CONFIDENTIAL REPORT

Prepared for: Energy Networks Association

WS3-Ph2 Addendum V1.0

Bug fix 1.0 and data validation

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1 Introduction

This document outlines the changes within the updated version of the network model, available for download from the secure server.

It addresses the following two areas:

1. Bug fix affecting data exchange between the two main engines within the model (EA Technology and Frontier Economics)

2. Detail regarding reconciling the model results to reflect the results shown in the Workstream 3 report (82530)

This associated work with these two tasks has been carried out at EA Technology's expense, in line with the Warranty agreed with the delivery of the model.

2 Bug Fix

A bug was identified in the model, affecting the way in which data was parsed between the Frontier Economics and EA Technology engines within the overall model.

This bug led to it being necessary to repeatedly run the model to obtain results, rather than this process happening automatically as it was intended to do.

The bug has been identified, and removed with the model being robustly tested to ensure that all paths via which data is exchanged do not exhibit this behaviour, and they all perform as expected.

This bug has been fixed as part of the warranty for the software at no cost to the Network Operators.

3 Discrepancy Between Model and Report Results

3.1 Overview

It was been brought to EA Technology's attention that when running the software model, the results obtained differ from those stated in the final report produced as part of this project.

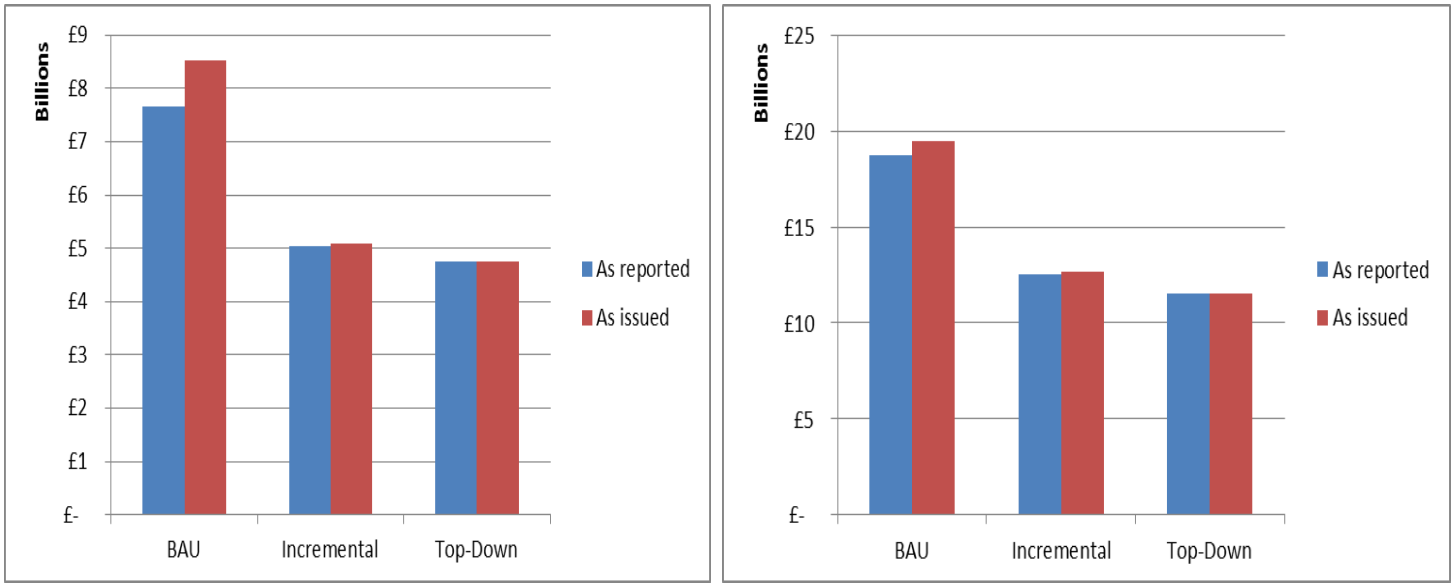
This has been investigated and the reason for this difference has been established. The results provided by the model are the correct results. In the final stages of model testing and report preparation, the values ascribed to the necessary amount of load to give rise to a 1% change in voltage on a network passed through several iterations. The final values used for these parameters were determined via studies carried out using IPSA (system modelling software) and are appropriate to the feeders characterised within the model.

However, the values used for some of the calculations in the report relied upon different (less accurate) figures for this voltage change analysis. This has led to the situation occurring where some of the figures in the results section of the report are not wholly reflective of the final released model. While the materiality of this remains fairly low, the key points regarding this situation are described in the following section.

3.2 Updated Results

The following figures illustrate the differences between the reported results (as per the final report for the Workstream 3 Phase 2 activity) and the results obtained from the released version of the model. While there is some variation in the level of investment required under BAU, when considering the smart strategies (incremental and top-down), the level of change is extremely small and in the case of top-down could be considered as within the noise of the model calculation.

Figure 1 illustrates the level of investment required under each investment strategy, when considering the default modelled scenario (Scenario 1) to 2030 and 2050 in terms of discounted totex.



(a) Investment to 2030 **(b) Investment to 2050**

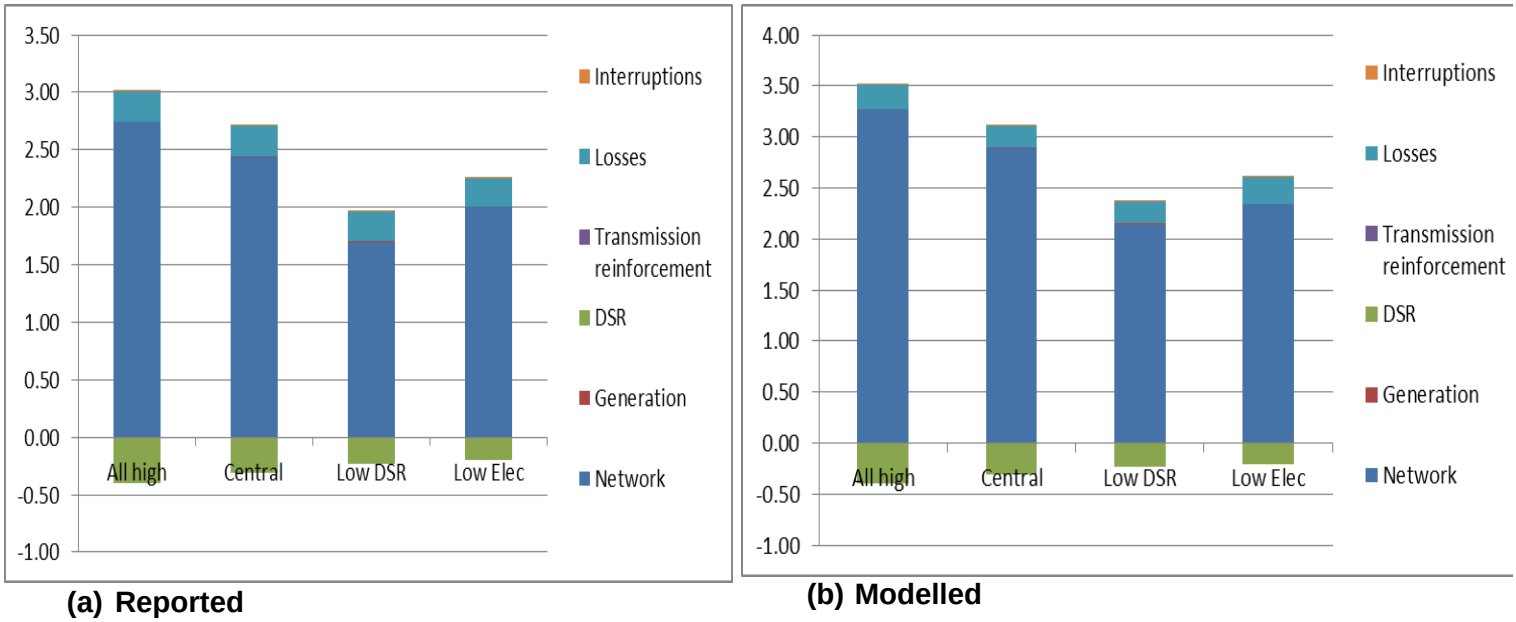
Figure 1 Discounted totex investment for the two cases (those in the report and the model)

The level of change exhibited within these graphs is summarised in the following table, indicating that while the change in figures has a significant effect on the BAU investment strategy, the implications for smart strategies are small. The reason for this is that any change is concerned with the need to invest to relieve a voltage problem. Under the BAU case, this necessitates some quite considerable investment (owing to the limited options available) while under the smart strategies, the solutions are more widespread and cost-effective resulting in only small changes to the overall investment profile.

Table 1 Changes in investment levels for various strategies from the reported figures

Investment Strategy	Change in investment to 2030 from reported figures (%)	Change in investment to 2050 from reported figures (%)
BAU	**11.18**	**4.04**
Incremental	**0.92**	**0.65**
Top-Down	**0.24**	**-0.22**

When considering the overall net benefits position relating to the use of smart strategies as against the conventional investment strategy, the position is slightly more favourable in terms of the released model, as opposed to the reported values. Figure 2 shows the relative net benefits positions for the reported and modelled cases for each scenario.



(a) Reported **(b) Modelled**

Figure 2 Net benefits of deploying smart strategy as against BAU; shown for reported results and modelled network in £billions

3.3 Replication of Reported Results

As previously stated, the version of the model currently released to Network Operators contains the correct figures, and these should continue to be used for all analysis carried out with the model.

However, should any Network operator wish to verify the results against those contained within the report, this can be done by simply inserting the values shown in Figure 3 (below) into the 'Network Details' sheet within the model. (This can be supplied as an Excel file should any Network Operator wish to undertake this task.)

Upon running the model, the results obtained will mirror those in the final report, but the model should then be returned to its released state to allow the appropriate analysis of individual licence areas.

	Voltage Headroom	Voltage Legroom	kW/%	Starting Fault Level	Fault Level Headroom
EHV1 Urban Underground Radial	20%	20%	9,600	562.5	750
EHV2 Urban Underground Meshed	20%	20%	9,040	712.5	750
EHV3 Suburban Mixed Radial	20%	20%	4,400	487.5	750
EHV4 Suburban Mixed Meshed	20%	20%	3,600	637.5	750
EHV5 Rural Overhead Radial	20%	20%	1,200	262.5	750
EHV6 Rural Mixed Radial	20%	20%	2,000	300	750
EHV7	20%	20%	3000	637.5	750
EHV8	20%	20%	3000	637.5	750
HV1 Urban Underground Radial	10%	10%	6100	187.5	250
HV2 Urban Underground Meshed	10%	10%	5200	200	250
HV3 Suburban Underground Radial	10%	10%	3900	150	250
HV4 Suburban Underground Meshed	10%	10%	3300	187.5	250
HV5 Suburban Mixed Radial	10%	10%	440	150	250
HV6 Rural Overhead Radial	10%	10%	280	75	250
HV7 Rural Mixed Radial	10%	10%	800	87.5	250
HV8	10%	10%	300	165	250
LV1 Central Business District	1%	15%	40	20	100
LV2 Dense urban (apartments etc)	1%	15%	40	17	100
LV3 Town centre	1%	15%	40	20	100
LV4 Business park	1%	15%	40	20	100
LV5 Retail park	1%	15%	40	20	100
LV6 Suburban street (3 4 bed semi detached or detached houses)	1%	15%	40	15	100
LV7 New build housing estate	1%	15%	40	15	100
LV8 Terraced street	1%	15%	40	15	100
LV9 Rural village (overhead construction)	1%	15%	40	12	100
LV10 Rural village (underground construction)	1%	15%	40	12	100
LV11 Rural farmsteads small holdings	1%	15%	40	10	100
LV12 Meshed Central Business District	1%	15%	40	35	100
LV13 Meshed Dense urban (apartments etc)	1%	15%	40	30	100
LV14 Meshed Town centre	1%	15%	40	35	100
LV15 Meshed Business park	1%	15%	40	40	100
LV16 Meshed Retail park	1%	15%	40	40	100
LV17 Meshed Suburban street (3 4 bed semi detached or detached houses)	1%	15%	40	30	100
LV18 Meshed New build housing estate	1%	15%	40	30	100
LV19 Meshed Terraced street	1%	15%	40	30	100
LV20	1%	15%	40	40	100

Figure 3 Extract from 'Network Details' sheet necessary to replicate results contained within report

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