was tabled at the RSEWG meeting on 4th November that 'future risk' can be considered using the existing 5x4 (Health v Criticality) reporting matrix by:-
  - retaining the existing approach to assigning a Health Index and Criticality Index to each asset;
  - retaining the existing methodology for assigning a typical value of CoF to each Criticality Band; and
  - applying new weightings to each Health Index Band that reflect the 'cumulative discounted future PoF' for a typical asset within each Health Index Band.

Proposed ED2 Reporting Framework (Recap)

- **Core assumptions**

  In order to assign a typical 'cumulative discounted future PoF' weighting to each Health Index Band, it is necessary to assume that:-

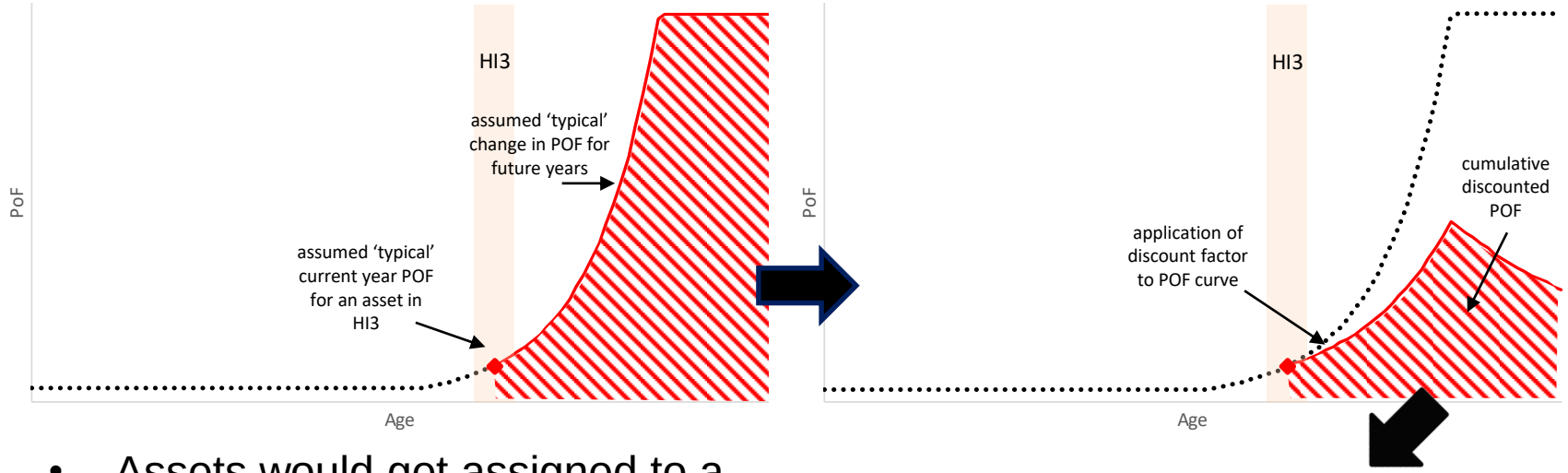
  1. all assets (within a given asset category) within the same Health Index Band can be regarded as having the same typical value of Health Score (and PoF) in the current year. This is an assumption already used in the current ED1 reporting framework

  2. all assets (within a given asset category) with the same Current Health Score, will follow a standard deterioration curve and therefore have the same value of Health Score (and PoF) in each future year. Typical 'time based' Health Score curves can be generated based on the principles used for the underlying age based curves within CNAIM. These can then be used to create typical time based PoF curves using the relationship defined in CNAIM.

  3. CoF can be considered to be a constant.

Proposed ED2 Reporting Framework (Recap)

- For each Health Index Band, the 'cumulative discounted future PoF' can be evaluated from the typical PoF curve.



- Assets would get assigned to a Health Index Band based on Current Health Score, in exactly the same way as ED1 reporting – however the weighting used reflects the cumulative discounted PoF

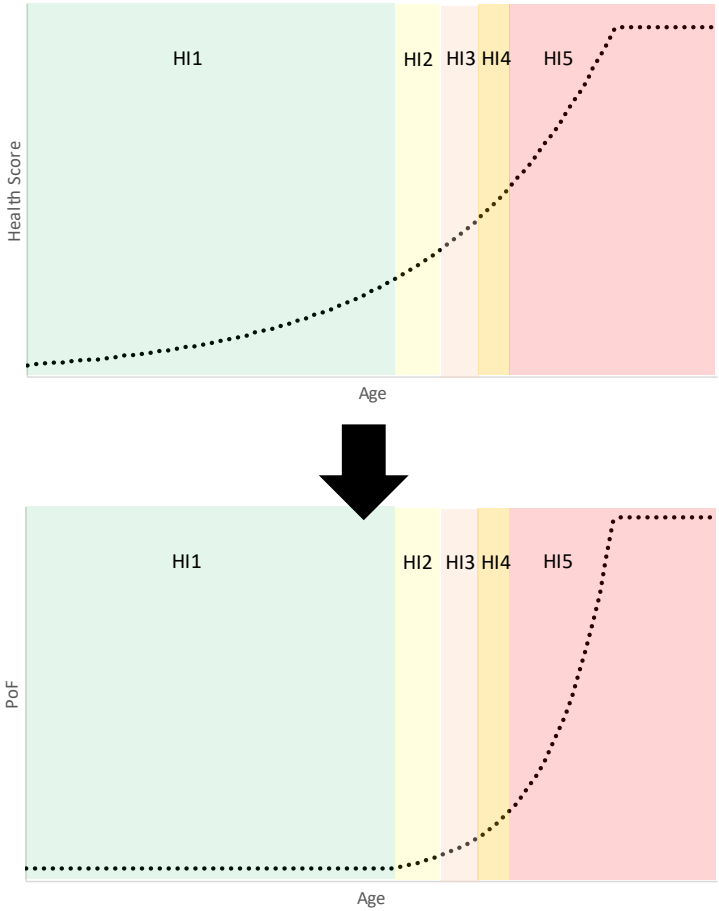
		HI1	HI2	HI3	HI4	HI5
	Weighting	325.4%	386.5%	498.5%	595.5%	766.8%
C1	320,238	1,041,940	1,237,732	1,596,377	1,906,901	2,455,500
C2	457,482	1,488,486	1,768,189	2,280,539	2,724,144	3,507,858
C3	686,224	2,232,729	2,652,283	3,420,808	4,086,216	5,261,787
C4	1,143,706	3,721,215	4,420,472	5,701,347	6,810,360	8,769,644

Considering Fitness For Purpose

- In order to consider the fitness for purpose of the proposed ED2 reporting framework, the NOMs ED WG have performed analysis to look at how the benefits from ‘like for like’ asset replacement (when evaluated using the proposed framework) compare with the typical cost of undertaking asset replacement.

- The analysis (based on the current version of CNAIM (V1.1)):-
  - uses the Ofgem Expert View asset replacement unit costs from ED1 cost assessment for the asset replacement cost;
  - considers of an ‘all DNO’ value for Consequences of Failure;
  - assesses the ‘cumulative discounted future PoF’ over a 40 year period;
  - applies discounting at the Social Time Preference Rate of 3.5% (and 3.0% after 30 years) specified in the Treasury Green Book;
  - assumes a typical time based PoF curve based upon:-
    - the principles used for the underlying age based Health curves within CNAIM; and
    - the relationship between Health Score and PoF also established within CNAIM.

Considering Fitness For Purpose



Health Score = H_{new} x $e^{(B_1 \times age)}$

Where:-
Health Score is capped at 15;

B_1 = ln($H_{expected\ life}$ / H_{new})/Normal Expected Life

H_{new} = 0.5; $H_{expected\ life}$ = 5.5

PoF = K x [1 + (C x H) + ((C x H)²/2!) + ((C x H)²/3!)]

Where:-
H = Health Score;
K and C are constants

Health Index Band	Health Score to be used to derive typical current year PoF
HI1	4
HI2	4.75
HI3	6
HI4	7.25
HI5	10

Considering Fitness For Purpose

- For each asset type, the typical future risk for each Health Index/ Criticality combination is evaluated.
- The benefit delivered by replacement on a like for like basis is then determined by subtracting the 'new asset future risk' (i.e. the risk associated with a HI1 asset with the same Criticality) from each Health Index/ Criticality combination.
- Where the benefit is greater than the cost of replacement, asset replacement is cost-benefit positive.

Example: 132kV Transformer

1) Typical Future Risk

	HI1	HI2	HI3	HI4	HI5
C1	1,041,940	1,237,732	1,596,377	1,906,901	2,455,500
C2	1,488,486	1,768,189	2,280,539	2,724,144	3,507,858
C3	2,232,729	2,652,283	3,420,808	4,086,216	5,261,787
C4	3,721,215	4,420,472	5,701,347	6,810,360	8,769,644

2) Future Risk Benefit of Like for Like Replacement

	HI1	HI2	HI3	HI4	HI5
C1	0	195,792	554,437	864,961	1,413,560
C2	0	279,703	792,053	1,235,658	2,019,372
C3	0	419,554	1,188,079	1,853,487	3,029,058
C4	0	699,257	1,980,132	3,089,145	5,048,429

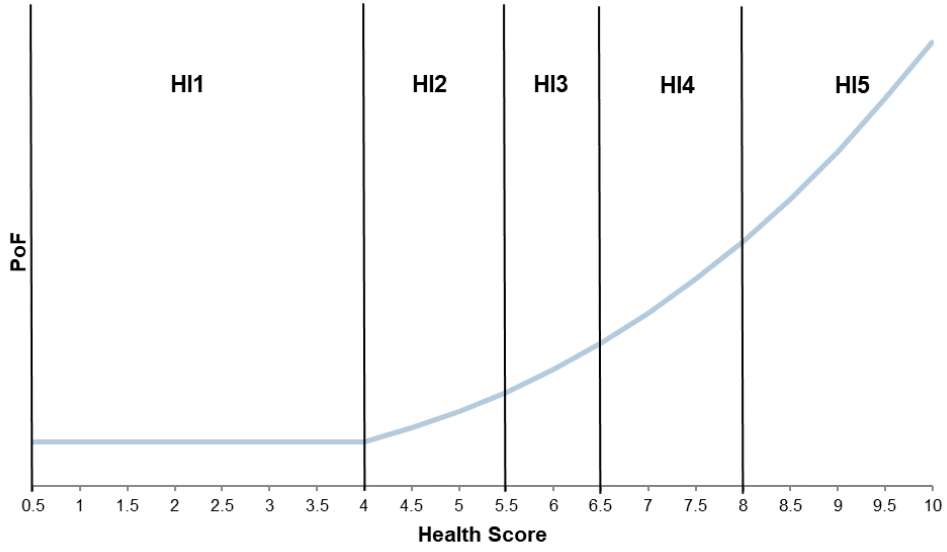
3) Typical Cost of Replacement = £995,144

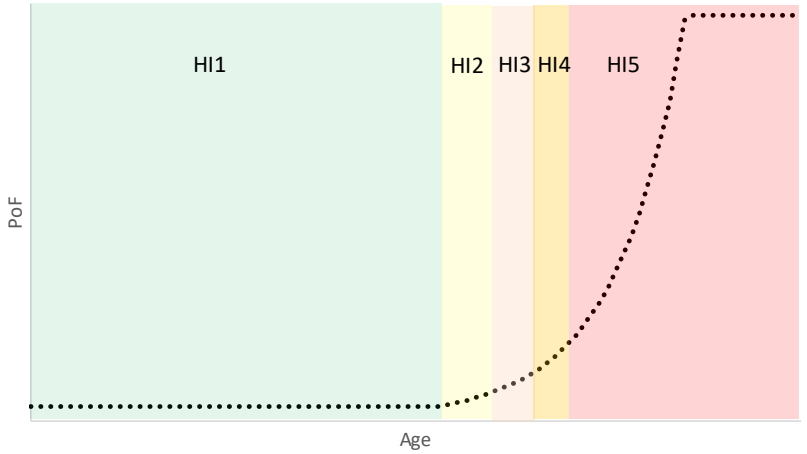
4) Cost-Benefit

	HI1	HI2	HI3	HI4	HI5
C1	-995,144	-799,352	-440,707	-130,183	418,416
C2	-995,144	-715,441	-203,091	240,514	1,024,228
C3	-995,144	-575,590	192,935	858,343	2,033,914
C4	-995,144	-295,887	984,988	2,094,001	4,053,285

Considering Fitness For Purpose

- Given the banding of the Health Indices, and the Health Score/ PoF relationship, a positive cost-benefit for some Criticality Bands in HI3 and HI4 would be appropriate.





Results of Analysis

- The following Health/ Criticality matrices show the future risk benefit of like for like replacement of different asset types. Cells are coloured green where the cost-benefit is positive.

LV Circuit Breaker

	HI1	HI2	HI3	HI4	HI5
C1	-	860	2,313	3,375	5,574
C2	-	1,228	3,304	4,822	7,962
C3	-	1,842	4,955	7,232	11,944
C4	-	3,070	8,259	12,054	19,906

Asset Replacement Unit Cost (£/unit) 5000

LV Pillar (ID)

	HI1	HI2	HI3	HI4	HI5
C1	-	1,011	2,719	3,969	6,554
C2	-	1,444	3,885	5,670	9,363
C3	-	2,166	5,827	8,505	14,045
C4	-	3,610	9,712	14,174	23,408

Asset Replacement Unit Cost (£/unit) 6965

LV UGB

	HI1	HI2	HI3	HI4	HI5
C1	-	1,314	3,143	5,146	8,014
C2	-	1,876	4,490	7,351	11,449
C3	-	2,815	6,735	11,026	17,173
C4	-	4,691	11,225	18,377	28,621

Asset Replacement Unit Cost (£/unit) 5700

6.6/11kV CB (GM) Primary

	HI1	HI2	HI3	HI4	HI5
C1	-	4,837	11,573	18,947	29,509
C2	-	6,909	16,533	27,067	42,156
C3	-	10,364	24,799	40,600	63,233
C4	-	17,273	41,332	67,667	105,389

Asset Replacement Unit Cost (£/unit) 28705

6.6/11kV Switch (GM)

	HI1	HI2	HI3	HI4	HI5
C1	-	1,387	3,319	5,434	8,463
C2	-	1,982	4,742	7,763	12,090
C3	-	2,972	7,112	11,644	18,135
C4	-	4,954	11,854	19,407	30,226

Asset Replacement Unit Cost (£/unit) 6471

6.6/11kV Transformer (GM)

	HI1	HI2	HI3	HI4	HI5
C1	-	1,695	4,559	6,654	10,989
C2	-	2,421	6,513	9,506	15,698
C3	-	3,632	9,770	14,258	23,547
C4	-	6,053	16,283	23,764	39,245

Asset Replacement Unit Cost (£/unit) 11422

Results of Analysis

- Similar outcomes are produced across all voltage levels.

33kV CB (Air Insulated Busbars)(ID) (GM)

	HI1	HI2	HI3	HI4	HI5
C1	-	13,483	38,179	59,563	97,340
C2	-	19,261	54,542	85,089	139,057
C3	-	28,891	81,813	127,634	208,586
C4	-	48,152	136,355	212,723	347,643

Asset Replacement Unit Cost (£/unit) 54914

66kV CB (Air Insulated Busbars)(OD) (GM)

	HI1	HI2	HI3	HI4	HI5
C1	-	43,430	103,920	170,133	264,976
C2	-	62,043	148,457	243,047	378,537
C3	-	93,064	222,686	364,571	567,806
C4	-	155,106	371,143	607,618	946,343

Asset Replacement Unit Cost (£/unit) 175000

132kV CB (Air Insulated Busbars)(ID) (GM)

	HI1	HI2	HI3	HI4	HI5
C1	-	89,820	254,349	396,803	648,474
C2	-	128,314	363,356	566,861	926,392
C3	-	192,471	545,034	850,292	1,389,588
C4	-	320,786	908,391	1,417,153	2,315,980

Asset Replacement Unit Cost (£/unit) 306821

33kV Transformer (GM)

	HI1	HI2	HI3	HI4	HI5
C1	-	60,304	170,767	266,408	435,376
C2	-	86,148	243,952	380,583	621,966
C3	-	129,223	365,928	570,874	932,949
C4	-	215,371	609,880	951,456	1,554,916

Asset Replacement Unit Cost (£/unit) 331816

66kV Transformer

	HI1	HI2	HI3	HI4	HI5
C1	-	66,714	188,919	294,726	481,656
C2	-	95,306	269,884	421,037	688,080
C3	-	142,958	404,825	631,556	1,032,119
C4	-	238,264	674,709	1,052,593	1,720,199

Asset Replacement Unit Cost (£/unit) 510015

132kV Transformer

	HI1	HI2	HI3	HI4	HI5
C1	-	195,792	554,437	864,961	1,413,560
C2	-	279,702	792,053	1,235,658	2,019,372
C3	-	419,554	1,188,079	1,853,487	3,029,057
C4	-	699,256	1,980,132	3,089,145	5,048,429

Asset Replacement Unit Cost (£/unit) 995144

Results of Analysis

- There are some models where the outcomes for a small number of Health Index/ Criticality combinations are not quite what might be intuitively expected.
- In some of these cases consideration of a small refinement to the calibration might be appropriate (noting the original CNAIM calibration exercise did not consider the overall present value of future risk).

6.6/11kV RMU

	HI1	HI2	HI3	HI4	HI5
C1	-	1,425	3,410	5,582	8,694
C2	-	2,036	4,871	7,974	12,420
C3	-	3,053	7,306	11,962	18,630
C4	-	5,089	12,177	19,936	31,050

Asset Replacement Unit Cost (£/unit) 12089

33kV Tower

	HI1	HI2	HI3	HI4	HI5
C1	-	6,536	15,769	26,382	42,888
C2	-	9,337	22,527	37,689	61,269
C3	-	14,006	33,790	56,533	91,904
C4	-	23,344	56,317	94,222	153,173

Asset Replacement Unit Cost (£/unit) 43094

33kV UG Cable (Non Pressurised)

	HI1	HI2	HI3	HI4	HI5
C1	-	18,527	64,732	114,016	205,177
C2	-	26,467	92,475	162,880	293,110
C3	-	39,700	138,712	244,320	439,665
C4	-	66,167	231,187	407,200	732,775

Asset Replacement Unit Cost (£/unit) 263400

LV UGB

	HI1	HI2	HI3	HI4	HI5
C1	-	1,314	3,143	5,146	8,014
C2	-	1,876	4,490	7,351	11,449
C3	-	2,815	6,735	11,026	17,173
C4	-	4,691	11,225	18,377	28,621

Asset Replacement Unit Cost (£/unit) 5700

Results of Analysis

- Results for poles, tower line conductor and gas-filled cables suggest the calibrations of these models may need to be reviewed to confirm that appropriate levels of future risk are being determined.

LV poles

	HI1	HI2	HI3	HI4	HI5
C1	-	845	2,023	3,311	5,157
C2	-	1,207	2,889	4,730	7,367
C3	-	1,811	4,334	7,095	11,051
C4	-	3,019	7,223	11,826	18,418

Asset Replacement Unit Cost (£/unit) 1358

6.6/11kV Poles

	HI1	HI2	HI3	HI4	HI5
C1	-	1,264	3,025	4,953	7,714
C2	-	1,806	4,322	7,076	11,020
C3	-	2,709	6,483	10,614	16,530
C4	-	4,516	10,805	17,689	27,551

Asset Replacement Unit Cost (£/unit) 1942

66kV OHL (Tower Line) Conductor

	HI1	HI2	HI3	HI4	HI5
C1	-	2,075	4,965	8,128	12,659
C2	-	2,964	7,093	11,612	18,085
C3	-	4,446	10,639	17,418	27,127
C4	-	7,410	17,732	29,029	45,212

Asset Replacement Unit Cost (£/unit) 56940

132kV OHL (Tower Line) Conductor

	HI1	HI2	HI3	HI4	HI5
C1	-	2,554	6,110	10,003	15,580
C2	-	3,648	8,729	14,290	22,257
C3	-	5,472	13,093	21,435	33,385
C4	-	9,120	21,822	35,726	55,641

Asset Replacement Unit Cost (£/unit) 49238

33kV UG Cable (Gas)

	HI1	HI2	HI3	HI4	HI5
C1	-	19,800	51,722	82,870	138,700
C2	-	28,285	73,889	118,385	198,143
C3	-	42,428	110,834	177,578	297,214
C4	-	70,714	184,723	295,963	495,356

Asset Replacement Unit Cost (£/unit) 263400

132kV UG Cable (Gas)

	HI1	HI2	HI3	HI4	HI5
C1	-	46,530	121,550	194,747	325,950
C2	-	66,472	173,643	278,210	465,643
C3	-	99,708	260,464	417,315	698,465
C4	-	166,180	434,107	695,525	1,164,108

Asset Replacement Unit Cost (£/unit) 909336

Summary

- Overall the proposed methodology for incorporating future risk into the ED2 NARMs reporting framework produces levels of risk that seem appropriate, when considering the cost-benefit of asset replacement activity.
- There is a likely need for a minor review of calibration for a small number of asset types as a refinement to CNAIM.
- A more detailed review of the pole, tower line conductor and fluid filled cables models is likely to be required, to ensure that appropriate levels of risk are being determined.
- This analysis shows that, overall, the proposed methodology for accounting for future risk is fit for purpose.

SRR Priorities

Theme	Topic	Detail
Reliability - NARM	Methodology - General	
	Commonality of assets/extension to further assets	
	Non-NARM assets	
	Cost alignment	
Reliability - QoS	Interruption types, including WSC	
	Target setting	
	Exceptional Events	
	Guaranteed Standards	
Resilience	Climate Change Resilience Metric (CC Adaptation)	
	Cyber, physical, and workforce resilience	
Safety	Safety metrics	

Resilience – What areas should we be considering?

Our proposed position is to introduce arrangements to **ensure DNOs are appropriately managing the risks associated with cyber and physical security, and workforce resilience**.

Cyber and Physical Security

Safe and resilient networks are not defined just by asset resilience. DNOs also need to respond to the threats presented by **extreme weather** (such as flooding), **climate change** (increasing likelihood of extreme weather events that may affect their assets, as well as other types of metrological threats affecting their assets), **cyber-attacks**, and/or **physical attacks** on the networks.

Workforce Resilience

DNOs need to ensure their **staff are resilient** and properly equipped to carry out their work, and that all staff (including those recruited into the business) have access to suitable training and support. This is particularly important given the challenge presented by an **ageing workforce**.

Some aspects of the 'Resilience' work area are relatively new, other areas that may be more developed may still have quite limited reporting or guidance at present. Some stakeholders have also argued for clarity on what areas constitute resilience investment, citing Ofgem annual report which includes areas such as flood defences, black start, physical security, tree clearance etc.

- What should our priority areas be for RIG development and reporting?
- What can be achieved for RIIO-ED2, and what may need to be considered in the context of RIIO-ED3?

Actions, Next Steps, AOB

Actions, Next Steps, AOB

- The next meeting will take place on 9th January, covering Quality of Supply. It will be in London.
- We will circulate notes and an actions log from this meeting.
- Based on the prioritisation exercise, we will set out the anticipated topics to be covered at the upcoming meetings.

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