How will SP ENERGY NETWORK'S RIIO-T3 INVESTMENT PLANS impact the wider UK economy?

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1 Introduction

This document provides additional information on the modelling approach used in the CEP policy brief reporting how the RIIO-T3 investment plans of SP Energy Networks are likely to impact the UK economy[i]. It also sets out a fuller set of results for the different scenarios considered. This appendix is aimed towards readers who seek more information associated with the key findings highlighted in the policy briefing without exploring the theoretical and mathematical formulations and specifications of our UKENVI computable general equilibrium (CGE) model of the UK economy. Such detail can be found in previous peer reviewed papers, including earlier UKENVI applications exploring the impacts of electricity network upgrades and expansion.[ii] We are in the process of developing a new paper for submission to a peer-reviewed journal on the work reported here.

2 Methodology

2.1 Overview of our economy-wide scenario simulation approach

The scenario simulation model is the multi-sector UKENVI dynamic CGE model developed by CEP to investigate how a range of policy and industry actions are likely to impact across the wider UK economy in different timeframes under alternative scenario and model configurations.[iii]

UKENVI incorporates the 2018 input-output (IO) data produced by the Office for National Statistics (ONS) that describe the structure of and interactions between all sectors of the UK economy[iv] as part of the social accounting matrix (SAM) the model is calibrated on.[v] IO multipliers – for example those generated from the ONS 2018 input-output data[vi] – can be used to estimate economy-wide impacts of things like investment spending. However, the CGE approach offers a more theory-consistent and rigorous approach to investigating both the dynamic adjustment of the economy and the implications of labour market and other constraints, particularly in the UK labour market, that will limit the extent of multiplier impacts predicted by IO analyses.[vii]

We have worked with colleagues at SP Energy Networks to ensure that the scenario input to our model effectively represents the investment profiles to be set out in their RIIO-T3 Business Plan in December 2024.[viii] The scenarios developed consider a range of potential triggers for wider economic responses, with particular focus on investigating:

- How network investment profiles may enable the transitory expansion of other UK sectors where a share of investment spending is directed (e.g., construction and manufacturing of equipment required to deliver network expansion) and the supply chains of those sectors.
- How investing ahead of time and recovery of the total investment cost affects average energy bills and the wider economic picture through dynamic impacts on the cost of living and doing business in the UK.
- How more sustained impacts on the trajectory of income generation (reflected in gross domestic product, GDP) – and, thus, growth and prosperity across the wider economy – may be enabled by how expansion of transmission networks within the electricity industry supports projected increases in the demand for electricity.

All scenarios are considered in the context of how prevailing economic constraints and conditions – with particular focus on the UK labour market, reflecting the need for and challenge of skills and workforce development and opportunities for existing and new/future entrants – may affect the additionality of outcomes associated with electricity network expansion. That is, we focus on the likelihood of some extent of displacement of other activities where cost and price pressures are triggered by investment in and operation of expansions in the network to meet increased demand for electricity going forward. In this regard, while we focus on SP Energy Network's investment plans, we also give attention to the fact that other TOs will also be extending their network provision through the RIIO-T3 period.

In reporting and explaining results we focus on the drivers and net outcomes for key macroeconomic variables such as GDP, employment and the consumer price index (CPI), the sectoral composition thereof, and add results and insight on the distributional impacts for households. All results are reported in the context of the impacts on key prices variables such as impacts on energy bills and the consumer price index (CPI).

2.2 The scenarios simulated

2.2.1 Modelling the investment on the transmission network

According to the information provided to our project by SP Energy Networks, the overall cost of the proposed investment on the transmission network during the RIIO-T3 period will reach £10.6 billion in 2023/24 prices. **Table A.1** shows how the spending is expected to be distributed across the 5 years of the RIIO-T3 period.

Of the total £10.6 billion, 1.82 billion will be used to for investment not related to expanding the network, including repair and replacement of existing equipment. The engagement with SP Energy Networks has highlighted that the latter will largely involve imported equipment, therefore, we only model the recovery of the cost of this equipment rather than its manufacturing.[ix] Thus, we focus attention on the £8.82 billion spending directed to expanding and upgrading the network.

The information provided by SP Energy Networks highlights their estimation that the investment during RIIO-T3 will increase the regulated asset value (RAV) of their transmission network from £4.4 billion to £11.6 billion; an increase by 163.64%.

An informational limitation of the UK IO tables, which constitute a central element of the structural database of our UKENVI CGE model, is that these ONS data only report for an entirely aggregated electricity sector, encompassing the generation, transmission, distribution and retail components. The main implication is that we need to scale SP Energy Networks' investment to reflect the expected change in the aggregated electricity sector.

We estimate that Transmission and Distribution networks have 58.23% of the total capital of the electricity sector, with generation accounting for 41.71% and retail 0.06%.[x] Moreover, according to information publicly available from Ofgem[xi], SP Energy Networks owns a 12.38% share of the transmission RAV, which will increase to 27.13% post-investment (assuming that only SP Energy Networks expands their network). Based on these figures, we calculate that the proposed SP Energy Networks will expand the capital of the electricity sector, all other components remaining fixed, by 4.89%. **Table A.1** shows how the transmission network will expand, i.e. the capital of the sector will increase over time, until it becomes 4.89% larger compared to the beginning of RIIO-T3.

We also consider an illustrative case where all TOs expand their network to the same extent as SP Energy Networks, i.e. each adding 163.64% to their RAV. In this case, the capital of the electricity sector will increase by 28.33%, assuming of course no changes in the capital of generation, distribution or retail. This is a necessary scenario assumption here, to isolate the impacts emerging from the changes in the transmission network, either by SP Energy Networks or by all transmission network owners (TOs). Using the aforementioned assumptions, we consider the following scenarios:

The central SP Energy Networks 'planned investment' case (Scenarios 1-2):

- **1A** SP Energy Networks RIIO-T3 investment and 45-year cost recovery – constrained labour market (the central case)
- **1B** SP Energy Networks RIIO-T3 investment and 35-year cost recovery – constrained labour market (variant on the central case)
- **2A** SP Energy Networks RIIO-T3 investment and 45-year cost recovery – all worker or skills shortages resolved
- **2B** SP Energy Networks RIIO-T3 investment and 35-year cost recovery – all worker or skills shortages resolved

TABLE **A.1** Distribution of SPEN investment spending over RIIO-T3

Year	2026/27	2027/28	2028/29	2029/30	2030/31	Total
Allocated amount (£ billion, 2023 prices)	2.1	2.2	2.3	2.2	1.8	**10.6**
Annual share	19.94%	20.32%	21.28%	21.08%	17.37%	
Annual share of network expansion	0.98%	0.99%	1.04%	1.03%	0.85%	**4.89%**
Accumulation of network expansion	0.98%	1.97%	3.01%	4.04%	4.89%	

Other SP Energy Networks investment scenarios:

3 SP Energy Networks – no network investment

4 SP Energy Networks – reactionary network investment

'All UK TO' variant of the 'planned investment' case:

5 All UK TOs investment and cost recovery – constrained labour market

2.2.2 The repayment of the investment costs

Consulting with SP Energy Networks, we established that investment costs will most likely be recovered via the electricity bills of all users (residential, industrial, commercial and electricity generators). We therefore model the cost recovery as an increase in price of electricity, and thus user electricity bills, sufficient to cover the investment cost. This approach socialises the cost of the network investment across all UK users, both for the cases where we only consider the SP Energy Networks' investment and when we model an investment by all the UK TOs.[xii]

For the SP Energy Networks' investment in the 'planned investment' considered in Scenarios 1-2, the amount to be recovered is £10.6 billion. In **Scenario 5**, where we extend to speculate as to how all TOs may invest in the transmission network, the cost in this case is £85.8 billion – as set out above, here we assume the same '£ million spending/£ millions of RAV created' ratio as for the SP Energy Networks' investment.[xiii] **Table A.2** shows how these costs are recovered over time. Under **Scenario 3** (reactionary investment), the model endogenously determines how much investment is required and the associated adjustment in prices and returns to capital.

The figures in **Table A.2** build in the assumption (informed by discussion with SP Energy Networks) that a 10% share of the investment spending each year needs to be repaid in the same year. Therefore, out of the £2.11 billion spent by SP Energy Networks in 2026 (see **Table A.1**), £211.8 million need to be recovered within the same year. The remaining £1.91 billion are recovered over 35 or 45 years, corresponding to the lifespan of the assets installed.

2.2.3 Changes in demand for electricity

The proposed investment by SP Energy Networks comes in response to projected changes in the demand for electricity in the years to come. Our colleagues at SP Energy Networks have indicated that the investment proposal has been informed by the National Grid Electricity System Operator's (NESO) 2023 Future Energy Scenarios (FES), specifically the 'Leading the Way' scenario.[xiv] FES scenarios describe the evolution of demand for a wide range of sources, with our specific focus being on the electricity demand.[xv]

We use the FES information to model the evolution of electricity demand, with two important refinements. First, to inform our economic model, we convert the projected changes in physical energy units into changes in value of electricity sector's output. Second, we scale the change to correspond to the size of the investment we consider in each scenario. Therefore, when we consider only the SP Energy Networks' investment we model 7.51% of the total change in electricity demand, as this will be the estimated share of total electricity sector's capital corresponding to SP Energy Networks' owned transmission network, once the investment has been implemented. Similarly, when we model an

TABLE

A.2 Annual cost recovery of investment in transmission network during RIIO-T3
(all values in £ million, at 2023 prices)

Year	2026	2027	2028	2029	2030	2031-71	2072	2073	2074	2075
SPEN 45-year recovery	0.21	0.26	0.31	0.35	0.36	0.21	0.17	0.13	0.08	0.04
All TO 45-year recovery	1.71	2.09	2.52	2.87	2.91	1.72	1.37	1.03	0.66	0.30
	2026	2027	2028	2029	2030	2031-61	2062	2063	2064	2065
SPEN 35-year recovery	0.21	0.27	0.34	0.39	0.41	0.27	0.22	0.16	0.11	0.05
All TO 35-year recovery	1.71	2.18	2.72	3.17	3.32	2.21	1.77	1.32	0.85	0.38

TABLE

A.3 Changes in electricity demand compared to base year 2025

(all values in £ million, at 2023 prices)

Year	2027	2028	2029	2030	2031-onwards
FES informed demand change for SP Energy Networks investment only					
Non-household demand	793.96	1,121.60	1,520.46	1,953.24	2,425.53
Lowest income households HG1	-7.54	-4.25	0.97	7.92	17.46
Lower income households HG2	-10.22	-5.76	1.31	10.74	23.66
Middle income households HG3	-10.81	-6.09	1.39	11.36	25.02
Higher income households HG4	-11.86	-6.68	1.52	12.45	27.44
Highest income households HG5	-13.32	-7.51	1.71	13.99	30.82
FES informed demand change for all TO					
Non-household demand	4,822.70	6,812.90	9,235.68	11,864.54	14,733.35
Lowest income households HG1	-45.82	-25.82	5.88	48.12	106.03
Lower income households HG2	-62.11	-35.00	7.97	65.23	143.72
Middle income households HG3	-65.68	-37.01	8.43	68.98	151.98
Higher income households HG4	-72.02	-40.58	9.24	75.64	166.67
Highest income households HG5	-80.91	-45.59	10.38	84.98	187.23

investment by all TOs, we consider 45.63% of the total change in electricity demand. **Table A.3** summarises the changes in electricity demand we consider for different scenarios.

Note here that we model the demand change from 2027 onwards, as the changes in the sector's capital from the 2026 investment begin to materialise in 2027. Hence, it is from that point onwards that the new extended network can service additional demand. We only model the additional demand for the different household income groups in our model, as supported by the information available via FES.

The non-household demand is introduced as an exogenous increase in demand for electricity, so that we can capture how it affects the electricity price and the wider UK economy. Note also that we assume that the demand directly attributed to the network investment remains fixed after the end of RIIO-T3, despite FES projecting the demand until 2050. This decision was made on the basis that additional investment will be necessary post-2031, but we have no information to model that, and focus here on the impacts of the proposed RIIO-T3 investment and demand changes with that only. Thus, it is necessary to caveat all result in that the further forward in time we run our simulations the more caution should be applied in interpreting results, noting that, generally, UKENVI scenario simulation results should be taken as what may transpire if nothing else changes.

Finally, we conduct some further sensitivity analysis where we estimate, based on the data informing our CGE model, what demand could be, theoretically, supported by the proposed investment. Effectively, we simulate a scenario where there is no excess investment compared to the changes in electricity demand. We conduct this analysis to explore how different the outcomes would be compared to the central case, and the changes in demand follow the evolution of investment (see **Table A.1**) rather than the FES scenarios.

3 Results of economy-wide scenario simulations around SP Energy Networks RIIO-T3 investment plans

3.1 Central case, with variation as to timeframe of cost recovery

Key Finding #1 reported in the policy brief focuses on how the RIIO-T3 investment plans of SP Energy Networks would drive and sustain wider social and economic benefits in the near and long term. Here we focus on **Scenario 1** as set out in **Section 2.2.1**, which encompasses our central case 'planned investment' scenario, labelled **Scenario 1A** 'SP Energy Networks RIIO-T3 investment and 45-year cost recovery – constrained labour market (the central case)'. While it is only referred to briefly in the policy brief, we have also run a 35-year cost recovery variant, **Scenario 1B**, which we consider in more detail here.

In either case, there are three drivers of wider economic expansion through which different household income generation sources, and therefore household spending, are affected:

1. The activity to expand the network from 2026 (both within the UK sectors where SP Energy Networks' investment spending is concentrated and the upstream supply chains thereof). This has largely transitory impacts linked to the RIIO-T3 investment period, which runs to 2030[xvi], though there are ongoing maintenance requirements associated with such a capital-intensive system.
2. The increased electricity production enabled in meeting the additional projected demand (and, again, associated supply chain activity). This is more of a sustained driver as with the third.
3. What happens to energy bills, where upfront planned investment means that supply capacity in the electricity network grows ahead of

TABLE

A.4 Comparative economy-wide impacts of SP Energy Networks investment plans for different cost recovery periods (values in 2023 prices)

Net economy-wide gains	Scenario	2030	Long term
GDP	**Sc1A** planned investment & 45y recovery	1.04 billion	2.00 billion
	Sc1B planned investment & 35y recovery	1.03 billion	2.00 billion
Jobs (full-time equivalents)	**Sc1A** planned investment & 45y recovery	7,447	11,459
	Sc1B planned investment & 35y recovery	7,283	11,459
Average annual real household income gain	**Sc1A** planned investment & 45y recovery	£46.78	£60.21
	Sc1B planned investment & 35y recovery	£45.68	£60.21
Consumer Price Index (CPI)	**Sc1A** planned investment & 45y recovery	0.09%	0.06%
	Sc1B planned investment & 35y recovery	0.09%	0.06%
Average electricity bills	**Sc1A** planned investment & 45y recovery	-0.005%	-0.279%
	Sc1B planned investment & 35y recovery	0.031%	-0.279%

demand, exerting moderate downward pressure on energy bills. For example, in **Scenario 1A**, the drop in average electricity bills is 0.005% in 2030, increasing to 0.12% after investment activity has ended (in 2031) and further expanding to 0.279% after the conclusion of the cost recovery period.

The presence of persisting worker and skills shortages in the UK labour market in both these scenarios will limit the extent of expansion supported by the first two of these drivers, and the adjustment paths of GDP and employment. We return to issue in **Section 3.3**, when we consider **Scenario 2** (what could happen if all skills and worker shortages are resolved).

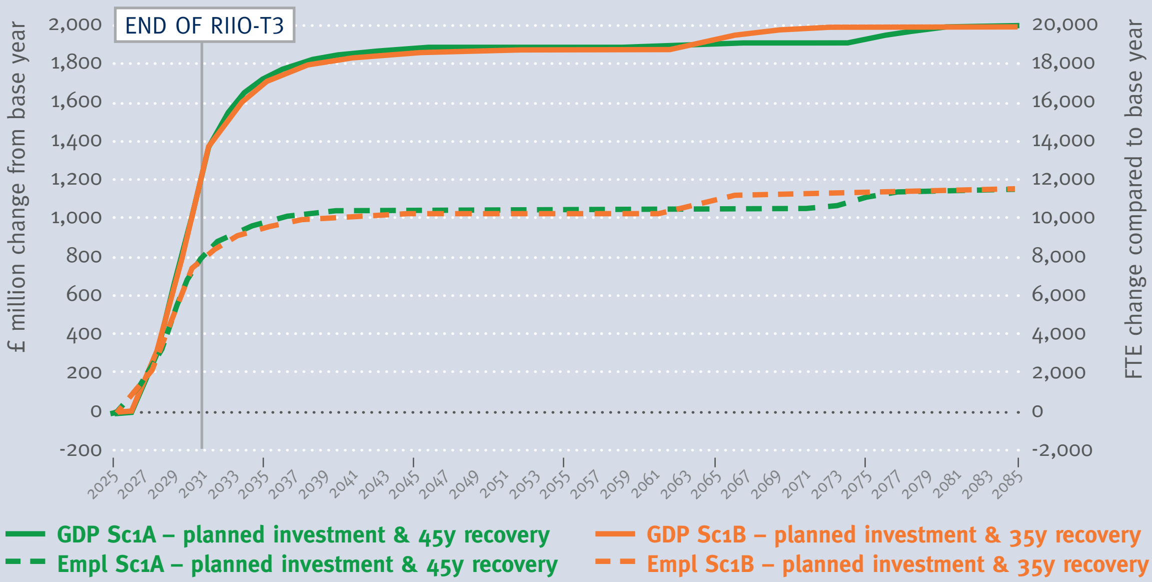
Here the key point is that any expansionary process in the presence of supply constraints will trigger wage-cost pressure across the economy, which will impact real outcomes, including for UK households, through the consumer price index (CPI), and that it is important to interpret all results reported as net impacts, where the gains reported in **Table A.4**. involve displacement of activity in some sectors of the economy.

That the long-run outcomes in the final column of **Table A.4** are the same for **Scenarios 1A** and **1B** reflects the picture in **Figure A.1** where the trajectories of net uplift in UK GDP and employment ultimately converge. Initially, where investment costs are recovered more quickly, within 35 rather than 45 years, economy-wide gains are marginally eroded due to the slightly greater increase in energy bills required to recover a higher share of the overall spending more quickly. However, over time, the fact that the cost recovery process ends 10 years earlier, slightly accelerates the adjustment to the long-term outcomes. **Table A.4** reports the headline GDP and employment figures (adding the 35-year investment recovery case to the data in **Table 1** from the Summary), while **Figure A.1** reports the relative adjustment paths for these two headline macroeconomic variables, with the timeframe of cost recovery having limited impacts on the trajectories.

Figure A.2 and **Figure A.3** report the composition of the net employment and GDP gains respectively, where the latter equates to gross value-added generated under the income measure of GDP. This reflects the impacts of the wage-cost driver price pressures under our central constrained labour supply assumption, manifesting through the displacement of activity in multiple sectors where the wider economy expansion is concentrated on the production side of the economy in the electricity and construction industries.

FIGURE

A.1 **UK GDP and employment trajectories due to SP Energy Networks RIIO-T3 investment on transmission network (values in 2023 prices) – Scenarios 1A and 1B** (central 'planned investment' case and 35-year cost recovery variant)



FIGURE

A.2 Sectoral breakdown of employment changes due to SPEN investment on the transmission network (Scenarios 1A and 1B for planned investment)

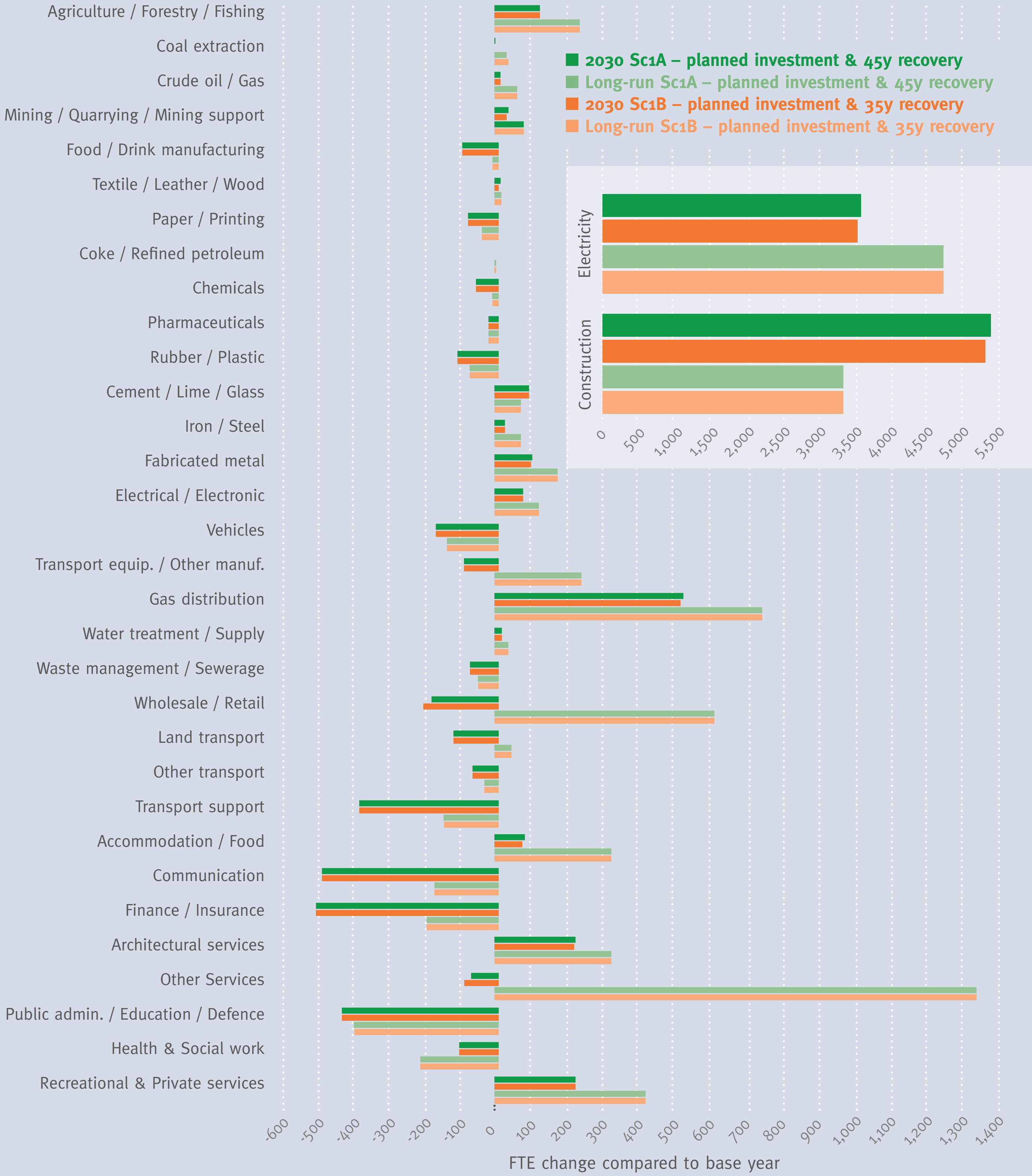


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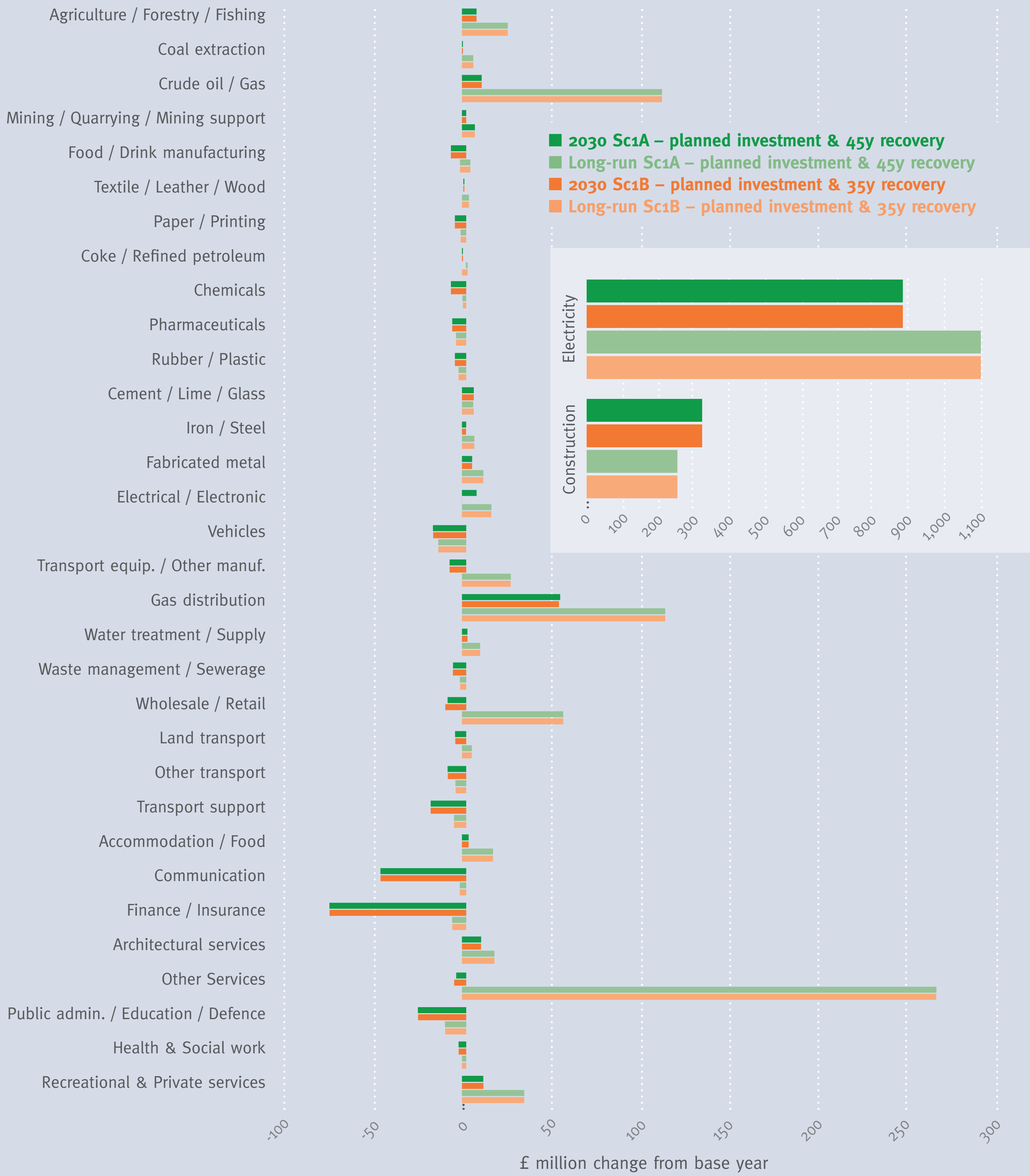
FIGURE

A.3 Sectoral breakdown of GDP changes (sectoral gross value-added) due to SPEN investment on the transmission network (values in 2023 prices) (Scenarios 1A and 1B for planned investment)



The investment in the expansion of the electricity transmission network has the potential to deliver positive outcomes across all households, regardless of their income level, but again subject to the impact of wage-cost pressures on the extent of expansion and with the real value of gains dependent on the Consumer Price Index (CPI) impact. Here the net outcome is net real income gains that ultimately grow to £60.21 per UK household per annum in the long run.

Whether the cost recovery is completed within 35 or 45 years has negligible effects on the average real income gains to UK households. A 35-year cost recovery marginally erodes the average real disposable income gains of households to £45.68 per household; a difference of just over £1 compared to the 45-year cost recovery case. One element driving this difference is what happens to electricity bills, where a 35-year recovery leads to a slight increase in electricity bills of 0.031% in 2030. However, this is not sufficient to drive a significant difference in the economy-wide prices, with the CPI increase under the 35-year recovery also around 0.089% in 2030. When the investment activity has been completed, we observe a small reduction in electricity bills of 0.08%, which is slightly smaller than the 0.12% reduction in the 45-year cost recovery case, again due to the higher amount recovered via the electricity bills on an annual basis.

Over time, even in the presence of persisting worker and skill shortages in the UK labour

TABLE

A.5 Comparative economy-wide impacts of alternative SP Energy Networks investment scenarios (values in 2023 prices)

Net economy-wide gains	Scenario	2030	Long term
GDP	**Sc1A** planned investment & 45y recovery (central case)	1.04 billion	2.00 billion
	Sc1B planned investment & 35y recovery (variant on the central case)	1.03 billion	2.00 billion
	Sc3 no network investment	**-0.34 billion**	**-1.08 billion**
	Sc4 reactionary investment	**0.12 billion**	**1.55 billion**
Jobs (full-time equivalents)	Sc1A	7,447	11,459
	Sc1B	7,283	11,459
	Sc3	**-5,121**	**-9,950**
	Sc4	**-122**	**8,357**
Average annual real household income gain	Sc1A	£46.78	£60.21
	Sc1B	£45.68	£60.21
	Sc3	**-£6.70**	**-£15.68**
	Sc4	**£17.06**	**£49.15**
Consumer Price Index (CPI)	Sc1A	0.09%	0.06%
	Sc1B	0.09%	0.06%
	Sc3	**0.09%**	**0.14%**
	Sc4	**0.10%**	**0.07%**
Average electricity bills	Sc1A	-0.005%	-0.279%
	Sc1B	0.031%	-0.279%
	Sc3	**1.536%**	**1.943%**
	Sc4	**0.924%**	**0.044%**

market, as the early cost-price pressures driven by the initial concentration of network expansion activity subside and the cost recovery period concludes, a sustained electricity bill reduction of -0.279% (after all investment costs are recovered) helps limit CPI pressure in supporting the sustained real household income gains. Thus, we can draw the conclusion that SP Energy Networks' RIIO-T3 investment plans supported drive and sustain economic growth processes.

3.2 Impacts of not investing through RIIO-T3 – no investment and reactionary investment cases

Key Finding #2 in the policy brief focuses on the outcomes of **Scenarios 3** and **4**, where we consider potential counterfactuals to SP Energy Networks proceeding with its RIIO-T3 investment plans. Despite the technical limitations that could affect the feasibility of the scenarios we consider here, the reactionary investment case (**Scenario 4**) could be viewed as broadly (though not specifically, in terms of how we model it) consistent with a regulatory approach of avoiding investment ahead of need, which is what is inherent in our central scenario (**Scenario 1A**).

We also consider alternative scenarios to the central case of 'planned investment' through RIIO-T3: an extreme case where SP Energy Networks does not invest at all and one where investment is entirely responsive to emerging demand (here assuming the FES 'Leading the Way' trajectory emerges in practice).

3.2.1 No network expansion (Scenario 3)

If we remind ourselves of the three drivers of wider economic expansion listed for **Scenario 1** in **Section 3.1**, the crucial difference in **Scenario 3** is that the first, activity to expand the network is not present. Thus, not only is there no boost associated particularly with construction supply chain activity, but the increase in electricity production that is the second driver needs to unfold without any increase in network capacity. This, in turn, causes an increase in electricity bills rather than the decrease that is the third identified driver of expansion in **Section 3.1**.

As shown in **Table A.5**, the **Scenario 3** outcome in terms of average electricity bills is a 1.536% increase by 2030, which knocks on to have negative implications for costs and prices across the economy, and the real disposable income of households. The impact on the CPI is limited by the fact that additional labour requirements are limited to delivering the electricity sector's own operational requirements in meeting increased demand, with only some net positive impacts in the electricity supply chain. As shown in **Figure A.5**, income generation in all other sectors of the UK economy contracts due to the net cost and price impacts being the only driver of changes in activity outside of the electricity sector. This, in turn translates to net GDP (and total employment) losses as the economy contracts in all timeframes, as reflected for **Scenario 3** in **Table A.5**.

3.2.2 Reactionary investment (Scenario 4)

The impact on electricity bills (the third driver of expansion in the planned investment scenarios in **Section 3.1**) is crucial in understanding the outcomes of **Scenario 4**. Here, there is activity associated with expanding the electricity network (the first driver of wider economy expansion). However, it happens later (and more incrementally) and entirely linked to the projected electricity demand increases in line with the FES 'Leading the Way' scenario, with the greater capacity enabled in producing electricity to meet higher demand (the second driver of wider economy expansion) also following later. Thus, the GDP and employment trajectories of the 'reactionary investment' in **Scenario 4** ultimately track those of the 'planned investment' in **Scenario 3**, as shown in **Figure A.6**, which replicates **Figure 1** in the policy brief.

However, what happens to the third driver of expansion – the impact on electricity bills – drives a wedge between the GDP and employment trajectories associated with planned and reactionary investment (**Scenario 1A** vs **Scenario 4**). Because the latter involves investment to expand supply capacity in the electricity network that happens after demand transpires, the electricity price/bill driver reverses and becomes a limiting or contractionary pressure on the extent of expansion. The average electricity bill results in **Table A.5** reflect the fact that the uplift in user bills is smaller in all timeframes under **Scenario 4** (reactionary investment) than in **Scenario 3** (no network investment). This, combined with the presence of the first driver and the capital assets of the electricity industry expanding under the second, enables net expansionary outcomes, but with the flip of the third driver constraining the expansion relative to what is observed with planned investment.

FIGURE

A.4 Sectoral breakdown of employment changes due to alternative SP Energy Networks investment scenarios

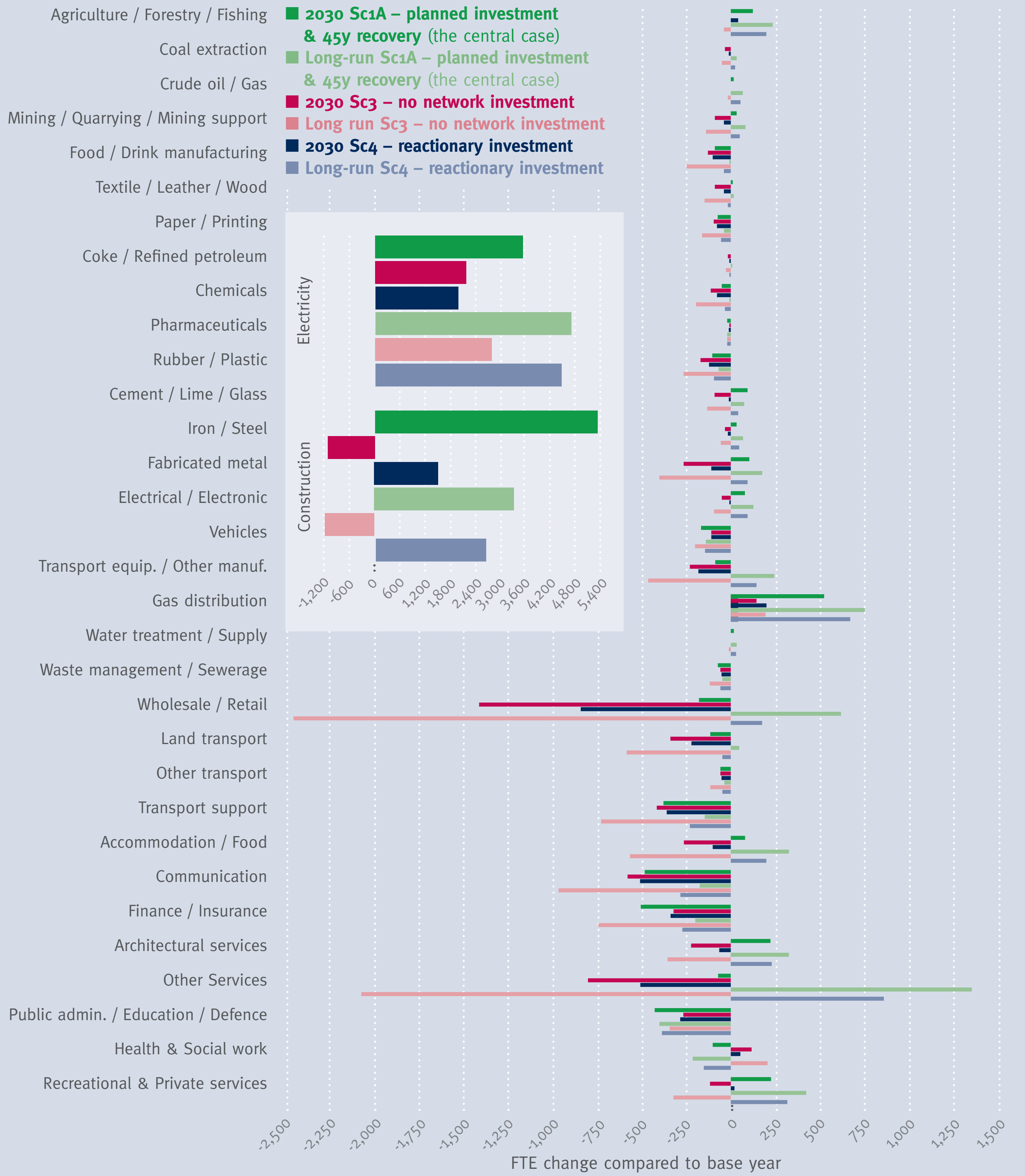


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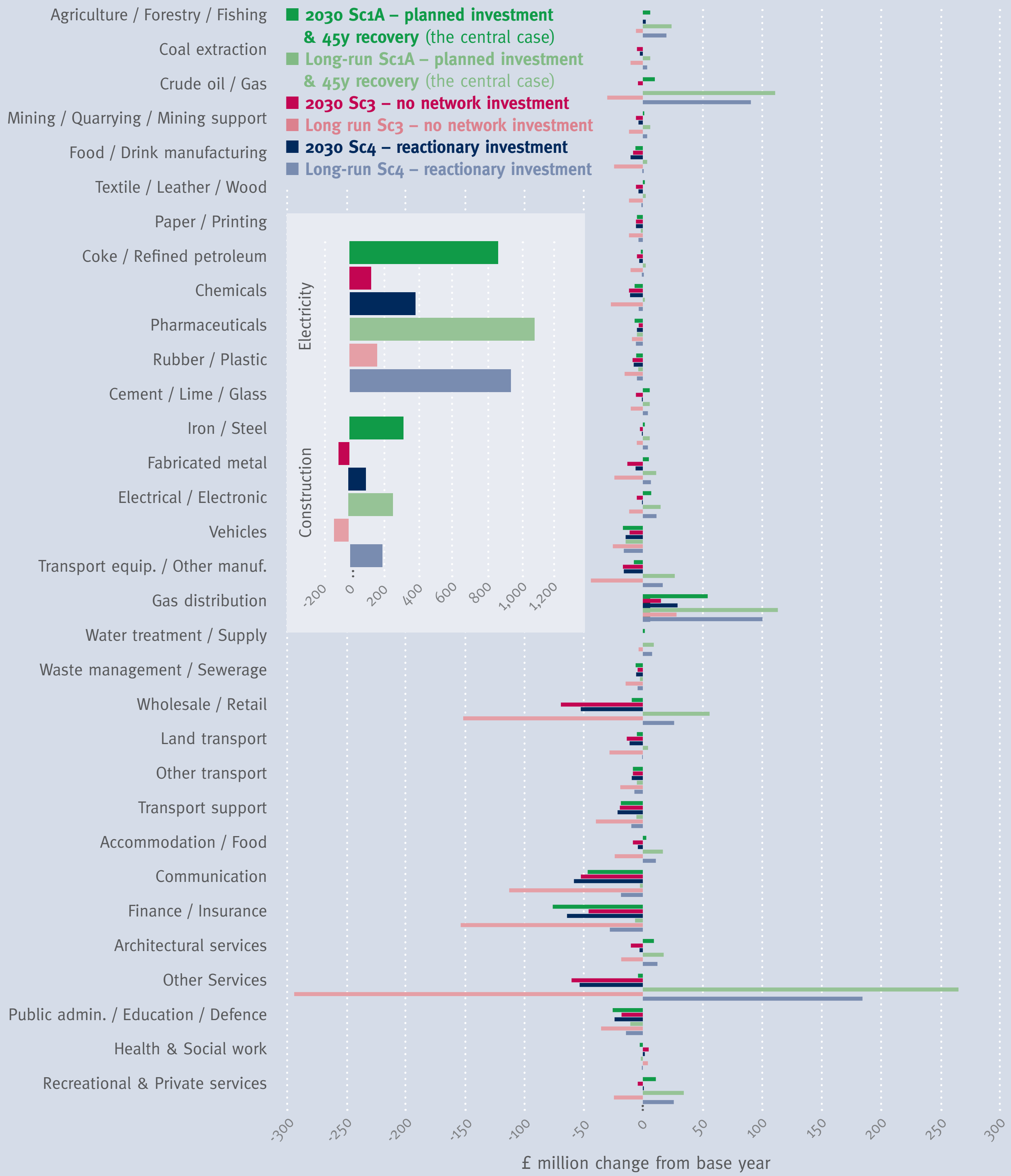
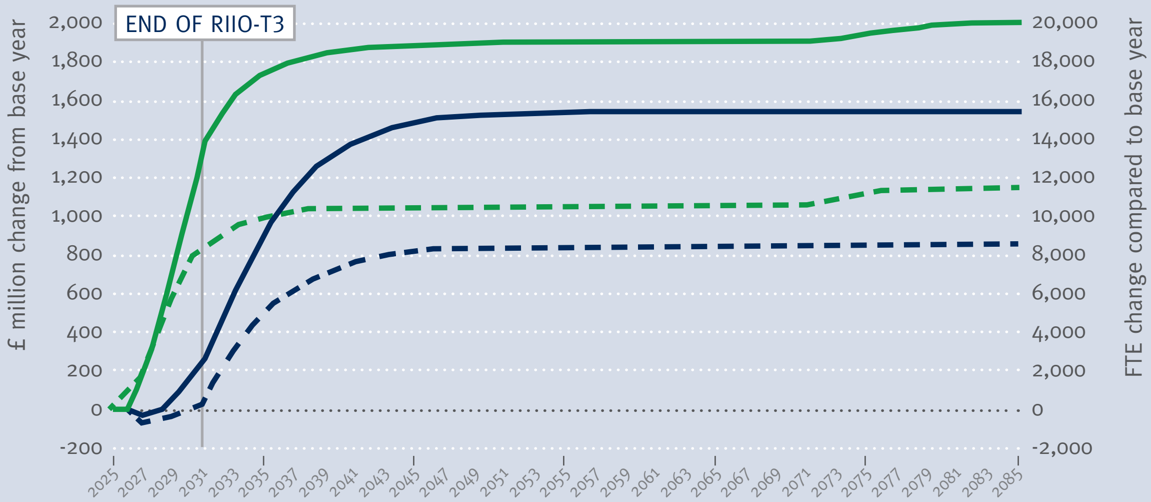
FIGURE

A.5 Sectoral breakdown of GDP (gross value-added) changes due to alternative SP Energy Networks investment scenarios (values in 2023 prices)



FIGURE

A.6 **UK GDP and employment trajectories for Sc1A – planned investment vs Sc4 reactionary investment** (all values in 2023 prices)



GDP Sc1A – planned investment & 45y recovery (the central case)
Empl Sc1A – planned investment & 45y recovery (the central case)
GDP Sc4 – reactionary investment
Empl Sc4 – reactionary investment

Thus, the wedges between the GDP and employment trajectories for planned and reactionary investment in **Figure A.6** could be considered as the societal value of investing ahead of time, which is largely driven by what happens to energy bills. However, the greater CPI uplift in **Scenario 4** relative to **Scenario 3** also plays a role, with the reactionary investment approach introducing more wage cost pressure throughout the timeframe studied than is the case with early and planned investment, triggering more displacement of activity in other sectors in **Figure A.4** and **Figure A.5**.

3.3 The potential to further maximise economy-wide gains if labour supply conditions can be improved (Scenario 2)

Key Finding #3 focuses on the outcomes of **Scenario 2**, where we rerun both variants of **Scenario 1** (i.e., for the central 45-year and alternative 35-year investment cost recovery case), but represent a situation with a more flexible and competitive labour market in the absence of worker and skills constraints by assuming there is no real wage bargaining in the labour market in response to increased employer demand.

Table A.6 shows how the key macroeconomic results are impacted in 2030 and over the long term. The crucial outcome is that in the absence of wage pressure related to worker and skill shortages (which is an unlikely but usefully illustrative extreme case), the economy-wide outcomes of SP Energy Networks RIIO-T3 investment plans would improve markedly.

Especially in the longer-term, the lack of wage pressures underlying the **Scenario 2** results in **Table A.6** means that net GDP gains could be more than double those observed in **Scenario 1**, with limited displacement impacts across other sectors of the economy. In terms of net employment impacts and real income gains to UK households, the magnitude of improvement could be several magnitudes of order bigger, with a shift towards a more labour-intensive economy in the absence of sustained wage pressure.

Figure A.7 shows how the adjustment path of GDP and employment is affected for the example of **Scenarios 1A** (our central case) and **2A**. Underlying this, **Figure A.8** reports the impacts on CPI and nominal wage (labour cost) impacts for these two scenarios. The crucial point is that as long as the UK's labour supply constraint 'bites' through the response of real wage bargaining as those sectors providing electricity network expansion and those supporting increased demand for electricity compete for workers, the cost of labour is pushed up across all sectors in the UK economy. This leads to increased output prices, depending on the labour and/or wage intensity of production across different sectors, which drives CPI impacts affecting the domestic economy and reducing the competitiveness of UK exporters. See **Figure A.9** and **Figure A.10** for the distribution of sectoral employment and GDP outcomes respectively. Here a key finding for **Scenarios 1A** and **1B** is that those sectors not benefiting from the electricity investment activity, or the increased electricity demand, tend to suffer negative gross value-added and employment impacts. When we assume no real wage bargaining response to the UK's persisting labour supply constraints, this displacement effect almost entirely disappears under **Scenario 2A** (and **2B**), particularly in the long run.

TABLE

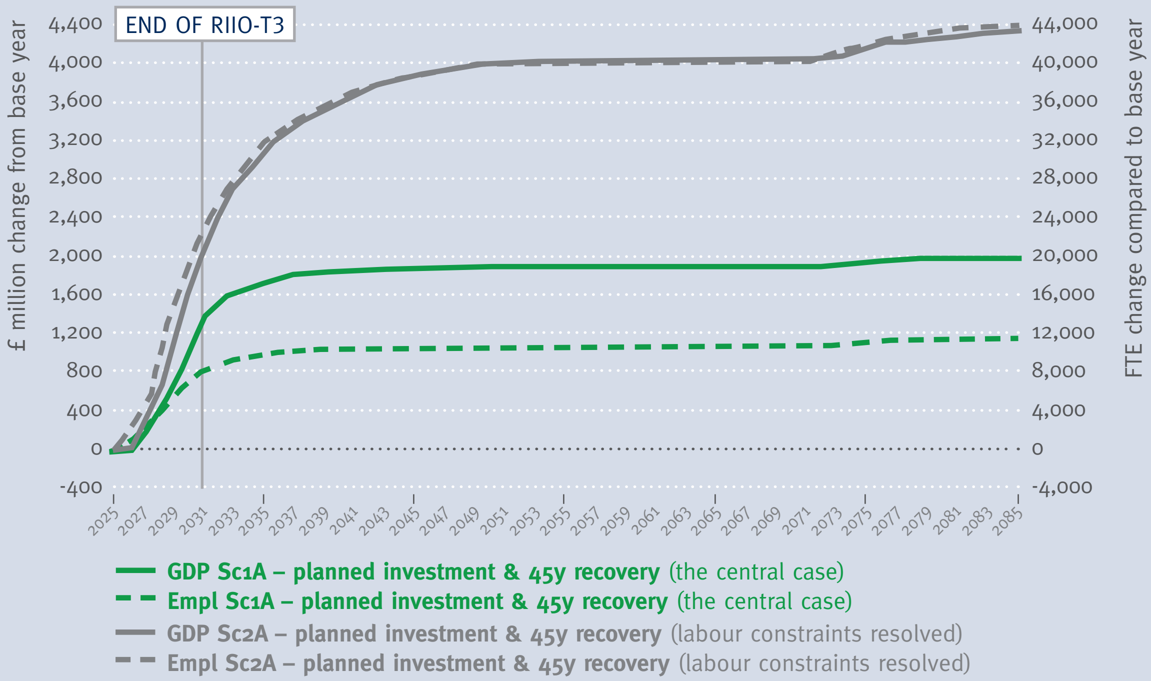
A.6 Comparative economy-wide impacts of Energy Networks RIIO-T3 investment plans for different labour market conditions

(values in 2023 prices)

Net economy-wide gains	Scenario	2030	Long term
GDP	**Sc1A** planned investment & 45y recovery (central case)	1.04 billion	2.00 billion
	Sc1B planned investment & 35y recovery (variant on the central case)	1.03 billion	2.00 billion
	Sc2A planned investment & 45y recovery (labour constraints resolved)	**1.70 billion**	**4.37 billion**
	Sc2B planned investment & 35y recovery (labour constraints resolved)	**1.68 billion**	**4.37 billion**
Jobs (full-time equivalents)	Sc1A	7,447	11,459
	Sc1B	7,283	11,459
	Sc2A	**20,228**	**44,226**
	Sc2B	**19,787**	**44,226**
Average annual real household income gain	Sc1A	£46.78	£60.21
	Sc1B	£45.68	£60.21
	Sc2A	**£246.69**	**£337.45**
	Sc2B	**£237.76**	**£337.45**
Consumer Price Index (CPI)	Sc1A	0.09%	0.06%
	Sc1B	0.09%	0.06%
	Sc2A	**0.07%**	**-0.03%**
	Sc2B	**0.07%**	**-0.03%**
Average electricity bills	Sc1A	-0.005%	-0.279%
	Sc1B	0.031%	-0.279%
	Sc2A	**-0.012%**	**-0.295%**
	Sc2B	**0.025%**	**-0.295%**

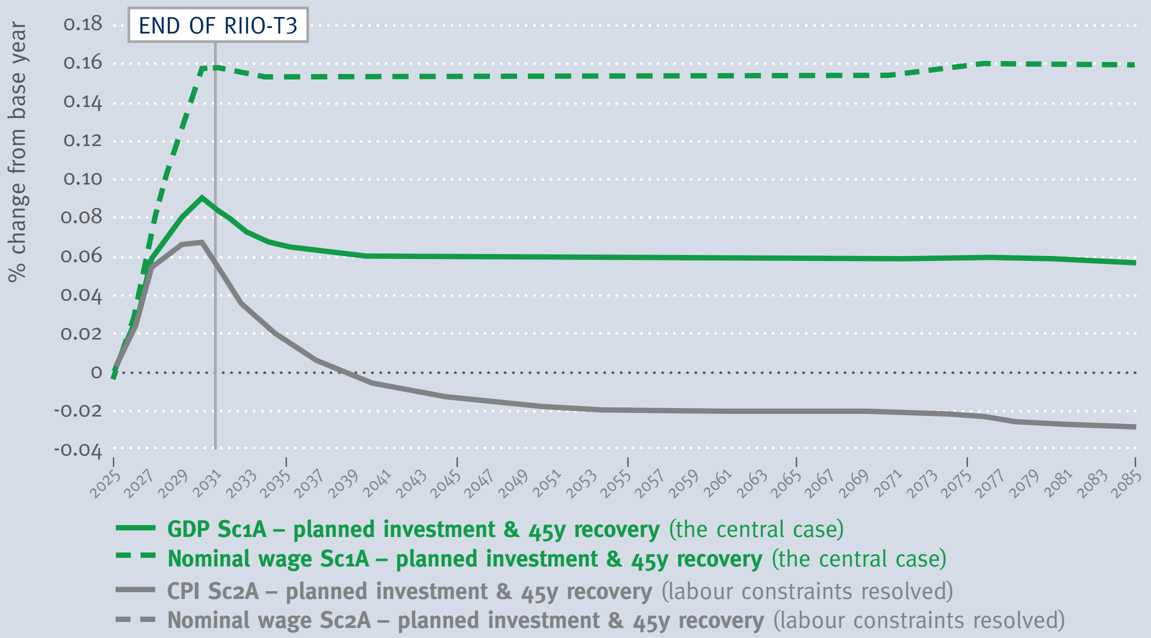
FIGURE

A.7 UK GDP and employment trajectories due to SP Energy Networks RIIO-T3 investment on transmission network under different labour market conditions (all values in 2023 prices)



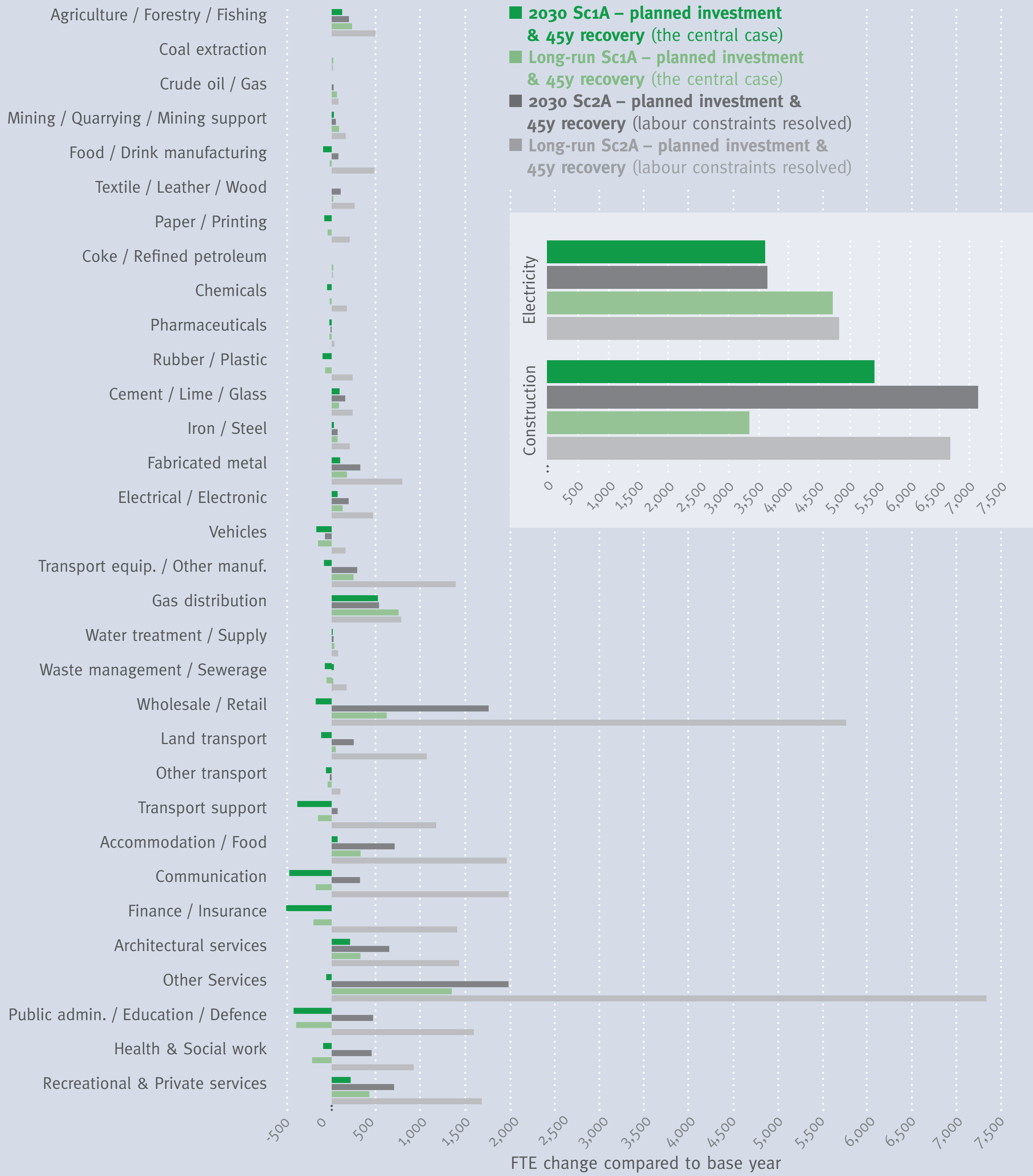
FIGURE

A.8 UK CPI and nominal wage trajectories due to SP Energy Networks RIIO-T3 investment on transmission network under different labour market conditions (all values in 2023 prices)



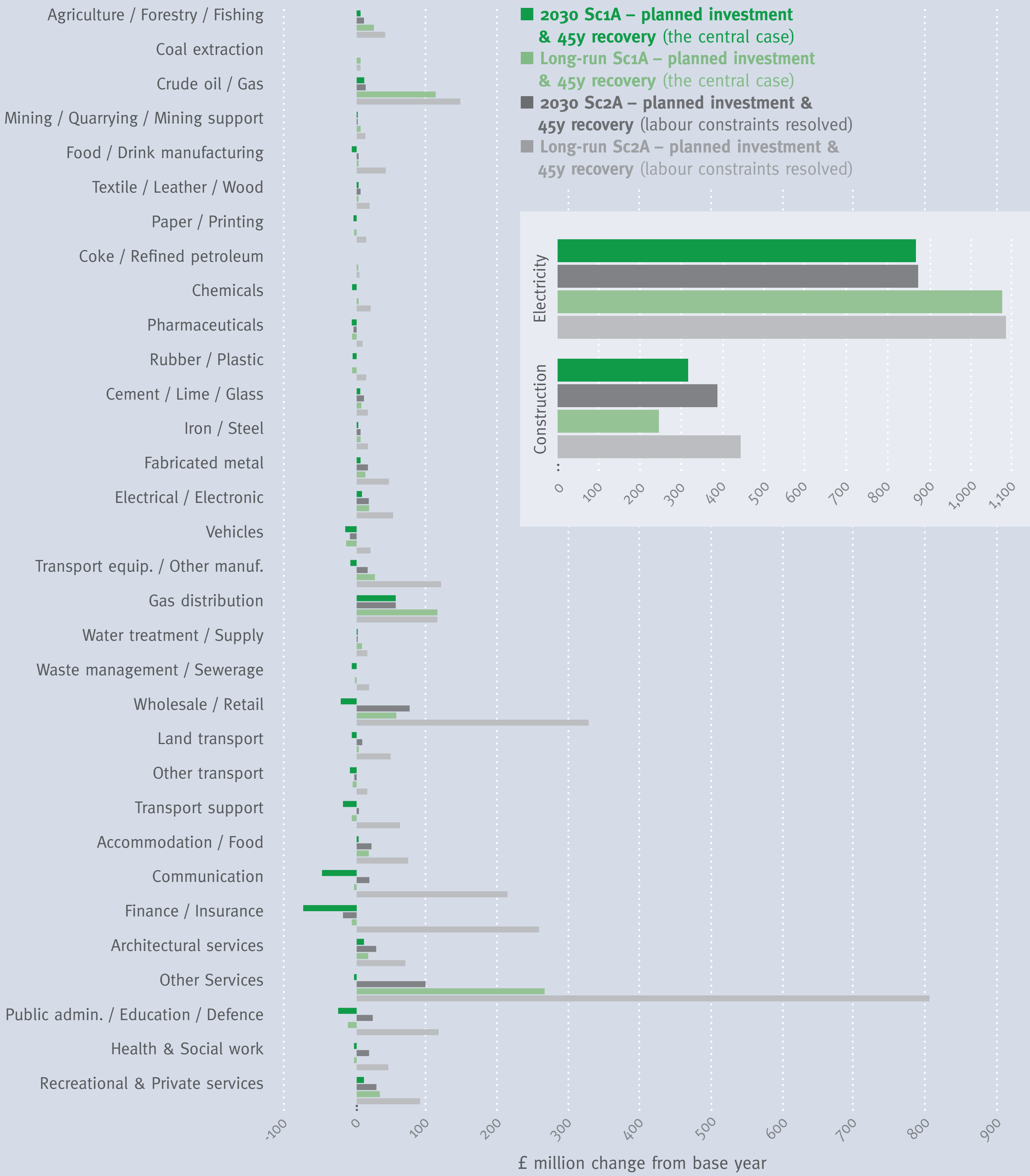
FIGURE

A.9 Sectoral breakdown of employment changes due to SPEN investment on the transmission network under different labour market conditions



FIGURE

A.10 Sectoral breakdown of gross value-added changes due to SPEN investment on the transmission network under different labour market conditions (values in 2023 prices)



It is important to note at this point that achieving an unconstrained labour market, here manifesting as one with no imperfectly competitive wage pressure, is probably unrealistic. This is especially so if we take into consideration the variety of skills, experience and other unique characteristics that members of the labour force have. That is, the workforce is not a homogenous group of people, and an unconstrained labour market would have to be able to address all needs of skills and levels of experience, regardless of how big or small the requirements may be. This challenge is further intensified given the limits on migration of labour in the current UK policy landscape, which affect the ability to recruit skilled workers from overseas.

However, this analysis highlights that there is a significant capacity to improve the potential economy-wide outcomes of the transmission network expansion, if some of the labour constraints are resolved, particularly in the net zero context and timelines where investment requirements and competition for workers will greatly exceed what we consider here in the context of SP Energy Networks' RIIO-T3 investment plans. It is therefore crucially important that the UK Government takes a leadership role in designing and implementing a comprehensive workplace strategy so that persisting labour market challenges and constraints can be addressed in an effective and timely manner.

4 The central case scenario expanded to the potential RIIO-T3 investment plans of all UK TOs

The final stage of our research involved considering how the type of wider economic benefits emerging for SP Energy Networks RIIO-T3 investment that are the subject of our **Key Finding #1** may be further uplifted if all the UK TOs followed a similar 'planned investment' approach. This involves considering our planned investment scenario (with the labour supply constrained case with 45-year investment cost recovery assumptions) analysis to the full transmission network in **Scenario 5** and as set out in **Section 2.2.1** above.

All three of the key drivers of wider economic expansion operate as explained for **Scenario 1A** in **Section 3.1**. However, with a higher level of investment and projected demand involved, the quantitative impacts are of substantially greater magnitude. The headline results reported in **Table A.7** are that a per annum GDP gain of £5.65 billion and 37,785 net jobs gains could be realised in 2030. Over the long-term, the sustained GDP uplift grows to just over £11.05 billion per annum, associated with net employment gains of more than 61,200, with the greater upward trajectory of both these key macroeconomic variables shown in **Figure A.11**. There is also a much greater boost in the households' real disposable income; £246.69 per household in 2030, compared to the £46.78 boost for the same year when only SP Energy Networks invests (**Table A.4**).

However, the CPI impacts in **Table A.7** show that this much larger expansion also causes the persisting labour supply constraints to 'bite' more quickly and to a greater extent throughout the period studied, which both triggers more extensive displacement of activity in other sectors (reflected in **Figure A.12** and **Figure A.13**) and limits the extent of real income (and spending) gains to UK households. Thus, the economic 'multiplier' processes triggered are further constrained in this more expansive case.

TABLE

A.7 Key economy-wide impacts of all UK TO RIIO-T3 investment plans (values in 2023 prices)

Net economy-wide gains	2030	Long term
GDP (real impacts in 2023 prices)	5.65 billion	11.05 billion
Jobs (full-time equivalents)	37,785	61,209
Average annual real household income gain	£246.69	£337.45
Consumer price index (CPI)	0.55%	0.37%
Average electricity bills	1.076%	-0.941%

FIGURE

A.11 UK GDP and employment trajectories due to all TOs RIIO-T3 investment on transmission network (all values in 2023 prices)

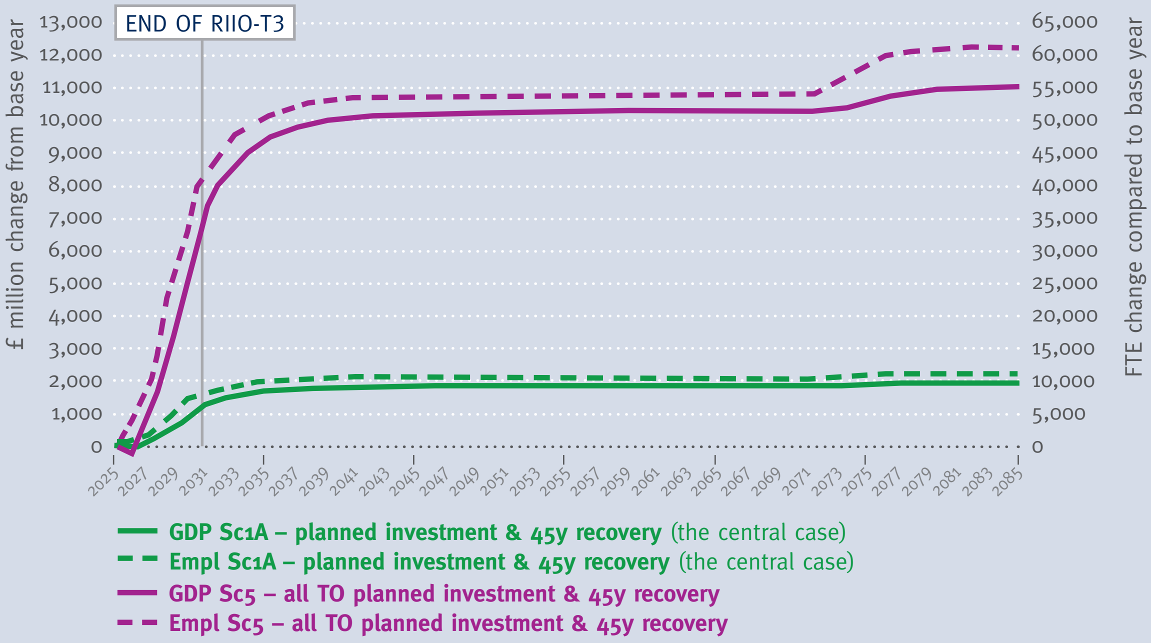


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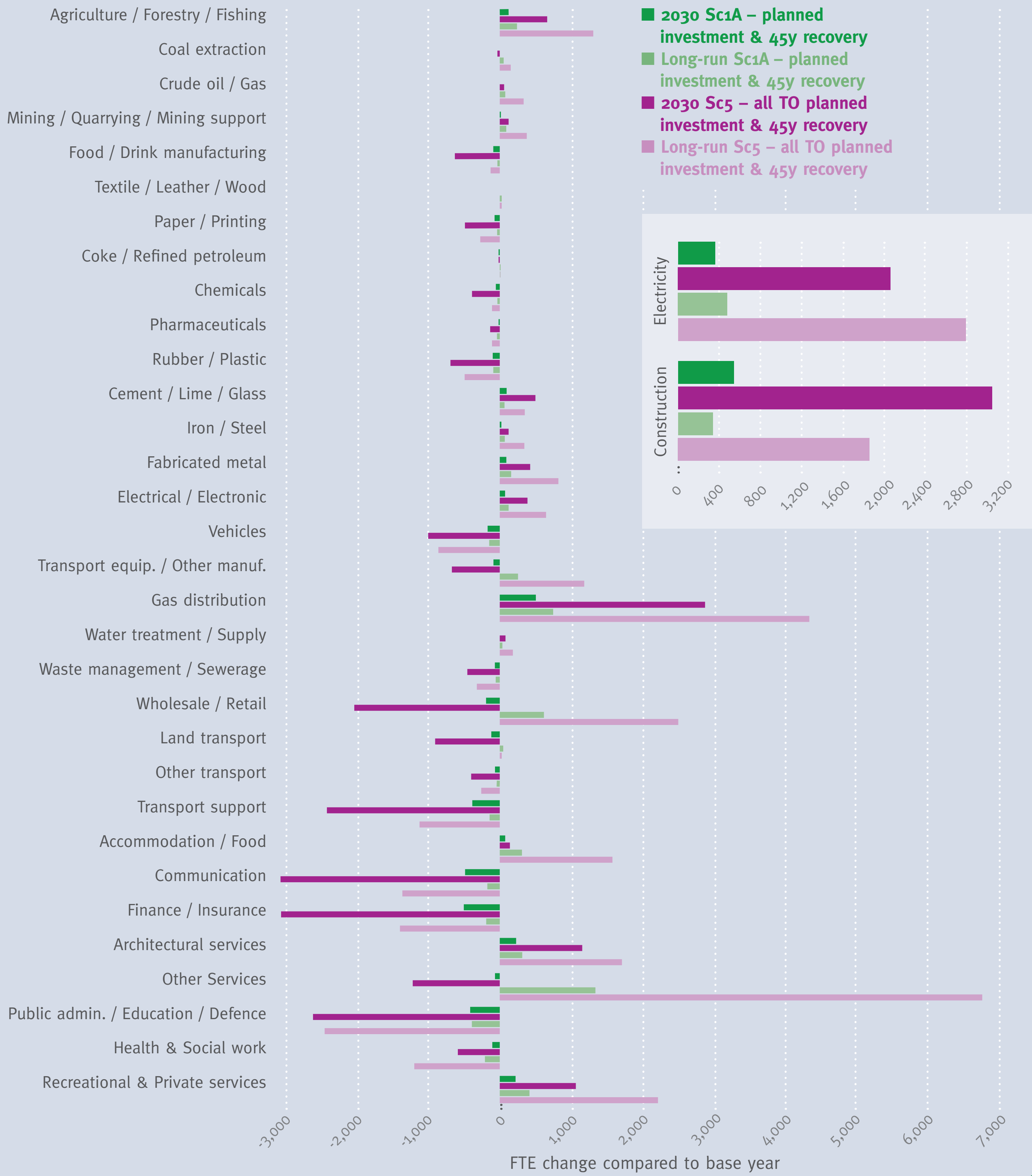
FIGURE

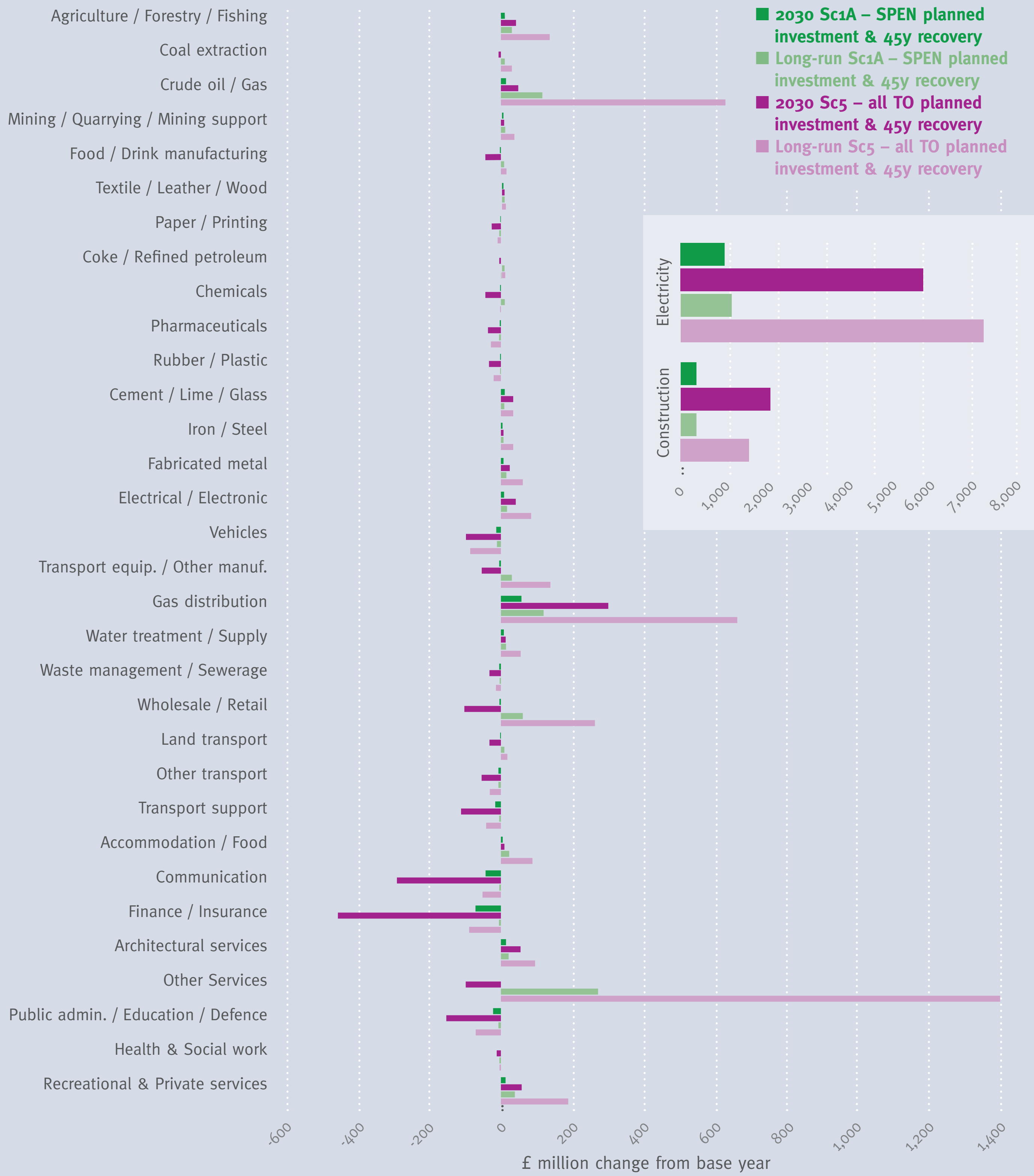
A.12 Sectoral breakdown of employment changes due to all TOs investment on the transmission network



FIGURE

A.13 Sectoral breakdown of gross value-added changes due to all TOs investment on the transmission network

(values in 2023 prices)



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5 Conclusion and future directions

This aim of this appendix has been to more fully explain our modelling and scenario simulation approach and the results of the economy-wide impact analysis reported in a linked policy brief (see the link in **Endnote I** below). The central focus has been to inform consideration by the regulator and policy decision-makers as how SP Energy Networks RIIO-T3 investment plans may impact the wider economy. This is both in isolation and how that TO's plans could contribute to the wider net economy-wide benefits of planned investment in the UK's electricity network capacity ahead of projected demand emerging.

Going forward, our first step will be to subject the work reported here to peer review via submission of a full academic paper to an international journal (please see contact details below if you would like access to draft and/or published versions when they become available). However, our investigation into how electricity network upgrade activity – and other linked net zero investments, including by consumers on the demand-side of the UK's ambitions around increased electrification – will require further focussed research activity. Some of this activity is already in progress through our work with the UKRI Energy Demand Research Centre (EDRC[xvii]) and UK Energy Research Centre (UKERC[xviii]) but please monitor the Centre for Energy Policy's own website[xix] or contact us (see below) if you would like to learn more about our research.

Endnotes/References

i The policy brief is available at https://doi.org/10.17868/strath.00091528.
ii For example: Katris et al. (2024), studying the UK's projected heat pump deployment, in Energy Strategy Reviews at https://doi.org/10.1016/j.esr.2024.101518; Alabi et al. (2022), studying the UK's https://doi.org/10.1016/j.eneco.2022.106001.
iii CGE models are commonly used in the international research community to simulate the potential impacts of a range of changes in economic activity (linked to policy interventions, industry decisions and/or the wider economic landscape). For example, see Babatunde et al., 2017 (https://doi.org/10.1016/j.rser.2017.04.064) for a review. They are also increasingly commonly applied by policy actors at regional, national and international levels. For example, HM Treasury have used their own CGE model to examine issues such as changes in corporation tax (https://www.gov.uk/government/publications/analysis-of-the-dynamic-effects-of-corporation-tax-reductions) and fuel duties (https://www.gov.uk/government/publications/analysis-of-the-dynamic-effects-of-fuel-duty-reductions). The Scottish Government use their own, for example in a 2022 study considering the potential impacts of the National Strategy for Economic Transformation (https://www.gov.scot/publications/scotland-national-strategy-economic-transformation-evidence-paper/pages/6/). The World Bank have developed a range of CGE model tools for examining long-range policy issues (e.g., see https://documents1.worldbank.org/curated/en/490571642086593026/pdf/World-Bank-Group-Macroeconomic-Models-for-Climate-Policy-Analysis.pdf).
iv See https://www.ons.gov.uk/releases/ukinputoutputanalyticaltablesindustrybyindustry2018.
v The UKENVI SAM database is available at https://pureportal.strath.ac.uk/en/datasets/a-2018-uk-sam-with-households-disaggregated-by-income.
vi See the UK 2018 IO multipliers at https://www.ons.gov.uk/economy/nationalaccounts/supplyandusetables/adhocs/14611ftemultipliersandeffectsreferenceyear2018.
vii There are a range of contributions in the economic modelling literature comparing methodologies for economy-wide impact analysis (e.g., West, 1995, at https://doi.org/10.1080/09535319500000021) and/or considering how CGE models may replicate input-output modelling results over the long run, if there are no persisting supply constraints (e.g., McGregor et al., 1996, at https://doi.org/10.1111/j.1467-9787.1996.tb01113.x). We have also compared CGE and input-output multiplier approaches using UKENVI in previous works (e.g., Turner et al., 2021, at https://doi.org/10.1177/02690942211055687).
viii At the time of writing, SP Energy Networks have not yet published their RIIO-T3 Business Plan. Please see https://www.spenergynetworks.co.uk/pages/riio_t3_business_plan.aspx for updates.
ix UKENVI is a national model so any good and service produced outside the UK economy cannot be modelled.
x This estimate is based on the information included in the UK Annual Business Survey on the UK's Non-Financial business economy. Specifically, we use the reported gross value added at basic prices minus the compensation of employees for sectors in Section D of the survey, to estimate the gross operating surplus of electricity generation, transmission, distribution and retail. In turn, the gross operating surplus is used as a proxy of how capital is distributed across the different components of the aggregated electricity sector in the input output table (IOT). We note that we needed to conduct some further balancing of the components of the electricity sector, meaning there is a small divergence to the specific shares implied by the survey data. The most recent release of the data tables is available at: https://www.ons.gov.uk/businessindustryandtrade/business/businessservices/datasets/uknonfinancialbusinesseconomyannualbusinesssurveysectionsas
xi Here we draw on information published in July 2024 within https://www.ofgem.gov.uk/publications/et2-price-control-financial-model
xii This approach is appropriate for this specific type of investment in electricity infrastructure but cannot be generalised across all types of electricity investments
xiii In practice, the cost may be different as it includes the cost of replacing existing equipment, where different TOs may have different equipment replacement requirements and costs. However, this is the most transparent approach to estimate, in the absence of detailed information, what the investment cost may be.
xiv The specific data used in this work can be accessed at: https://www.neso.energy/document/283061/download
xv The evolution of demand in our scenarios is informed by the data available Table ES.02 of the 'Future Energy Scenarios 2023 Data Workbook'.
xvi We note that although RIIO-T3 is scheduled to conclude in the 2030/2031 fiscal year, the data informing our model reflect calendar rather than fiscal years. So for the purposes of our analyses, the last year of RIIO-T3 is 2030. This does not affect the modelling outcomes or the emerging insights as we still model a full 5-year price control period.
xvii See https://www.edrc.ac.uk/.
xviii See https://ukerc.ac.uk/.
xix See https://www.strath.ac.uk/humanities/centreforenergypolicy/.

Acknowledgements

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Contact

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Established in 2014 and based at the University of Strathclyde, the Centre for Energy Policy (CEP) works with government, industry and other partners to understand and address the pressing public policy challenge of ensuring transitions to net zero deliver sustainable and more equitable prosperity. Over the last decade, CEP's research has helped shape UK and Scottish Government policy across the areas of industrial decarbonisation, energy efficiency, low carbon heating and transport and energy infrastructure.

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