SP Electricity North West

QUEST

Revised Post Project QUEST Business & Carbon Benefits Cases

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Date issued: 04/12/2025

Document number: 200952 67C

1. DOCUMENT ISSUE CONTROL

Document name: **Revised Post Project QUEST Business & Carbon Benefits Cases**

Document number: **200952 67C**

Version	Issue Date	Author	Reviewed by	Approved by	Description	DUR #
A	28/11/2025	Yunus Cem Duman	Colin MacKenzie	Colin MacKenzie	Initial issue	9418
B	01/12/2025	Yunus Cem Duman	David Conkie	Kiera J. Todd	Updated issue	9421
C	04/12/2025	Yunus Cem Duman	Colin MacKenzie	Kiera J. Todd	Updated issue	9434

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CONTENTS

FIGURES

TABLES

2. EXECUTIVE SUMMARY

This version of the "Business and Carbon Benefits Cases – SGS Update" document is for use by others outside of SP Electricity North West (SP ENW) and includes summary details of the Smarter Grid Solutions (SGS) updates to the original benefits calculations made at the NIC application stage in 2020.

SGS has updated the QUEST Project Business and Carbon Benefits Cases with changes agreed with SP Electricity North West. SGS has updated various technical and monetary inputs to the previous business case calculations. The updated calculations use the latest DFES data published in 2024 along with other updated information agreed with SP ENW.

SGS updated the DFES scenario inputs, carbon emission intensities and price uplifts since the business case prepared in 2020.

SGS has also applied various sensitivities such as voltage-demand relationship (Kp values), and various DFES scenario inputs to observe the effect on the monetary equivalent estimations.

Comparisons between the 2020 NIC application stage benefits analysis and the post QUEST project completion benefits assessment reflect that QUEST will deliver the benefits estimated in 2020. QUEST has also proven that additional voltage reduction benefits of 3.5% above CLASS LCNF findings are achievable rather than the 2.5% estimated at the NIC application stage. This is reflected in an increase in the estimated GB benefits anticipated following a rollout of QUEST.

3. INTRODUCTION

The QUEST Business and Carbon Benefits case that was produced for the NIC application in 2020 has been updated reflecting the price changes and DFES scenario changes towards the end of the QUEST project (Years 2024/25).

The QUEST Business and Carbon Benefits are quantified by the NPV and relative economic calculations. The NPV calculation consists of two main calculation and result categories: SP Electricity North West network scale benefits and GB DNO scale benefits. The calculations focus on SP Electricity North West's network area and corresponding asset numbers and are then scaled to obtain GB scale results.

The NPV calculations are based on the following benefit subclasses: Network Capacity Release, Consumption Reduction, Losses Reduction and Carbon Benefits.

Capacity Release benefits are based on the estimated deferral years of the substation reinforcement costs from the release of capacity by considering the peak demand values for selected DFES scenario over the time period of the study, which is 2024-2050.

Consumption Reduction benefits are based on load reduction due to voltage reduction based on the voltage demand relationships, electricity consumption reduction and corresponding bill reduction for low voltage customers.

Losses Reduction benefits are calculated by the monetary values of the losses reduced in the network.

Carbon Benefits due to carbon emission reduction are calculated based on the electricity demand related carbon reduction and corresponding carbon prices forecast over the time period of the study (2025 to 2050).

The overall NPV figures are calculated by the sum of the contribution of each monetary benefit for each of the years in the study time period and summed by factoring the discount rate over the whole study period.

4. SGS UPDATES TO THE PROJECT BUSINESS AND CARBON BENEFITS AND RESULTS

4.1. Assumptions

When updating the NPV calculations, a number of assumptions have been made. The majority of these are described in the following.

Accommodating the latest updated DFES scenario input data into the NPV calculation, required the updated DFES scenario input data substation list to be adapted to match the substations listed in the existing NPV calculation.

The MPAN numbers are taken to be the same, no further addition has been made in the latest revised calculations.

When updating the voltage-demand relationship, it is assumed that there are no updates to the Kp values of MPAN numbers.

The NPV calculation discount rate has been kept as 3.5%, based on the most recent RIIO-ED2 Cost Benefit Analysis (CBA) Guidance published by Ofgem[1].

4.2. Results

The results from the updated NPV benefits calculation are provided in the following figures, with further details provided in ANNEX 1 - QUEST NPV model – SGS Update. The results presented use a voltage reduction percentage of "3.5%", Kp sensitivity of "Average", and the selected DFES scenario is "Best View". These settings represent an average view of the NPV calculations. These inputs can be changed and different results obtained by using the ANNEX 1 - QUEST NPV model – SGS Update.

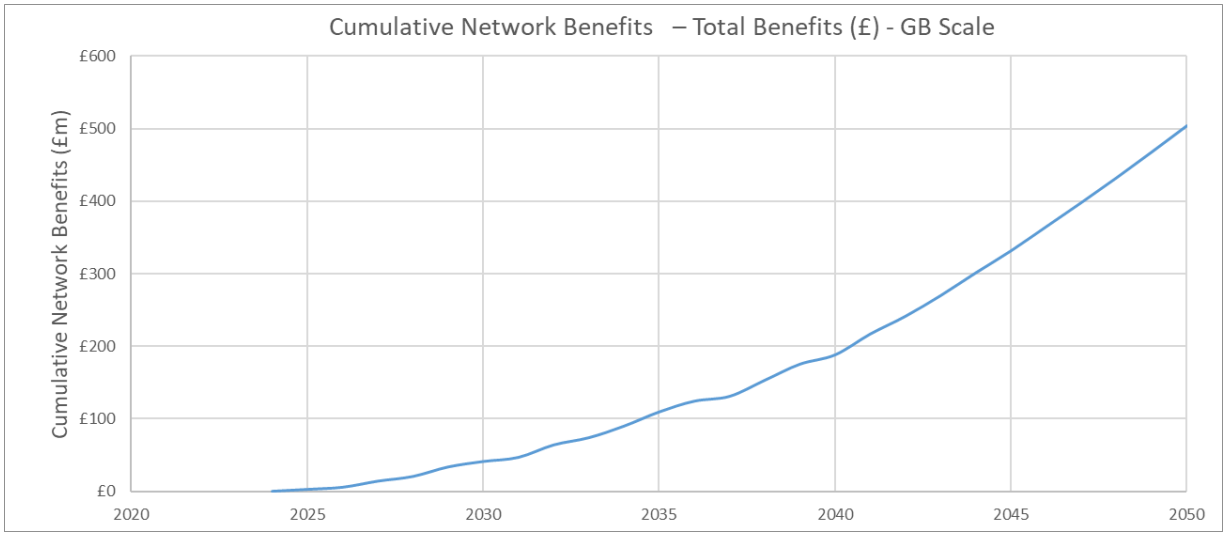

Figure 1: Cumulative Network Benefits – GB Scale

The Cumulative Network Benefits at a GB scale are shown in Figure 1. The total benefits from QUEST project are reaching 500m£ in the GB Scale.

[1] RIIO-ED2 Cost Benefit Analysis (CBA) Guidance, Appendix 1: Summary of updates to CBA Guidance, https://www.ofgem.gov.uk/sites/default/files/2021-10/RIIO-ED2%20Cost%20Benefit%20Analysis%20Guidance.pdf

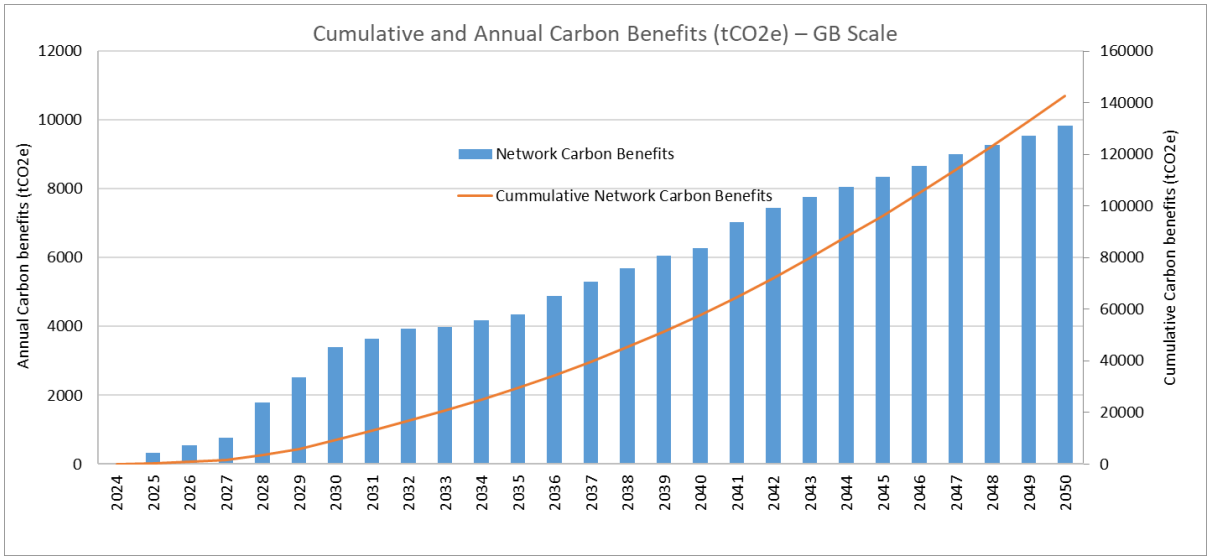

Figure 2. Cumulative and Annual Carbon Benefits (tCO2e) – GB Scale

The GB Network Carbon Benefits and Cumulative Network Carbon Benefits in tonnes of CO2e are given in Figure 2. The CO2 emission benefits have a continuous increase throughout the year 2050.

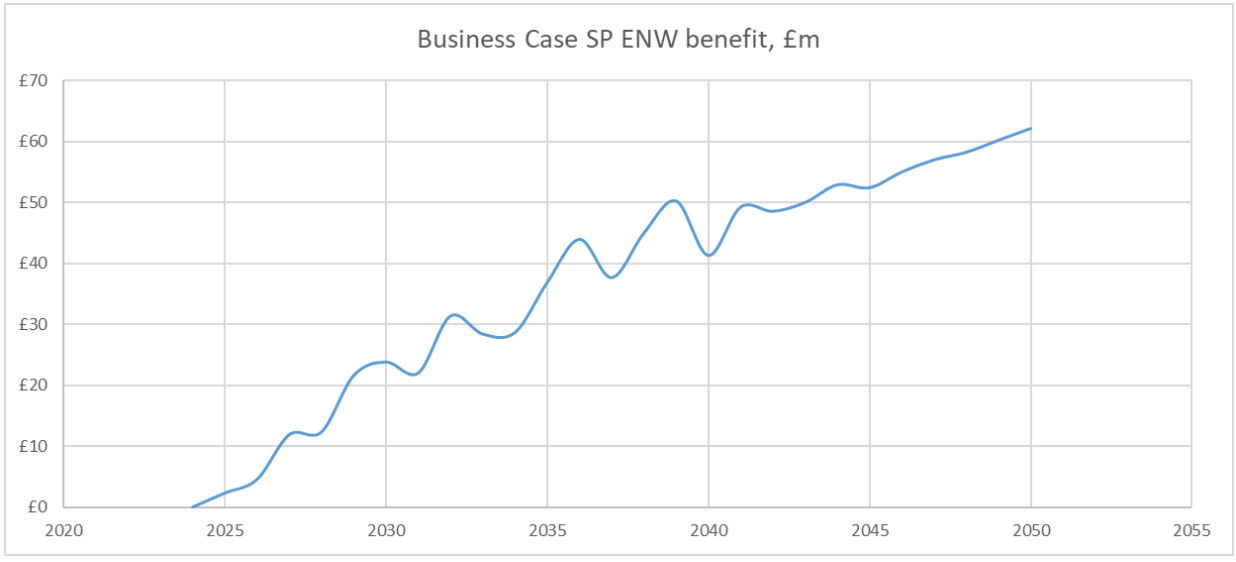

Figure 3: The SP Electricity North West Business Case Benefits (£m)

Figure 3 shows the Business Case Benefits for SP Electricity North West demonstrating a benefit overcoming £60m by 2050. The general trend of the business case benefits is the increase over the time with oscillations between the years 2026 and 2046.

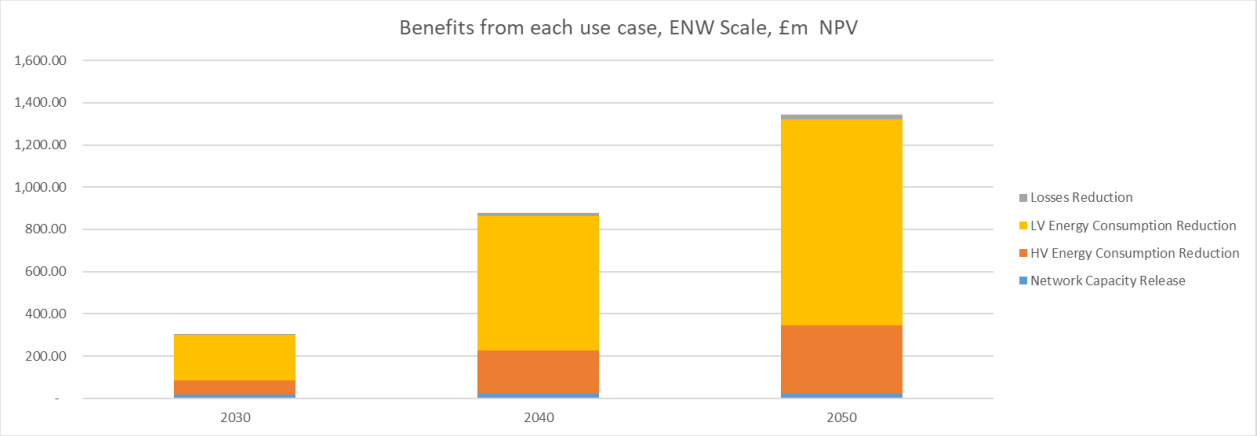

Figure 4: Benefits from Each Use Case, SP Electricity North West Scale 2024 NPV (£m)

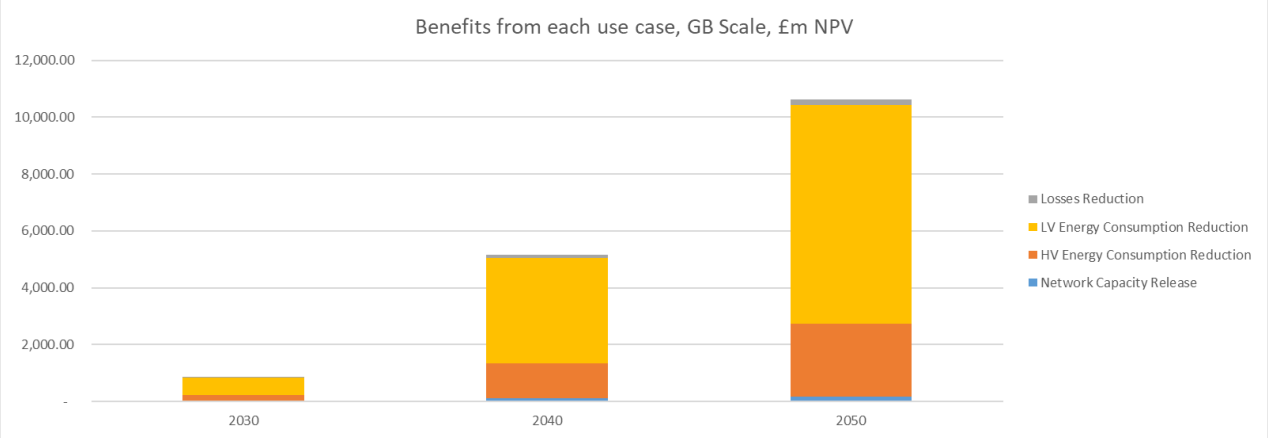

Figure 5: Benefits from Each Use Case, GB Scale 2024 NPV (£m)

Figure 4 and Figure 5 illustrate the benefits from each use case for 2030, 2040, and 2050 for SP Electricity North West scale and GB scale. The main portion of the benefits of both SP Electricity North West and GB scale is the LV Energy Consumption Reduction. It should be noted that the Network Capacity Release doesn't include the LV Capacity release since it has not been calculated.

Table 1: Financial Benefits Table

Scale	Benefit/Cost	Benefit £m NPV - post QUEST project			Benefit £m NPV - 2020 NIC application		
		2030	2040	2050	2030	2040	2050
SP ENW Scale Benefits	QUEST Benefits*	22.8	37.3	48.2	22.8	32.4	35.6
	QUEST Roll-Out Costs	2.55	5.04	5.94	1.5	2.6	3.0
	Net Benefits**	20.2	32.3	42.3	21.3	29.8	32.6
GB Scale Benefits	QUEST Benefits*	60.7	220.7	380.6	65.6	202.1	308.2
	QUEST Roll-Out Costs	26.30	91.66	106.79	14.6	37.1	41.5
	Net Benefits**	34.4	129.0	273.8	51	165.1	266.7
	Additional Benefits***	£10,237m by 2050			£4,300m by 2050		

*QUEST Benefits include network capacity release benefits, losses reduction and project costs.

**Net Benefits is the difference between QUEST Benefits* and QUEST Roll-Out Costs.

*** Additional Benefits refer to the consumption reductions benefits only for GB Scale.

Table 1 shows the comparison of total benefits of the QUEST project in 2030, 2040 and 2050 in both SP ENW scale and GB Scale for both the 2020 NIC application results and post QUEST project results. The benefit calculations show a better business case for post QUEST project results compared to 2020 NIC application case results. The updated DFES scenario inputs have an effect on the results, as well as the update on the voltage reduction figure. The selected DFES scenario (Best View) is the most likely scenario which represents a similar set of inputs to the 2020 NIC application case. The QUEST project has established higher achievable voltage reduction (3.5%) in the network compared to the bid stage calculations (2.5%) which has led to a stronger Post QUEST project business case as reflected in the NPV values in Table 1. This change increased the NPV figures and gives greater support to the business case for QUEST project when compared to initial bid case calculations.

Table 2: Carbon Benefits Table

Scale	Benefit/Cost	Benefit (tonnes of CO2e) - post QUEST project			Benefit (tonnes of CO2e) - 2020 NIC application		
		2030	2040	2050	2030	2040	2050
SP ENW Scale Benefits	Losses reduction (main business case benefits) *	4,749	11,848	19,195	2,161	5,286	8,373
	Energy consumption reduction (additional benefits) **	105,987	265,156	431,026	70,217	172,617	275,022
GB Scale Benefits	Losses reduction (main business case benefits) *	9,337	57,657	142,579	4,088	22,090	51,498
	Energy consumption reduction (additional benefits) **	208,468	1,292,443	3,210,079	82,461	451,901	1,070,380

*Losses reduction (main business case benefits) refers to the carbon benefits due to losses reductions by QUEST project.

Energy consumption reduction (additional benefits) refers to the carbon benefits due to energy consumption reductions by QUEST project. Table 2 shows the comparison of the total carbon benefits of the QUEST project in 2030, 2040 and 2050 including Losses reduction (main business case benefits)*, and Energy consumption reduction (additional benefits) at the SP ENW scale and GB Scale for the 2020 NIC application results and post QUEST project results. The difference between the carbon benefits of the 2020 NIC application and post QUEST project is significant. The main input that effects the changes is the voltage reduction figure, which is higher in post QUEST project with achievable voltage reduction (3.5%) in the network, compared to bid stage calculations (2.5%). Additionally, the post QUEST results show exponentially higher values for the loss reduction and higher consumption reduction achieved. Therefore, post QUEST project results show higher carbon benefits.

Another reason for the difference between post-trial and application calculations for “Energy consumption reduction (additional benefits) **” at GB scale is a correction to the original methodology. The original calculations incorrectly summed the ‘HV consumption reduction benefit’ and ‘loss reduction benefit’. This has now been corrected to sum the ‘HV consumption reduction benefit’ and ‘LV consumption reduction benefit’.

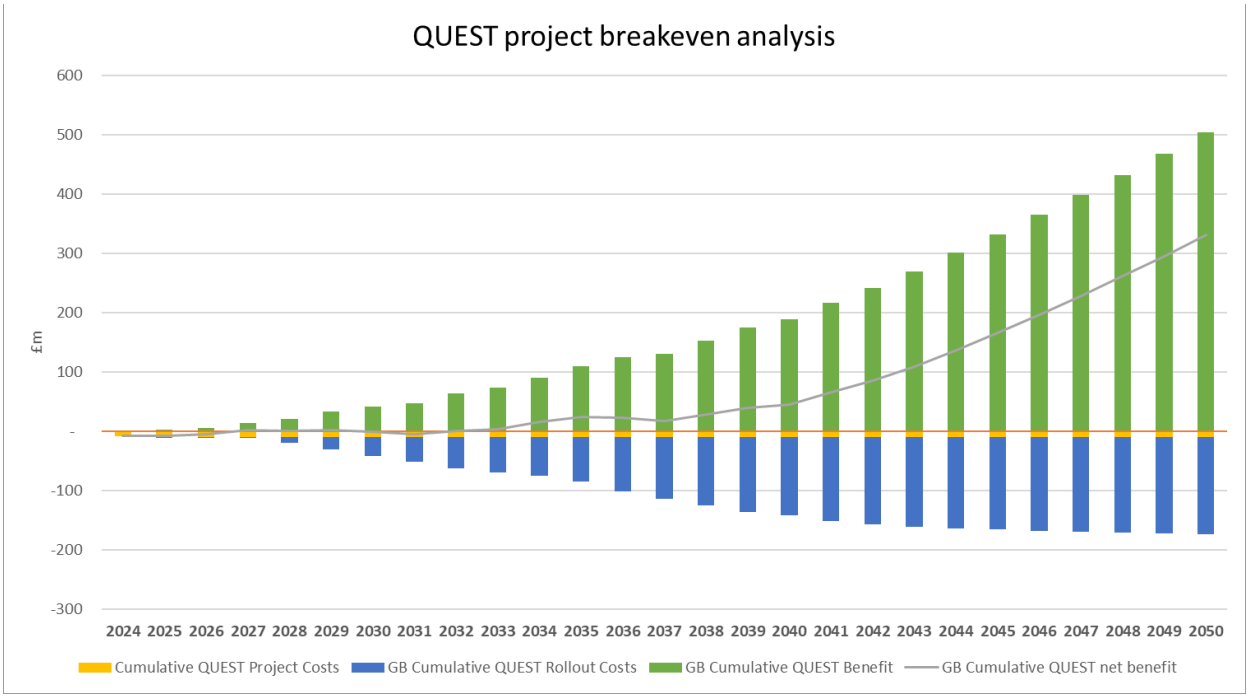

Figure 6: QUEST Project Breakeven Analysis - GB Scale

Figure 6 shows the breakeven analysis of the QUEST project at a GB level. As can be seen from the figure above, the QUEST project has the benefits starting from 2025 (green bars in Figure 6), the costs including project cost and rollout costs (blue bars in Figure 6), and the net benefits (grey line in Figure 6). The breakeven point of the project is the year 2032.

5. CONCLUSION

Comparisons between the 2020 NIC application stage benefits analysis and the post QUEST project completion benefits assessment reflect that QUEST will deliver the benefits estimated in 2020. QUEST has proven that additional voltage reduction benefits of 3.5% above CLASS LCNF findings are achievable rather than the 2.5% estimated at the NIC application stage. This is reflected in an increase in the GB benefits anticipated following a rollout of QUEST.

The updated Business and Carbon Benefits Cases following the QUEST trials reflect changes in the prices from 2020 to 2025 and consider the latest updated DFES scenario forecasts. The updated results show the breakeven point of the project is the year 2032. After 2032, there is a significant increase in the cumulative QUEST benefits at a GB scale. Although the network has grown slightly during the project QUEST Project, this growth has not materially impacted the underlying business case.

The QUEST project has established higher achievable voltage reduction (3.5%) in the network compared to bid stage calculations (2.5%) which has led to a stronger business case as reflected in the NPV values in Table 1. Additionally, the value of reduction in CO2 emission is significantly higher, see Table 2, mainly due to higher losses reduction on the HV network achieved compared to the NIC bid stage.

Following ~£8 million of investment[2], QUEST has proven its value for investment establishing potential GB benefits in excess of £250m by 2050.

While the DFES has evolved during the QUEST project, the scenario used for both the initial NIC application and post project are consistent and applicable. The results depicted in the updated benefits cases are based on a DFES “Best View” scenario. QUEST GB roll out costings have changed significantly during the project; therefore, appropriate adjustments have been made to account for this.

[2]https://www.enwl.co.uk/future-energy/innovation/key-projects/quest/quest-library/quest-full-submission/