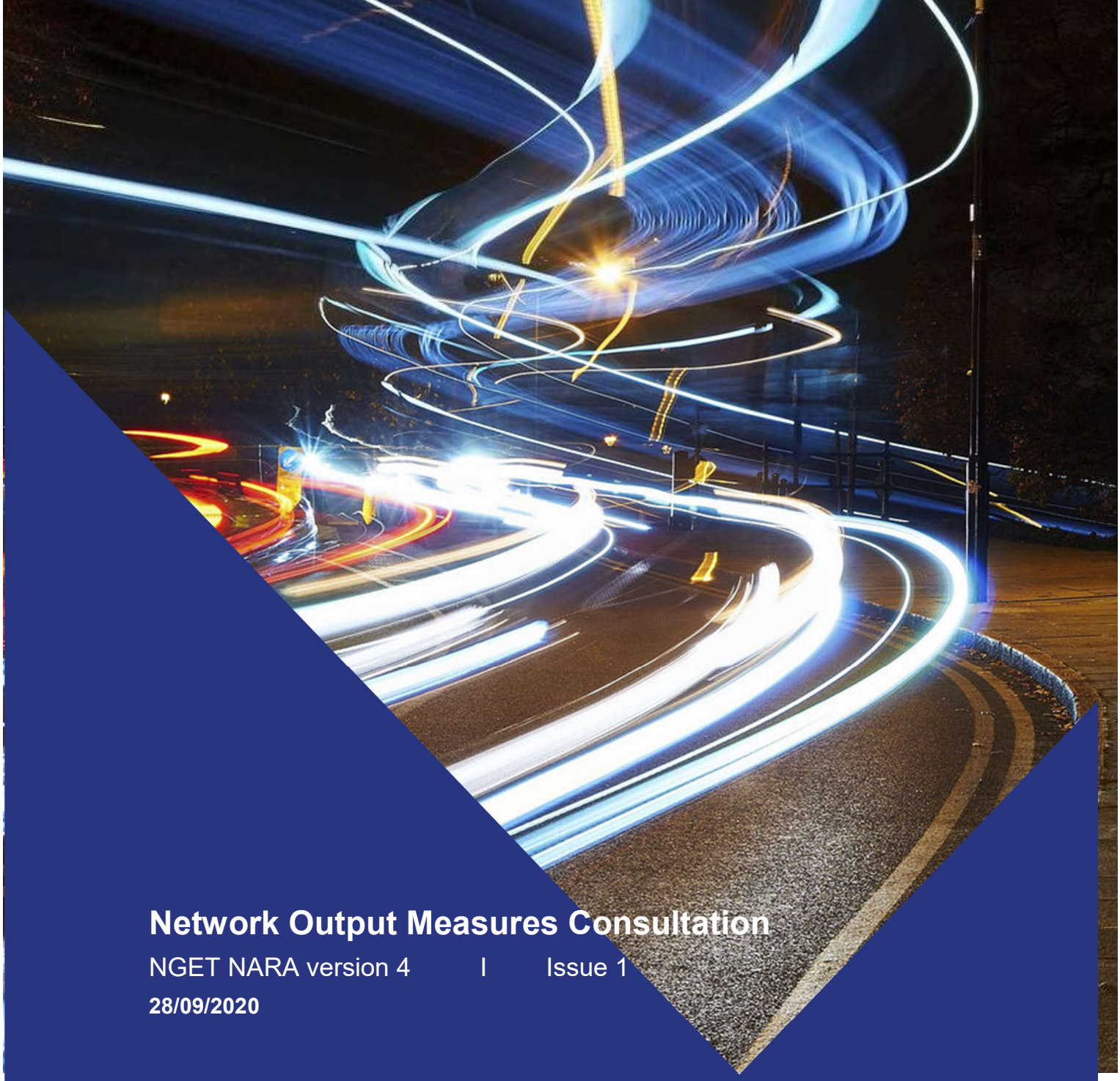

Network Output Measures Consultation

NGET NARA version 4 I Issue 1

28/09/2020

nationalgrid

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Purpose and Scope

National Grid are obliged to review the Network Output Measures (NOMs) methodology and associated documentation, including the Network Asset Risk Annex (NARA) at least once a year, in accordance with the NGET Special License condition 2L. The consultation and license permit modification of the NOMs methodology from time to time to facilitate better achievement of NOMs methodology objectives.

This document details provides supplementary information relevant to proposed changes to the NOMs methodology with regards the implementation of the findings of the Calibration, Testing and Validation exercise.

As per conditions 2L.10 (b) and 2L.11; NGET are to submit a report detailing the following in respect of changes.

(a) a statement of the proposed modification to the NOMs Methodology

(b) a full and fair summary of any representations that were made to the licensee pursuant to paragraph 2L.10(a) of this condition and were not withdrawn

(c) an explanation of any changes that the licensee has made to its modification proposal as a consequence of representations

(d) an explanation of how, in the licensee's opinion, the proposed modification, if made, would better facilitate the achievement of the NOMs Methodology Objectives

(e) a presentation of the data and other relevant information (including historical data, which should be provided, where reasonably practicable, for a period of at least ten years prior to the date of the modification proposal) that the licensee has used for the purpose of developing the proposed modification

(f) a presentation of any changes to the Network Replacement Outputs, as set out in the tables in Special Condition 2M (Specification of Network Replacement Outputs), that are necessary as a result of the proposed modification to the NOMs Methodology

(g) a timetable for the implementation of the proposed modification, including an implementation date (which must not be earlier than the date on which the period referred to in paragraph 2L.12 of this condition would expire).

Proposed Modifications to Network Asset Risk Annex, Issue 4

The Calibration, Testing and Validation (CTV) exercise highlighted changes to the previous releases of the Network Asset Risk Annex. These changes have been applied to production environments; hence information presented in the T2 business plan, and subsequent supplementary questions incorporate the effect of these changes already.

1) An error in the licensee's formulae for Probability of Disconnection and Duration for $X_{min} = 1$ within the System Consequence calculation were discovered. This change is common to the SPT-SHET NARA; all three TO's are jointly consulting on this change.

Probability of Disconnection, P_{oc}

Existing Equation 18 in NGET NARA	**Proposed Change**
For $X_{min} = 1$, $P_{oc} = 1-N_oN_dN_mN_f$	*For* $X_{min} = 1$, $P_{oc} = P_d + N_dP_o + N_oN_dP_m + N_oN_dN_mP_f$

Duration of Disconnection, *D*

Existing Equation 22 in NGET NARA	**Proposed Change**
For $X_{min} = 1$, $D = [min(D_{fm},D_o)P_o + min(D_{fm}, D_d)P_d + min(D_{fm}, D_f)P_f + min(D_{fm}, D_m)P_m] / P_{oc}$	*For Xmin = 1,* $D=[min(D_{fm}, D_d)P_d + min(D_f, D_o)N_dP_o + min(D_{fm}, D_m)N_oN_dP_m + min(D_{fm},D_f)N_oN_dN_mP_f / P_{oc}$

2) Improvements to the OHL conductors and fittings scoring methods for NGET End of Life assessment.

Maximum End of Life Modifier for OHL Conductor

Original Text in Section 8.2.4.1 in NGET NARA	**Proposed Change**
The maximum value of EOLmod is 100.	The maximum value of EOLmod is 60, which represents the conditional probability of being in a state requiring replacement of 10%.

Preliminary End of Life Calculation for OHL Conductor, PRE_{hs}

Original Equation 63 in NGET NARA	**Proposed Change**
$PRE_{HS} = W_{FAM} * \max(AGE_{SCORE}, REPAIR_{SCORE})$ $AGE_{SCORE} = \begin{cases} 0 & AGE - AAL \leq -8 \text{ or } AGE \leq 5 \\ 35 & AGE - AAL \leq -3 \\ 2(AGE - AAL) + 41 & otherwise \end{cases}$ $REPAIR_{SCORE} = \begin{cases} 0 & REP = 0 \\ 10 & REP \leq 0.6 \\ 20 * REP & otherwise \end{cases}$	$PRE_{HS} = W_{FAM} * \max(AGE_{SCORE}, REPAIR_{SCORE}) + JNT$ $AGE_{SCORE} = \begin{cases} 0 & AGE - AAL \leq -8 \text{ or } AGE \leq 5 \\ 35 & AGE - AAL \leq 0 \\ 2(AGE - AAL) + 35 & otherwise \end{cases}$ $REPAIR_{SCORE} = REP * 100$

JNT is the Joint score, generated from a combination of joint type and the number of locations of high resistance or 'hot' joints detected in the annual infra-red camera surveys. Higher scores are generated by 'Tate/Noral' or oval type compression joints of the main 'within span' conductor at tension towers. Low scores are generated by higher resistance witnessed in bolted joints of jumper conductors. These items provide a continuous conductor path between the within-span conductors at tension towers. A multiplier is assigned for OHL 'Tate' joints to reflect that this type of joint is inferior to a hexagonal compression. If 'Tate' joints are present then TATE=2, otherwise 1.

Infra Red Survey	**JNT Score**
Hot Joints in Main Compression >2.5% of Tension Towers in last 5 years	10
Hot Joints in Compressed Jumper Palm >2.5% of Tension Towers in last 5 years	7.5
Hot Joints in Bolted Jumper Palm >2.5% of Tension Towers in last 5 years	5

Second Stage for OHL Conductor

Original text in section 8.2.4.4 in NGET NARA	**Proposed Change**
The PCSI component is therefore determined by adding up the component scores for each phase conductor sample (S_i). This generates a total result for each phase conductor sample. The maximum total result across all phase conductor samples then gives the value if *PCSI*. This second stage assessment is the maximum of either *PCSI* or non-intrusive core corrosion rating.	The overall PCSI score is generated from a weighted average of the max conductor sample score and the average of all conductor sample scores.

Maximum End of Life Modifier for OHL Fittings

Original Text in Section 8.2.5.2 in NGET NARA	**Proposed Change**
The formula to determine the EOL modifier of fittings is given below, and is capped at a maximum of 100	The formula to determine the EOL modifier of fittings is given below, and is capped at a maximum of 83

Environment Modifier for Insulators

Original text in section 8.2.5.7 in NGET NARA

$$ENV_{MOD} = \begin{cases} 1.2 & if\ A \\ 1.1 & if\ B \\ 1 & if\ C \\ 1.2 & if\ D \\ 1 & if\ not\ A, B, C\ or\ D \end{cases}$$

Proposed Change

The effect of wind exposure is smaller on insulators than linkages, spacers and dampers. The modifier takes into account increased time of wetness associated with these environments (increase corrosion) and generally the higher likelihood of lightning strike (height above sea level)

$$ENV_{MOD} = \begin{cases} 1.2 & if\ A \\ 1.1 & if\ B \\ 1 & if\ C \\ 1.1 & if\ D \\ 1 & if\ not\ A, B, C\ or\ D \end{cases}$$

Second Stage Scoring for OHL Conductors

Original Table 34 in NGET NARA

Diameter of Aluminium Strands (*DAS*) (0-5)	
Average>=275	5
Average>100	2
Average>0	0

Proposed Change

Diameter of Aluminium Strands (*DAS*) (0-5)	
Less than 0%, or lower than the Min Spec of 3.18mm	5
Between 0 and 0.4 % (inclusive) Min Spec of 3.18mm	2.5
Greater than 0.4 % Min Spec of 3.18mm	0

Representations made to the licensee

A public consultation on the proposed changes were launched on 24th August 2020. The consultation was open through to midnight of 21st September 2020. Invitations to the consultation were sent by email to over 1000 interested parties; and the consultation documents were posted externally at the following link:

https://www.nationalgrid.com/uk/electricity-transmission/network-asset-risk-annex-nara-consultation

No responses concerning the content of the consultation were received.

Explanation of changes made as a consequence of representation

No further changes to report.

Better facilitating NOMs objectives

The proposed changes were identified during the Calibration, Testing and Validation exercise and have already been implemented.

The CTV exercise amongst other tests, included a what-if analysis by setting all the inputs to the Probability of Disconnection and Duration of Disconnection values to 1. These formulae as printed in previous releases of the NARA returned an unexpected output, indicating an error for this test. The proposed alterations correctly return the expected values for the same test.

Accurately expressing the Probability of Disconnection and Duration of Disconnection, for circuits with a low degree of redundancy i.e. those where $X_{min} = 1$ is necessary to ensure the correct expression of risk. Such circuits are rare within the NGET network and the materiality of this change is relatively minimal; however, it is acknowledged to be important to other networks.

The changes to the overhead line evaluation are in response to feedback concerning the End of Life methodology weightings; for the various component parts of an overhead line.

Altering the maximum end of life score for cases where conductor samples are not available; ensures that the highest priorities cannot be assigned in the absence of sampling. This avoids the risk of prematurely replacing a conductor system before all reasonable endeavours to evaluate condition are taken.

Alterations to component scores for Conductors and Fittings better represent the available condition data and experience of systems operating in different environments. Second stage OHL scoring were modified for more direct comparison with the technical specifications.

The proposed changes better express the risk and available condition data than were used in earlier developments of the NOMs methodology.

Presentation of data and other relevant information

Not applicable.

Changes to Network Replacement Outputs

No changes applicable.

Timetable for implementation

The consultation on the proposed changes closed at Midnight on 21st September.

These changes have already been applied in production environments; their effect included in data presented in the T2 business plan as well as subsequent supplementary questions.

The revised text for NARA issue 4 to be published within 28 days of submission of this report to the Authority, unless the authority issues direction not to implement the proposed modification as per 2L.12.