Impact Assessment

Consideration of adjustments to the NTS Charging Regime

IUK-BBL

March 2021

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1. Executive Summary

Executive Summary

- IUK and BBL asked CEPA to model five policy options for changes to the NTS Entry and Exit tariff arrangements (see slide 5):
  1. Entry-Exit split:
     a) 35:65 Entry-Exit split
     b) 20:80 Entry-Exit split
  2. Benchmark adjustments to Bacton IP Entry tariff:
     a) 69% benchmark
     b) 50% benchmark
     c) 36% benchmark
- They also asked us to model two sensitivities (see slide 6):
  - Introduce a revenue recovery charge to the modelling
  - Remove existing contracts from modelling
- We modelled these options in 2022/23 using a consistent modelling methodology with that developed for the assessment of Ofgem's UNC728 policy analysis. We assessed impacts on tariffs, flows, gas and electricity market prices and consumer welfare. In line with modelling for Ofgem, we focused on the Consumer Transformation scenario (National Grid Future Energy Scenarios 2020) for analysis.

Executive Summary

- Our modelling suggests that consumers would benefit from most of these policy options. The primary mechanism for this benefit is an aggregate reduction in the wholesale market price.
- For options which adjust the Entry-Exit split, the decrease in wholesale prices is offset by an increase in the tariff costs at Exit. However, our modelling aligns with economic theory in suggesting that there would be an aggregate benefit to consumers, with this benefit increasing as the proportion of the tariff allocated to Entry decreases. Under the 20/80 split option we observe NPV benefits of up to £130m per year.
- For options which introduce benchmarking at the Bacton IP Entry point, lower wholesale market prices in some periods are offset by increases for other sources of supply. We observe welfare benefits of up to £110m per year under one benchmarking option. However, when the adjustment becomes too large, we observe a resulting disbenefit.

Executive Summary

Sensitivities

- Modelling of sensitivities suggests that the current ‘dual regime’ (i.e. different treatment of existing contracts at Entry) could lead to consumer harm.
- It also suggests that the revenue recovery charge could lead to consumer harm in any given year.

Summary of options modelled

	Status Quo	Option 1.a: 35:65 Entry-Exit split	Option 1.b: 20:80 Entry-Exit split	Option 2a: 69% Benchmark	Option 2b: 50% Benchmark	Option 2c: 36% Benchmark
Storage discount	80%, as per UNC727 decision					
UNC728 mod	UNC728B, as per minded to decision					
RRCs	None – the model endogenously ensures full revenue recovery					
Existing contracts	Included	Included	Included	Included	Included	Included
Bacton IC entry adjustment	None	None	None	69% – based on average annual entry tariff levels for NWE interconnectors	50% – based on the next highest annual entry tariff amongst NWE interconnectors	36% – level that would lead to 10% CAA index incorporating ECs (calculated ex ante)
Entry-Exit split	50:50	35:65	20:80	50:50	50:50	50:50

Summary of sensitivities modelled

	SQ	Sensitivity 1: SQ with RRCs	Sensitivity 2: SQ no ECs
Storage discount	80%, as per UNC727 decision		
UNC728 mod	UNC728B, as per minded to decision		
RRCs	None – the model endogenously ensures full revenue recovery	Both at Entry and Exit – at 50% of the February 2021 level	None – the model endogenously ensures full revenue recovery
Existing contracts	Included	Included	Not included
Bacton IC entry adjustment	None	None	None
Entry-Exit split	50:50	50:50	50:50

Contents

We set out the remainder of this pack as follows:

1. **Context** – introduction, definition of options/sensitivities**Tariff impacts** – impacts on tariffs at entry and exit points
2. **Consumer welfare** – impacts on gas market consumer welfare
3. **The CAA index test** – impacts on the CAA index
4. **Conclusions**

Appendices – discussion of gas and electricity price impacts, methodological approach, price dynamics in the modelling and supplementary tariff impact charts.

1. Context

Context - Introduction

- The new NTS charging regime from October 2020 has increased charges to enter/exit the GB network, with IUK's analysis showing that GB now has the highest entry tariffs among key North West European markets.
- IUK and BBL (the ICs) consider that this may have led to gas from the Continent being diverted to more attractively priced markets, rather than entering GB. Where gas does enter GB from the continent, it may result in higher wholesale gas prices, and hence higher consumer charges.
- Implementing the new charging regime has also reinforced the differences generated by the 'dual regime', with existing entry capacity contracts before April 2017 priced at a significant discount relative to new bookings.
  - Only a small fraction of the total existing contract volumes are held at the NTS Bacton IC entry point – currently less than 1%.
- The ICs consider that this is exacerbating the impact of the new charging regime on the relative competitiveness of cross-border flows from the Continent, to the detriment of GB consumers.
- CEPA was commissioned by IUK and BBL to analyse the costs and benefits of five NTS charging options designed to mitigate these challenges and assess the potential for consumer benefit.
- The results of our analysis are set out in this report.

Context - EU Network Code

- The EU Tariff Network Code (TAR) sets out requirements for national Regulatory Authorities when defining gas transmission tariff arrangements. The following articles are of relevance:
- **Article 6, 4.a: 'Benchmarking'** – This allows for reference prices at a given entry exit point to be set to meet a competitive level of reference prices.
- **Article 30, 1.b (v) (2): 'Entry-Exit Split'** – While tariffs should be compared against a tariff structure which includes a 50:50 Entry-Exit split, the TAR NC allows NRAs to determine an appropriate split. A wide range of splits can be observed across the EU (see slide 12).
- **Article 5: 'Cost Allocation Assessments'** - This article requires a cost allocation test to be carried out and includes indicated threshold of 10% (*Article 5, 6*).
  - Using the 2020 gas transmission tariffs and National Grid's Forecasted Contracted Capacity (FCC) for 2020, the CAA Index would be 6.3%.[1]
  - However, ACER recommended that the index be calculated incorporating existing contracts, which would lead to a 31% index, outside of the threshold.

[1]We calculate this in line with the methodology utilised by National Grid for calculating the CAA index on behalf of Ofgem under UNC678. See NGGT, March 2019, Sensitivity Tool (Model) 0678 V3.1 CWD Transmission Services (21 March 2019).

Context - Status Quo

We model the **status quo (SQ)** as per the current charging regime, but also reflecting Ofgem's decision on UNC727[2] and Ofgem's minded-to decision on UNC728.[3]

- This includes:
  - 'Postage stamp' reference price methodology at Entry and Exit
  - An 80% discount for storage entry and exit tariffs (in line with UNC727)
  - A reformed shorthaul tariff discount (in line with Ofgem's 'minded-to' decision on UNC728)
  - Inclusion of existing contracts
  - We did not include revenue recovery charges (RRC), though we note that RRCs have been observed in practice in gas year 20/21 and that RRC arrangements have been the subject of recent modifications.[4] However, we include an RRC within one of our sensitivities.

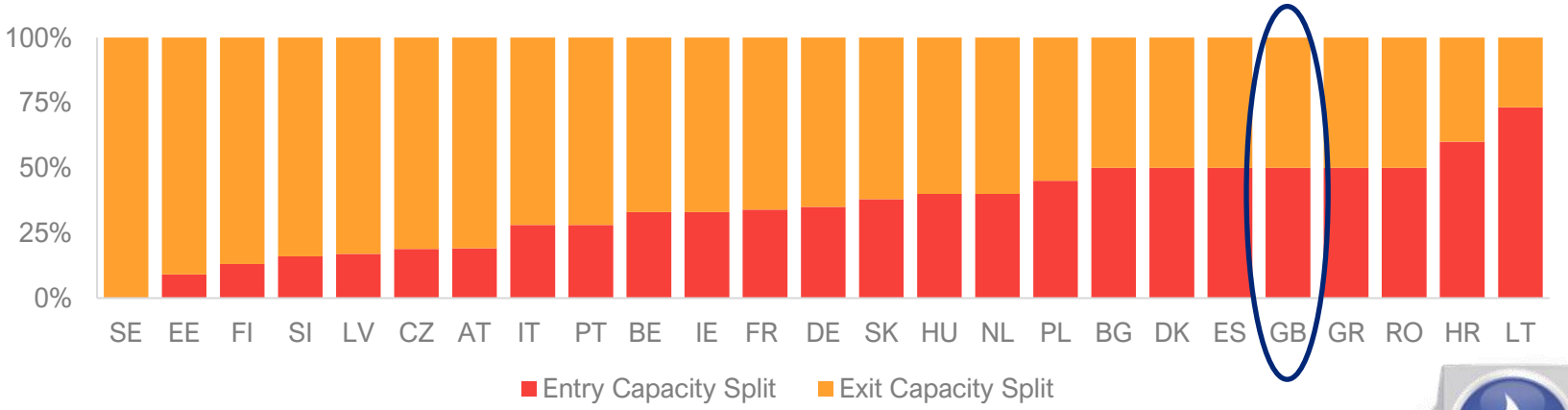
[2]See Ofgem, December 2020, UNC727 decision letter.
[3]See Ofgem, January 2021, UNC728 minded-to decision and impact assessment.
[4]Including UNC748 (see Ofgem, December 2020, UNC748 decision letter), UNC751 and UNC753.

Context – Modelled adjustments

We model two policy options for revision to the Entry-Exit split:

- This involves adjusting the Entry-Exit revenue split to achieve more competitive entry tariffs
  - The current 50:50 split results in entry capacity tariffs that are approximately 2.5 times the exit capacity tariffs in GB (based on published Oct 2020 tariffs).
  - Applying a 50:50 split has no explicit justification. In fact economic theory (Ramsey pricing) may suggest allocating a higher proportion to exit.
- **Option 1a. 35:65 Entry-Exit split**
- **Option 1b. 20:80 Entry-Exit split**

Entry-exit splits vary considerably across Europe



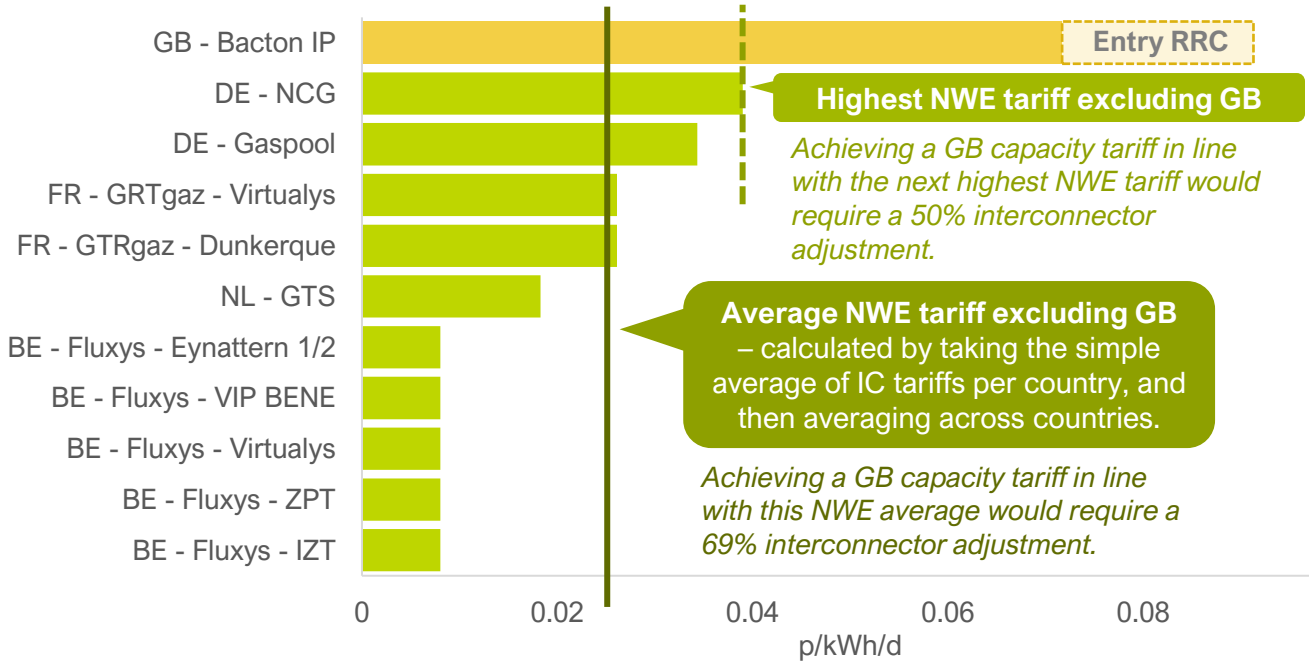
Source: ENTSOG, 2020.

Context – Modelled adjustments

We model three options for benchmarking of the Bacton Entry point tariff:

- **Option 2a. 69% benchmarking** – introducing an interconnector entry adjustment to align with the ***average*** North-Western European (NWE) competitor entry tariffs. This would imply a **69% adjustment**.
- **Option 2b. 50% benchmarking** – introducing an interconnector entry adjustment to align with the ***highest alternative*** North-Western European (NWE) competitor entry tariff. This would imply a **50% adjustment**.

Annual firm capacity entry tariffs, 20-21



Sources: IUK analysis based on GB capacity tariff, GB RRC; Germany; France; Netherlands; Belgium.

Context – Modelled adjustments

- **Option 2c. 36% benchmarking** – introducing an interconnector entry adjustment which is informed by the TAR NC CAA index (*including existing contracts at Entry and based on modelled flows under the status quo)*.
  - The CAA index measures the absolute percentage difference between the 'effective' tariff that domestic ("non-IC") points face vs. the 'effective' tariff that cross-border (IC) points face.
  - While ensuring a CAA index ≤10% is not mandatory, ACER[5] previously noted that the threshold is easily exceeded in GB if existing contracts are included. They recommended that Ofgem monitors:
    (i) the impact of tariffs on interconnectors and cross border trade, and
    (ii) the impact of existing capacity contracts on the market.
  - ***With flows and tariffs as modelled under the SQ***, a **36% adjustment** on interconnector entry tariffs would be required to reach the 10% CAA threshold (after including existing contracts) in line with ACER's recommendations.
  - We note that the benchmark under Option 2c. is calculated 'ex ante' and there is a feedback loop between tariffs and flows. The option does not guarantee that the CAA index would be met 'ex post' after flows have been re-modelled.

For all options, we calculate whether the CAA threshold is met after taking flows and tariffs from the modelling ('ex post').

[5]See ACER, Agency report – Analysis of the consultation document for Great Britain.

Context - Sensitivities

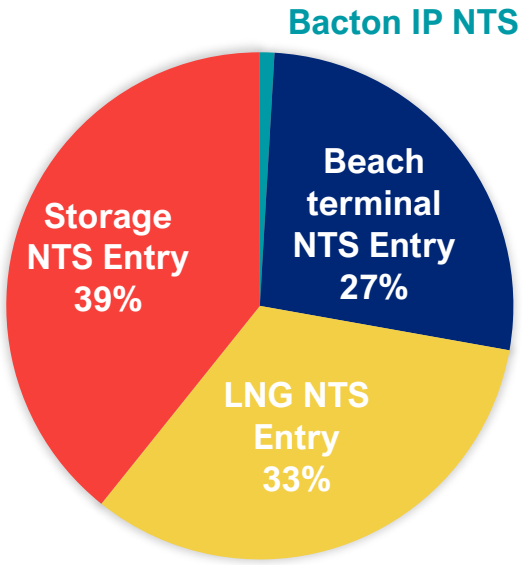
In addition to these options, CEPA modelled two sensitivities based on the status quo:

- **Sensitivity 1. SQ with revenue recovery charges (RRCs)** – illustrating the effects of ongoing over-forecasting leading to repeated RRCs. We model RRC levels at 50% of the Transmission Services RRCs set for February 2021[6] because:
  - A proportion of the Q4 2020 under-recovery resulted from the application of capacity neutrality – UNC748 decision ensures this will not be repeated.[7]
  - The rest of the under-recovery was a result of over-forecasting. The October 2020 tariff regime change was a key factor for this, but over-forecasting may be a persistent issue (e.g. due to declining demand or reduced overbooking).
  - If we compare NGGT's 22-23 forecasted contracted capacity FCC[8] to CEPA's SQ modelled bookings, this suggests an Entry RRC of up to 0.0152 and an Exit RRC of up to 0.0042 may be needed – 52% and 92% of February RRCs, respectively.

[6]See NGGT, December 2020, Notification of Transmission Services Entry and Exit Revenue Recovery Charges.
[7]See Ofgem, December 2020, UNC748 decision letter.
[8]Incorporating NGGT's planned discounts to this: Gas Transportation Charges Update (Jan 2021), slide 26.

Context - Sensitivities

- **Sensitivity 2. SQ without existing contracts (ECs)** – illustrating the market-wide impacts of existing contracts.
  - In 2022-23, there is more than 3 TWh/d of existing contract entry capacity, contributing on average only 0.005 p/kWh/d – approximately 7% of the October 2020 entry tariff.
  - Large tariff differentials between existing contracts and new bookings are likely to have an impact on the supply merit order, since holders of ECs are in an advantageous position.
  - Currently, users at the Bacton NTS Entry IP hold less than 1% of existing contracts, with holdings expiring by 2024-25.

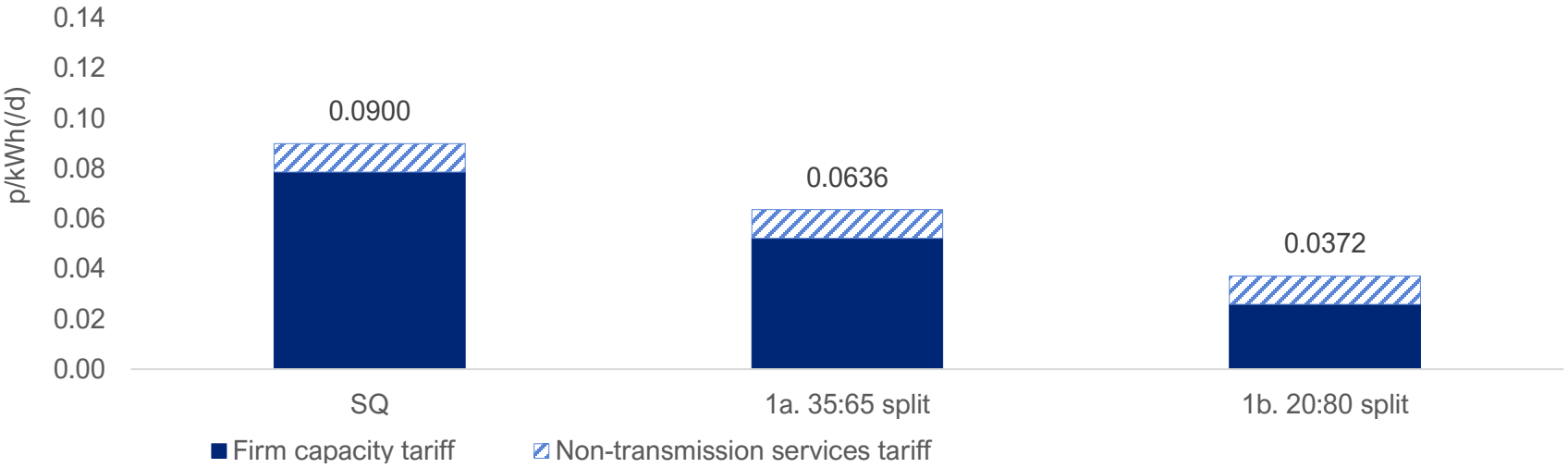


Source: National Grid, October 2020 Transmission Services Model.

2. Tariff impacts

Tariff impacts – Entry-Exit split options

Non-shorthaul entry tariffs (transmission and non-transmission services) under Entry-Exit split options (2022-23), all points[9]



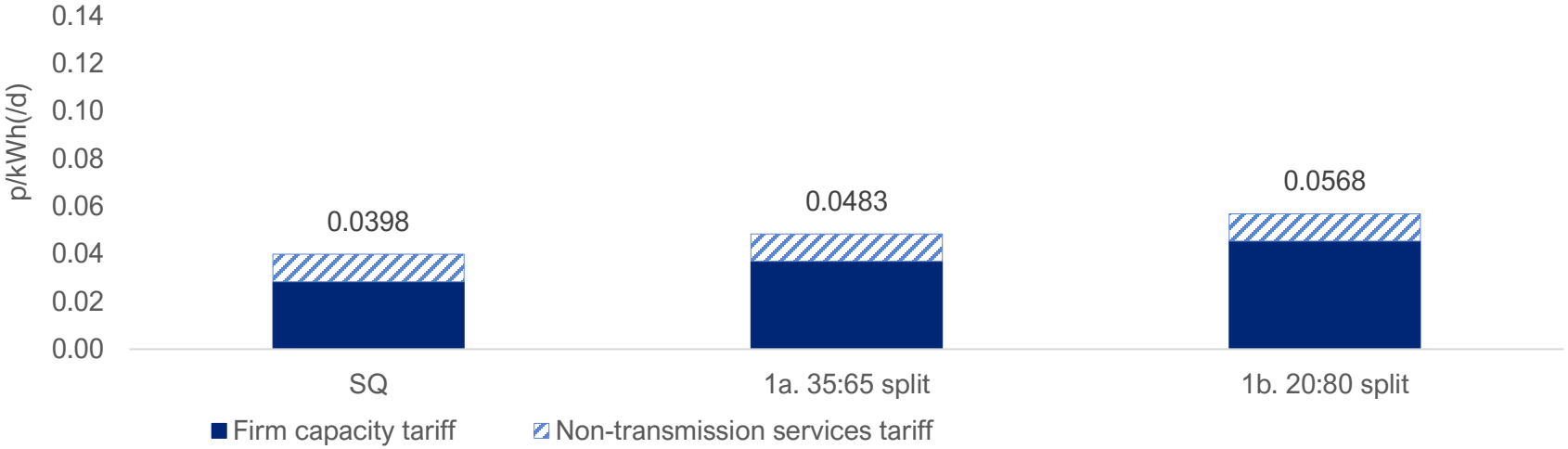
Note: Under the SQ and the entry-exit split options, both ICs and non-ICs (with the exception of storage) face the same tariffs, at both entry and exit, as no IC adjustments are included.

- The GB entry tariffs are lower under both Entry-Exit split options than under the status quo.
- They are lowest under the 20:80 split option, in line with the lower proportion of transmission services revenue recovered from entry.

[9]With the exception of storage points, which benefit from an 80% capacity tariff discount both at entry and exit, and only pay the non-transmission tariff on own-use gas at exit.

Tariff impacts – Entry-Exit split options

Non-shorthaul exit tariffs (transmission and non-transmission services) under Entry-Exit split options (2022-23), all points[9]

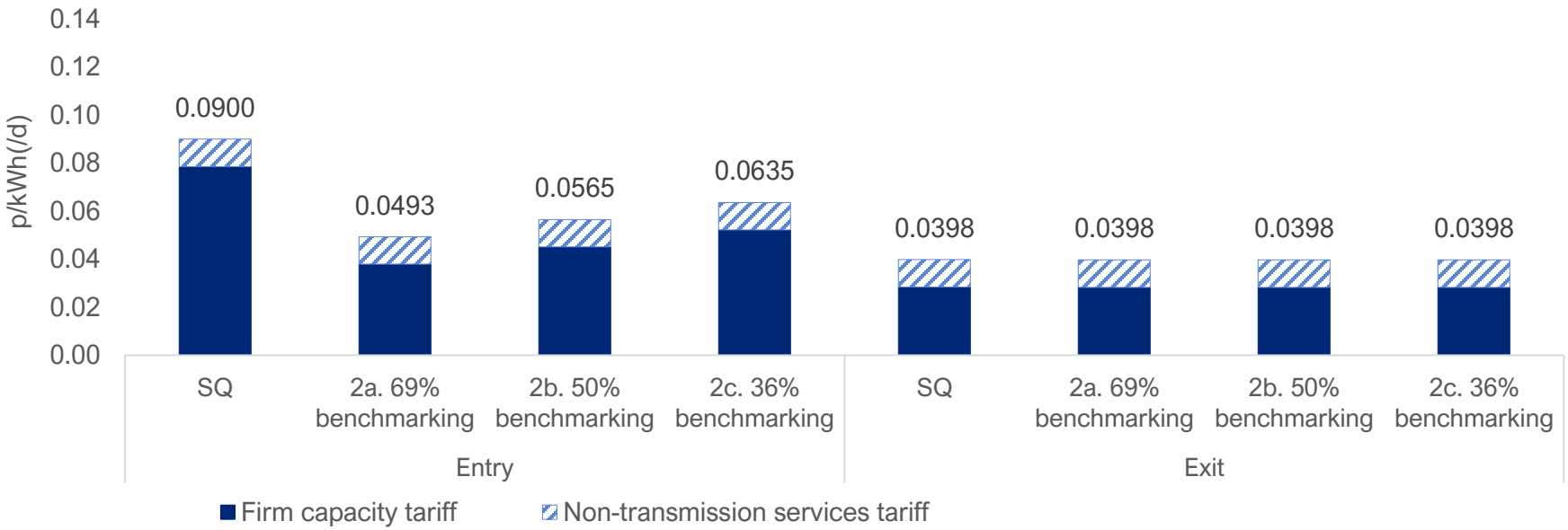


- Under the Entry-Exit split options, exit tariffs increase relative to the SQ.
- The increase in the exit tariffs is significantly smaller than the decrease in the entry tariff (slide 23).
  - This 'imbalance' between entry and exit tariff impacts is a result of higher booking volumes at exit than at entry, such that the additional revenue requirement is spread over a larger base at exit.
  - Total bookings are higher at exit because (i) we assume significant over-booking from GDNs who book enough exit capacity to meet 1-in-20 demand,[10] and (ii) the existence of ECs at entry reduces the need for new entry bookings.

[10]This in line with GDNs' interpretation of their licence obligations. This is the current standard practice, and is widely expected to continue – e.g. see Ofgem's RIIO-2 Exit Capacity Planning Guidance, paragraph 2.2.

Tariff impacts – benchmarking options

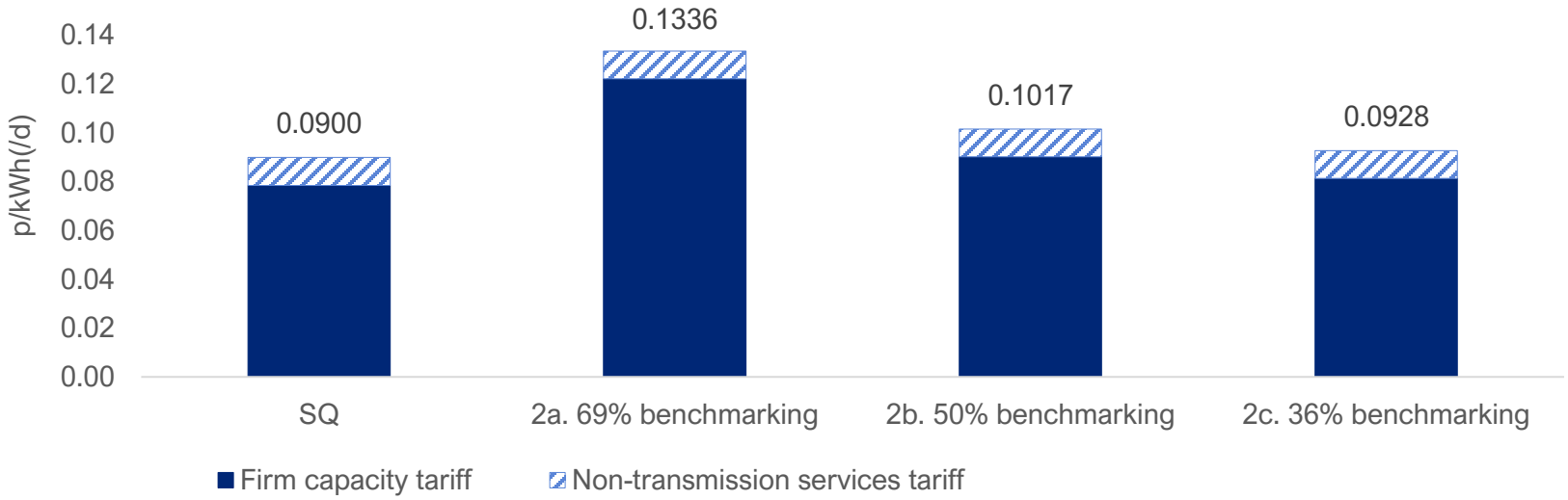
Bacton IC non-shorthaul entry and exit tariffs (transmission and non-transmission services) under benchmarking options (22-23)



- The Bacton IC entry tariffs are lowest under the 69% benchmark option and the highest under the 36% option, in line with the level of adjustment.
- Exit tariffs are largely unaffected, as no explicit IC adjustment is included at exit.

Tariff impacts – benchmarking options

Non-shorthaul firm entry-only point tariffs (transmission and non-transmission services) under benchmarking options (2022-23)



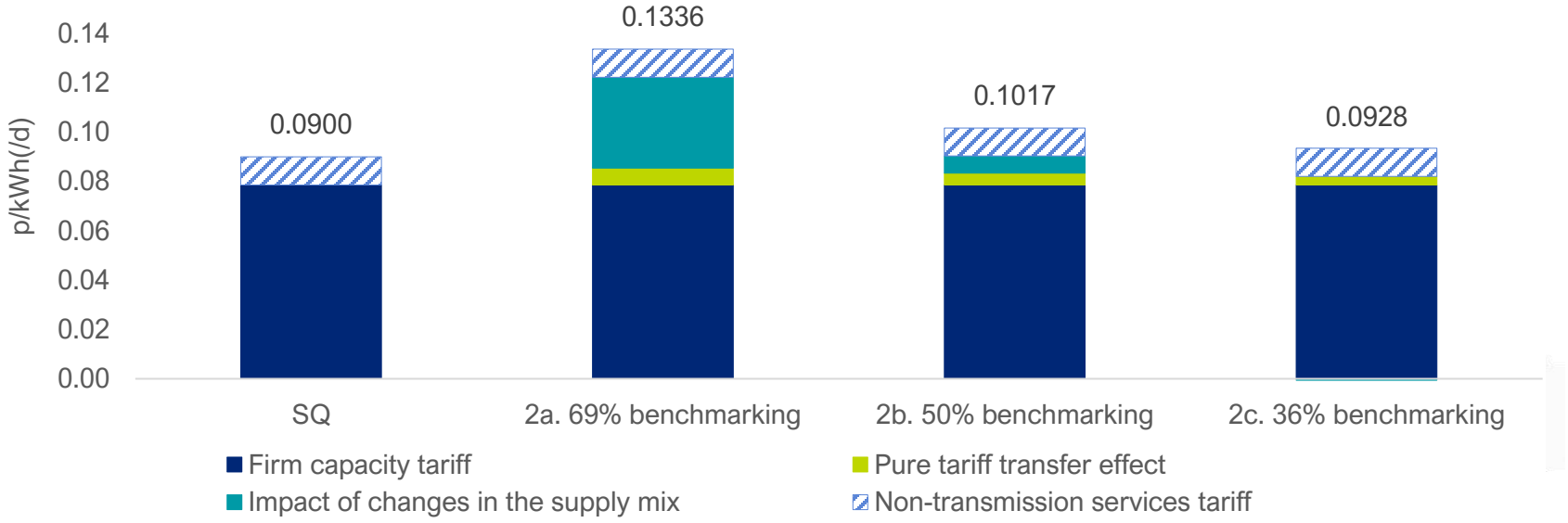
- The entry tariffs for non-interconnector entry points increase under the benchmarking options relative to the SQ, driven by:
  - a pure 'tariff transfer' effect as a direct result of the IC adjustment, and
  - a second-order effect from resulting changes in the supply mix.
- The impacts of these two drivers on tariffs are decomposed overleaf.

Tariff impacts – benchmarking options

The increase in the non-IC tariffs under the benchmarking options relative to the SQ can be decomposed into two components:

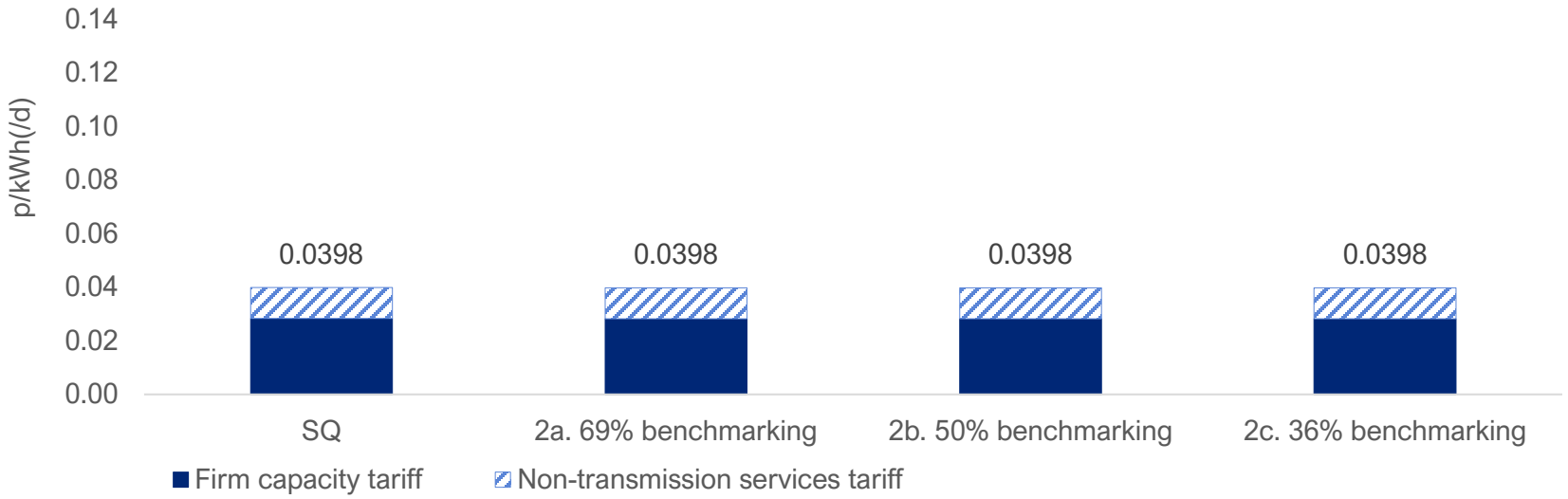
1. A **pure tariff transfer effect** as a direct result of the IC entry point adjustment. The higher the IC adjustment, the greater the impact on tariffs for non-IC points.
2. A second-order effect from resulting **changes in the supply mix**. Lower IC entry tariffs lead to higher interconnector flows and lower non-IC flows correspondingly. New bookings from non-IC points decrease even further in some cases, as ECs become sufficient to cover capacity needs.

   This reduces the total volume of new bookings over which revenues must be recovered (particularly new bookings that don't benefit from additional adjustments relative to the SQ), increasing tariffs. The higher the IC adjustment, the more pronounced this effect is.



Tariff impacts – benchmarking options

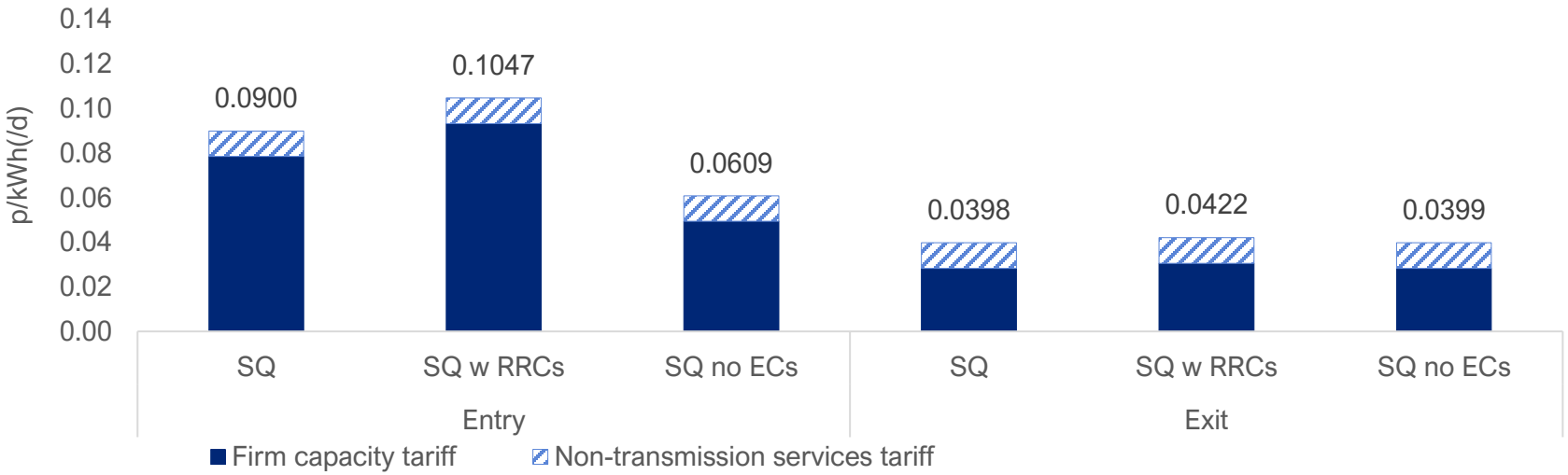
Non-shorthaul exit-only point tariffs (transmission and non-transmission services) under benchmarking options (2022-23)



- The benchmarking options have little impact on the exit tariff.

Tariff impacts – sensitivities

Non-shorthaul entry and exit tariffs (transmission and non-transmission services) under each sensitivity (2022-23), all points[11]



Note: Under the SQ and the sensitivities, both ICs and non-ICs (with the exception of storage) face the same tariffs, at both entry and exit, as no IC adjustments are included.

- Relative to the SQ, the RRC sensitivity has higher entry tariffs, as well as higher exit tariffs (by definition).
- The sensitivity without Existing Contracts substantially reduces the entry tariff, relative to the SQ, as the volume of new entry bookings rises. It has little impact on the exit tariff.

[11]With the exception of storage points, which benefit from an 80% capacity tariff discount both at entry and exit, and only pay the non-transmission tariff on own-use gas at exit.

3. Consumer welfare

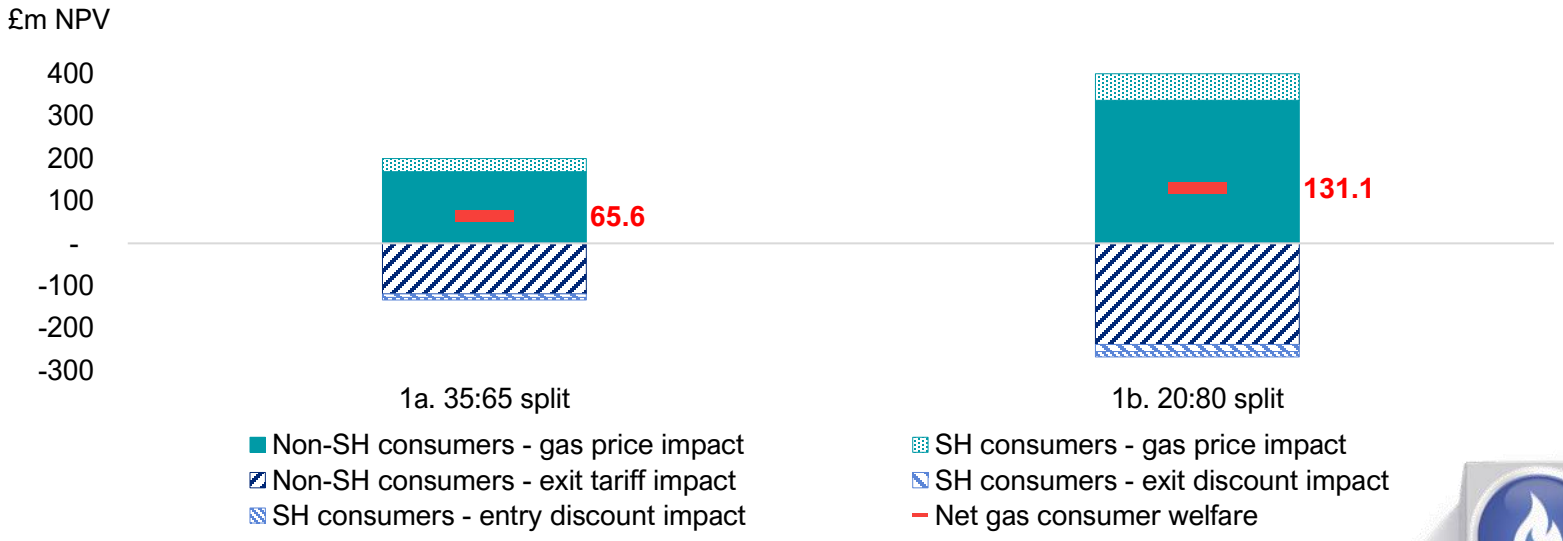
Consumer welfare - Summary

- We observe consumer welfare benefits under all options other than Option 2a (i.e. 69% adjustment to the Bacton IP Entry tariff).
- The primary mechanism for this benefit is an aggregate reduction in the wholesale gas market price (see Appendix A).
- Options 1b and 2b deliver the highest consumer benefit through the reduction in the aggregate wholesale gas price.
- In the case of the entry-exit split options (1a and 1b), benefit is offset by consumer welfare losses from the increase in the Exit tariff.
- In the case of the benchmarking options (2a, 2b and 2c), a lower wholesale price in some periods is offset by a higher wholesale price in others. Under Option 2a, the latter effect dominates resulting in consumer disbenefit.
- Modelling of sensitivities suggests that the current 'dual regime' (i.e. presence of existing contracts at Entry) could lead to consumer harm.
- It also suggests that the revenue recovery charge could lead to consumer harm in any given year. However, we note that this revenue recovery is likely to present a transfer of revenue between years which we do not model.

Consumer welfare – entry-exit split options

Change in consumer welfare under each option (NPV 2022-23, £m 2019)

- Both entry-exit split options lead to high positive price impacts on consumers (see Appendix A), but these are partially offset by increases in the exit tariffs that consumers pay.
- Option 1b has both a higher positive price impact (in line with its lower price) and a higher exit tariff disbenefit for consumers than option 1a.
- Overall consumer welfare benefits under option 1b are double the benefits observed under option 1a.



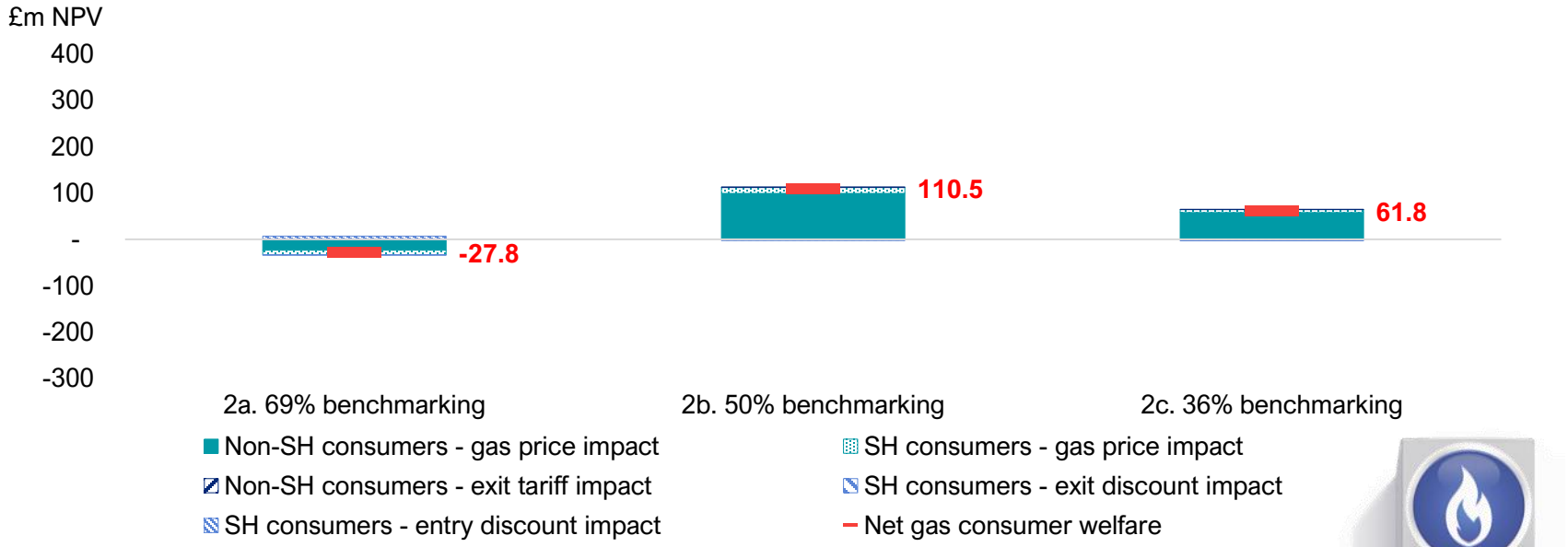
Consumer welfare - Gas market price – benchmarking options

- Under the benchmarking options, we observe two opposing effects which impact on the wholesale gas price:
  1. In periods where ICs are the marginal source of gas entry, we observe a decrease in the gas price under those options that provide an adjustment to IC entry capacity.
  2. In periods where non-ICs are the marginal source of entry, the gas price increases/decreases depending on the direction of impact on the reference entry tariff for non-SH flows.
- The overall gas price over the year is the result of combination of these effects.
- Some of the limitations that we noted earlier in this report introduce a bound of uncertainty in relation to precise price effects.
- While not reflecting stochastic price shocks in our model, we would expect the deterministic mechanisms for consumer benefit to hold in aggregate and over time.
- Acknowledging some level of uncertainty, we expect the direction of consumer welfare impacts in the following slides to hold in aggregate.

Consumer welfare – benchmarking options

Change in consumer welfare under each option (NPV 2022-23, £m 2019)

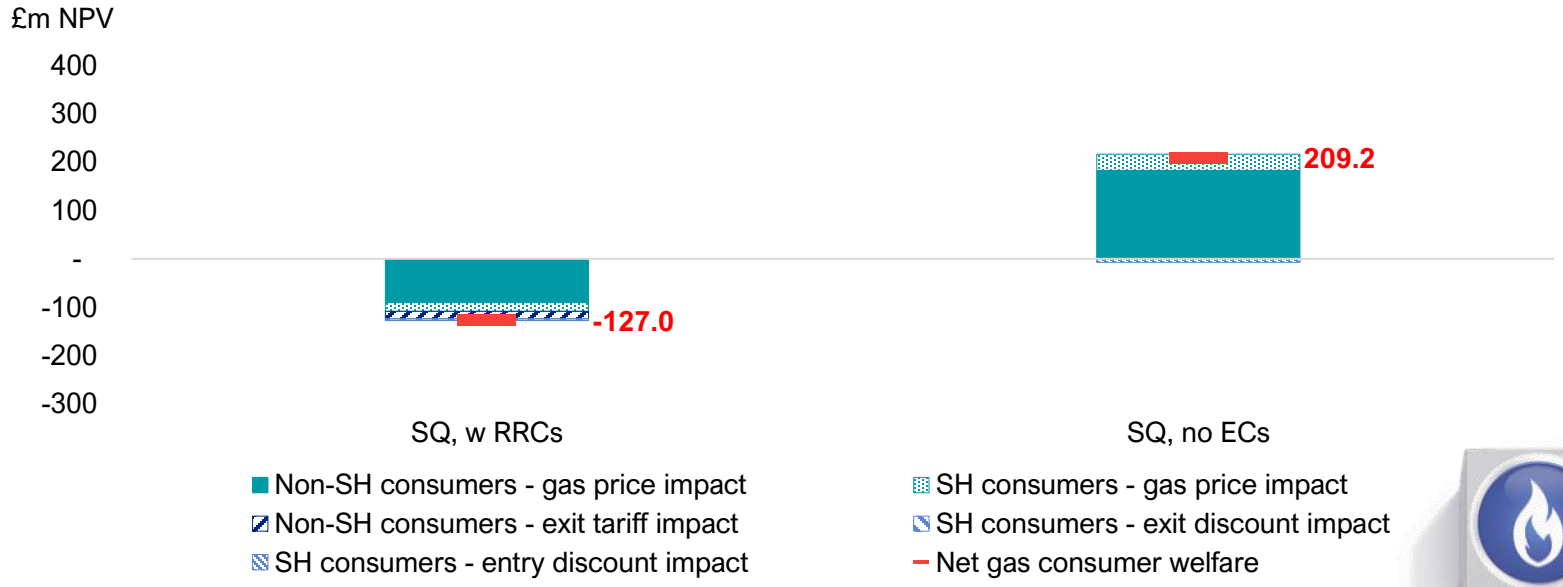
- The **69% benchmark** option leads to slightly negative consumer welfare, as the impact of the higher non-IC tariffs on the wholesale price offset benefits from periods when the interconnectors are marginal over the year.
- The **50% benchmark** option leads to the highest net positive consumer welfare, driven by the impact on the wholesale gas price observed in the previous slide.
- The **36% benchmark** has similar drivers to the 50% benchmark option but the size of the adjustment does not allow for the same level of welfare benefit.



Consumer welfare - sensitivities

Change in consumer welfare under each sensitivity (NPV 2022-23, £m 2019)

- Consumer welfare impacts largely follow the price differentials shown in the previous slide.
- Under the sensitivity, assuming persistent RRCs, consumer welfare decreases relative to the status quo – as a result of both price and tariff effects.
- When we remove existing contracts from the model, we observe significant consumer welfare benefits relative to the status quo. This impact can be interpreted as the cost of the dual tariff regime, which generates merit order distortions. We would expect the materiality of the impact to decrease over time as the volume of existing contracts falls over the decade.



4. The CAA index test

The CAA index test – under the SQ

- **The CAA index threshold is not met under our modelled SQ** with or without existing contracts.[12]
- This is partly driven by our assumption of bookings equal flows, but also the impact of incorporating subsequent mods.
- We consider this basis to be more appropriate than using 2020 tariffs.

CAA Index definition	Modelled SQ
Without Existing Contracts	46.7%
With Existing Contracts	50.2%

- All modelled options (presented overleaf) would also improve the CAA index relative to the SQ, regardless of whether existing contracts are included in the calculation.

[12]We calculate this in line with the methodology utilised by National Grid for calculating the CAA index on behalf of Ofgem under UNC678. See NGGT, March 2019, Sensitivity Tool (Model) 0678 V3.1 CWD Transmission Services (21 March 2019).

The CAA index test – options

Entry-Exit split options

- Neither option meets the threshold, but option 1a leads to a greater improvement in the CAA index than option 1b.

CAA Index definition	Modelled SQ	Option 1a. 35-65 Entry-Exit split	Option 1b. 20-80 Entry-Exit split
Without Existing Contracts	46.7%	14.6%	32.1%
With Existing Contracts	50.2%	15.2%	30.0%

Benchmarking options

- Option 2b is the only option that meets the CAA threshold both with and without inclusion of existing contracts, based on observed flows from our modelling.

CAA Index definition	Modelled SQ	Option 2a. 69% benchmarking	Option 2b. 50% benchmarking	Option 2c. 36% benchmarking
Without Existing Contracts	46.7%	13.4%	3.3%	11.8%
With Existing Contracts	50.2%	5.0%	9.0%	13.3%

The 69% benchmarking option meets the threshold only when ECs are considered, as the effective IC tariff is lower than for non-IC points without ECs.

The 50% benchmarking option meets the 10% threshold under both definitions of the CAA index.

5. Conclusions

Conclusions

Options

- Both the Entry-Exit split options (1a and 1b) and two of the benchmarking options (2b and 2c) lead to consumer welfare benefits in our modelling through an aggregate reduction in the wholesale market price.
  - This is not the case for option 2a, demonstrating that too significant an IC adjustment can lead to consumer harm by increasing the aggregate wholesale price through the increase in tariff for other forms of supply.
- **Overall, an entry-exit split of 20:80 (1b) appears to provide the biggest increase in consumer welfare, closely followed by a 50% benchmarking option (2b).**
- **Option 2b also has the benefit of rebalancing the effective tariff levied on ICs relative to non-ICs** (as measured by the CAA index), and increases interconnector flows in the modelling, which suggests that it is likely to incentivise greater cross-border trade.

Conclusions

Sensitivities

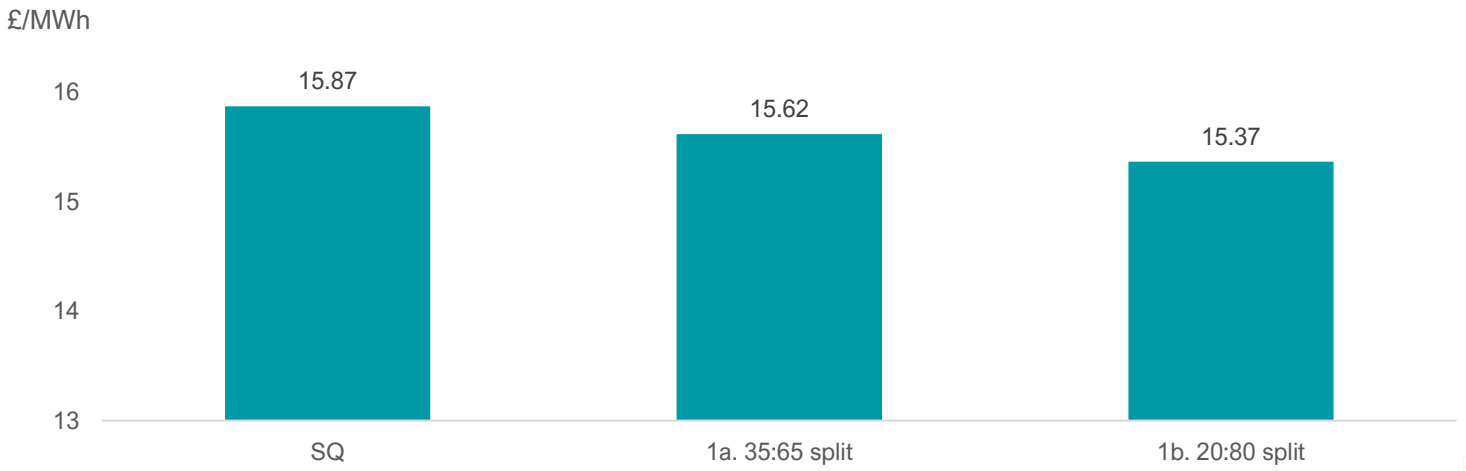
- Modelling of sensitivities suggests that the current ‘dual regime’ (i.e. presence of existing contracts at Entry) could lead to consumer harm.
- It also suggests that the revenue recovery charge could lead to consumer harm in any given year.
- While a revenue recovery charge is likely to create an inefficiency in allocation of tariffs and could impact on wholesale prices in a given year, we note that there is an intertemporal dynamic relating to recovery of revenue from one year too the next that we do not model.

Appendix A – Gas and electricity price impacts of options and sensitivities

Consumer welfare - Gas market price, entry-exit split options

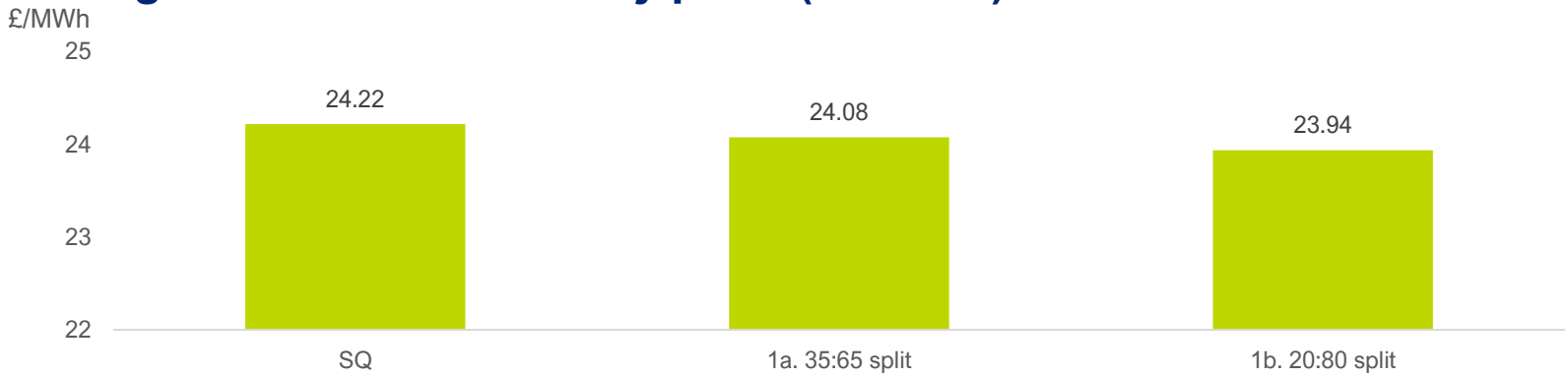
- In our modelling the wholesale gas price is determined by the cost of the marginal source of gas entry.
- Under the entry-exit split options, entry tariffs are lower than under the SQ. As a result, the marginal cost of supply falls for every entry point.
- This leads to lower gas prices under both entry-exit split options than under the SQ.
  - The impact is stronger for 1b, in line with the tariff impact.

Demand-weighted average wholesale gas price under each option

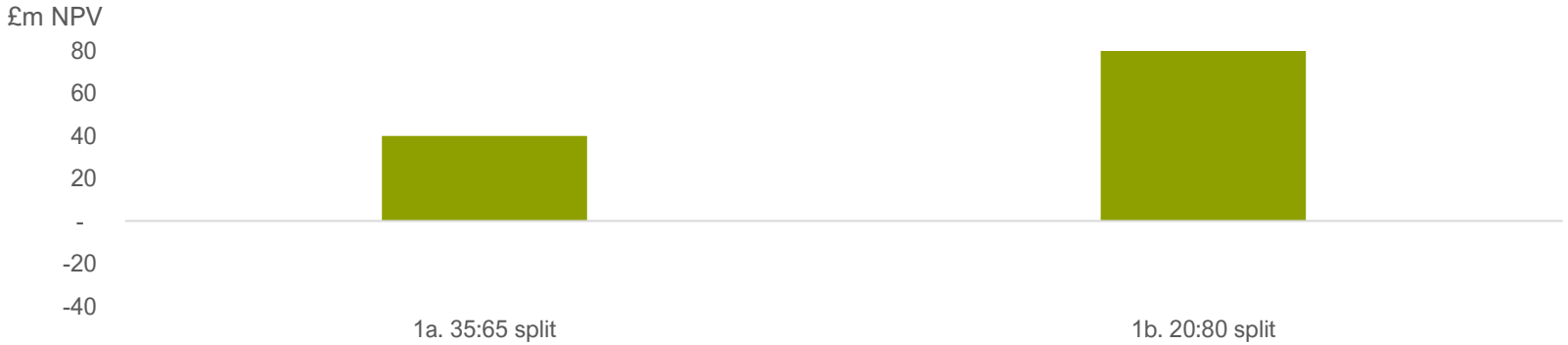


Consumer welfare - Electricity market, entry-exit split options

Average wholesale electricity price (2022-23)



Change in electricity consumer welfare (NPV 2022-23, £m 2019)

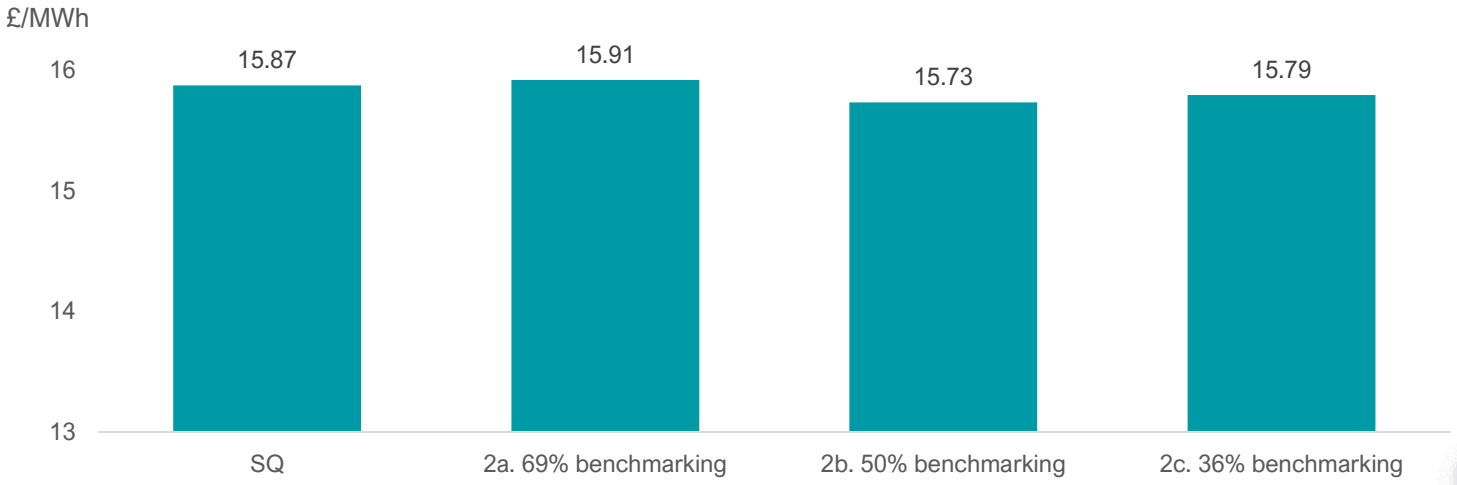


- Electricity market results are strongly linked to gas price impacts – with the resulting electricity prices following a similar trajectory as gas prices.
- Electricity consumer welfare impacts are then proportional to electricity price impacts.

Consumer Welfare - Gas market price, benchmarking options

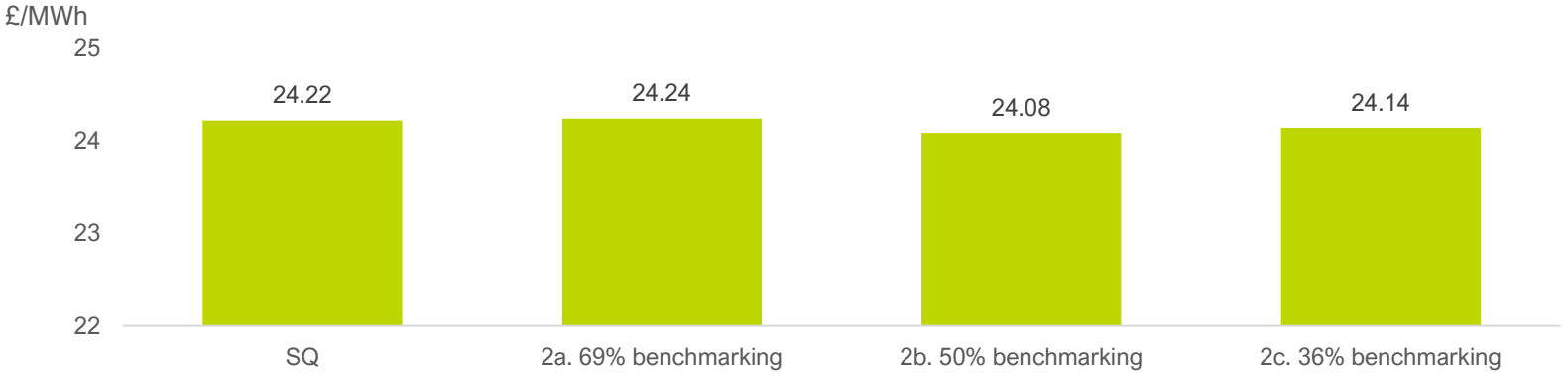
- Results suggest the following impacts under each option:
  - ***2a. 69% benchmarking***: The significant increase in the tariff when non-IC entry is marginal outweighs the lower price when ICs are marginal. This increases the gas price.
  - ***2b. 50% benchmarking***: This option strikes a balance between the decrease in the price of IC entry when marginal and the increase in the tariff for non-ICs which leads to a reduction in the gas price.
  - ***2c. 36% benchmarking***: The impacts are similar to the '50% Bench' option, but less pronounced given the lower adjustment for IC entry capacity.

Demand-weighted average wholesale gas price under each option

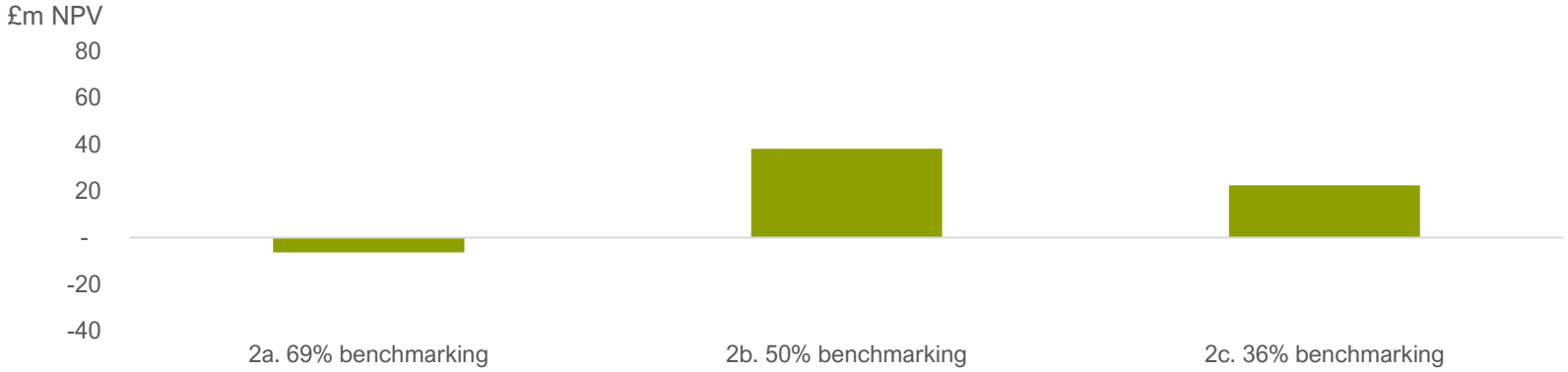


Consumer welfare - Electricity market, benchmarking options

Average wholesale electricity price (2022-23)



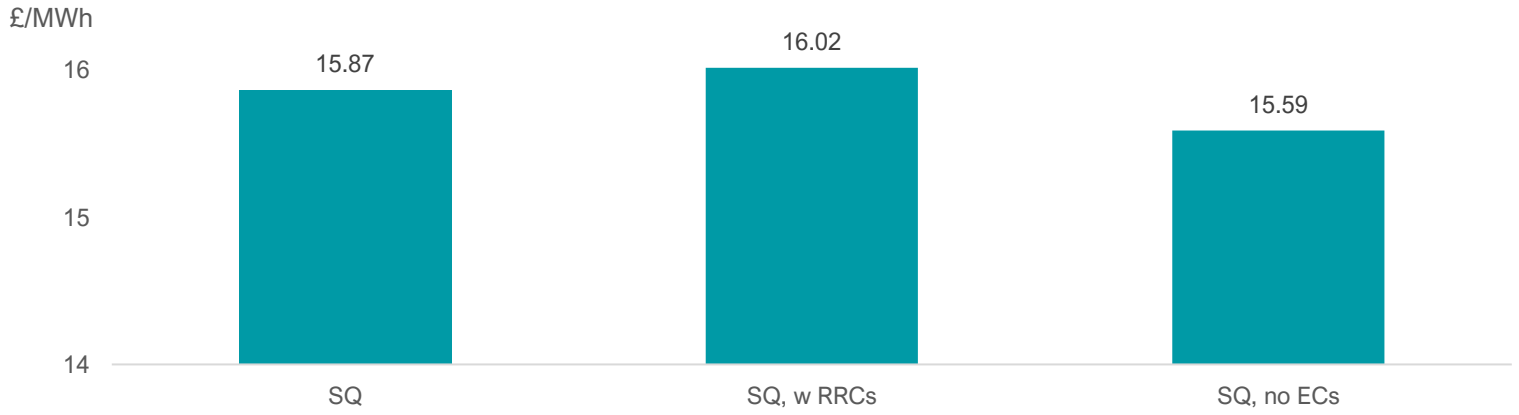
Change in consumer welfare (NPV 2022-23, £m 2019)



- Again, electricity price impacts are strongly linked to gas price impacts.
- Electricity consumer welfare impacts are then proportional to electricity price impacts.

Consumer welfare - Gas market price, sensitivities

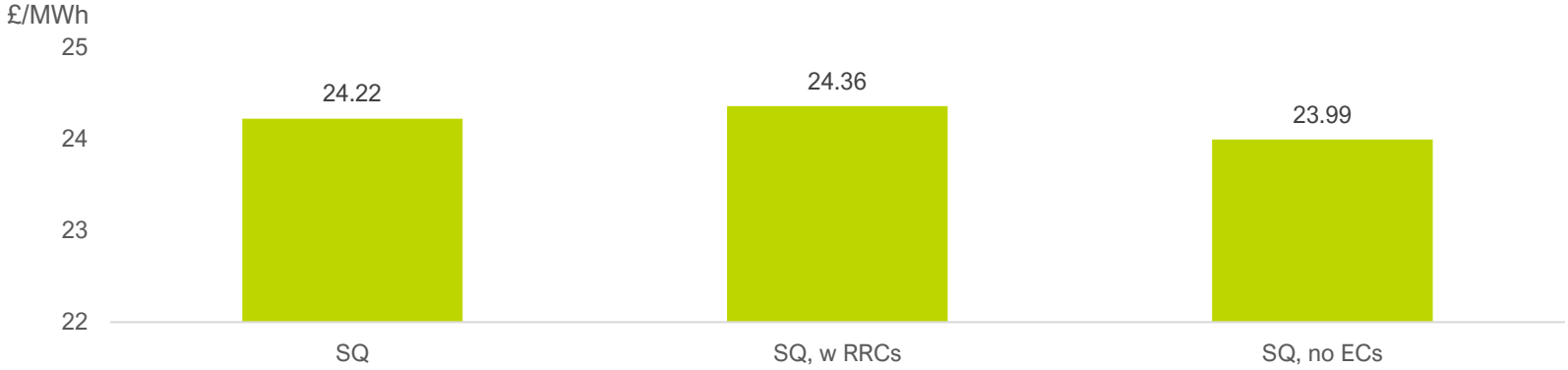
Demand-weighted average wholesale gas price under each sensitivity



- The average wholesale gas price rises under the RRC sensitivity relative to the status quo, and falls under the sensitivity without existing contracts.
- This is in line with the impacts of the sensitivities on entry tariffs relative to the status quo.

Consumer welfare - Electricity market, sensitivities

Average wholesale electricity price per option and sensitivity (2022-23)



Change in consumer welfare under each option and sensitivity (NPV 2022-23, £m 2019)

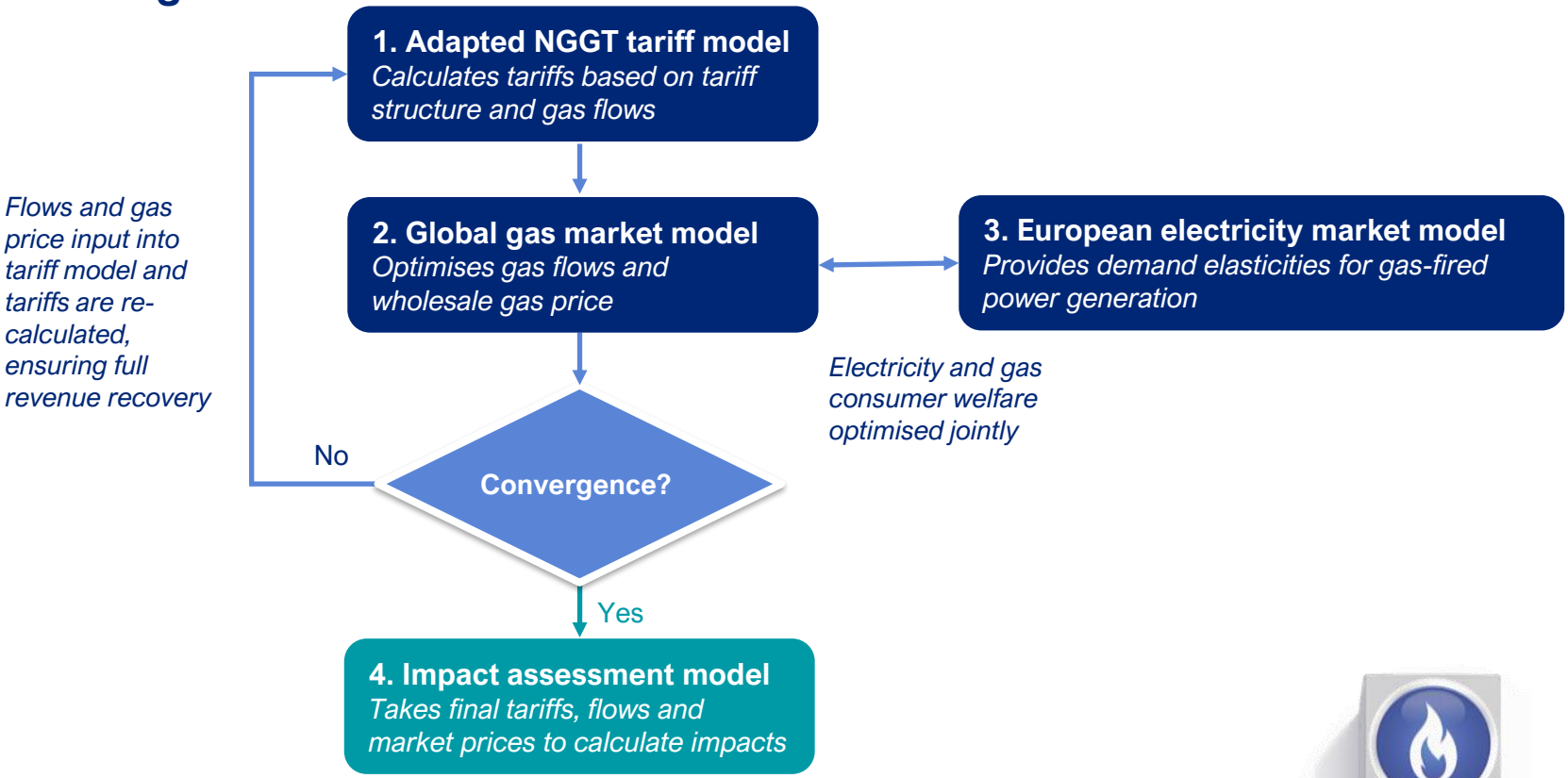
- Electricity market impacts follow a similar trajectory to gas price impacts.
- Elec consumer welfare impacts are proportional to price impacts.

Appendix B – Model methodology and limitations

High-level Modelling approach

- This analysis follows a consistent approach with CEPA's recent work advising Ofgem on UNC728.[13]
- CEPA was asked by Bacton ICs to model adjustments in gas year 2022/23. The results of our analysis are set out in this report.

Modelling framework



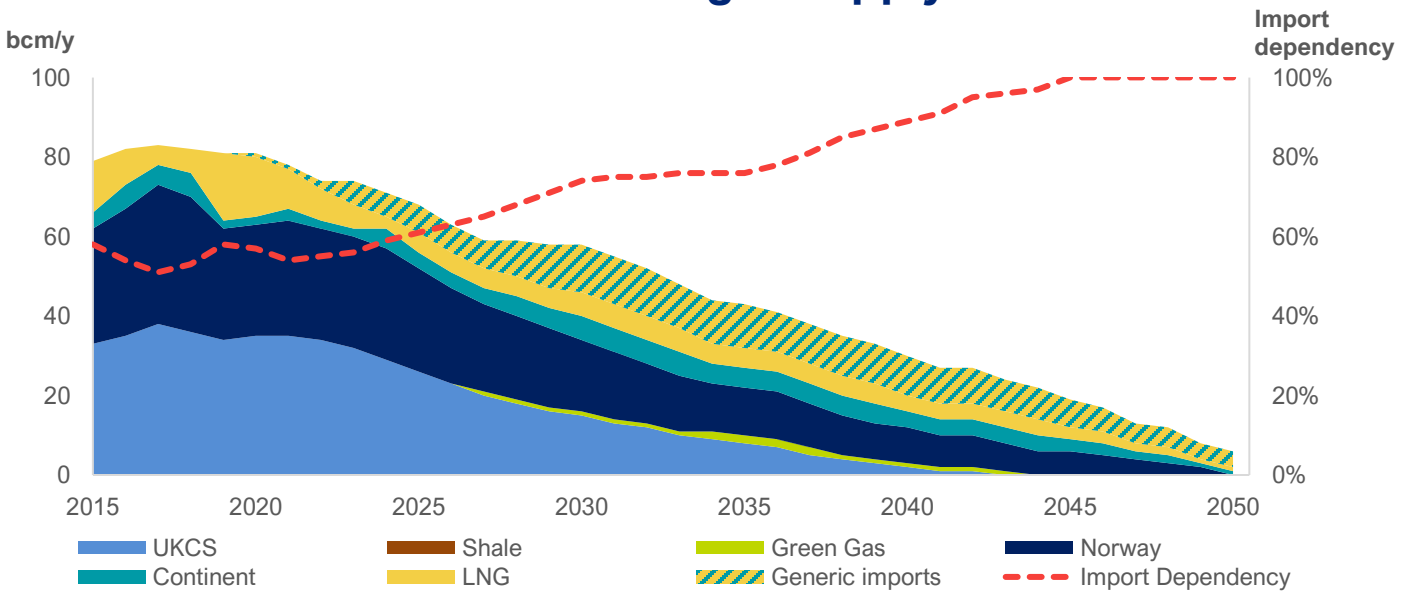
[13]For more details, see CEPA December 2020, UNC728 Analytical Support report for Ofgem.

High-level Modelling approach

FES 2020 scenario modelled

- This analysis focuses on the Consumer Transformation (CT) scenario and gas year 2022-23. This is consistent with Ofgem's lead scenario for the UNC728 impact assessment.
- Under CT, we observe a 10% fall in gas demand by 2022-23.

Consumer Transformation gas supply



Source: National Grid

Modelled supply dynamics

- CEPA's market modelling framework is deterministic, assuming perfect foresight and perfect information.
- Additionally, CEPA have modelled typical climatic conditions under a low-demand scenario, with no stochastic demand- or supply-side shocks.
- This is likely to underestimate the role of assets that respond to shocks and price volatility – in particular LNG flows.
- As a result, we would not necessarily see the same supply mix of flows into GB in the model as we may see in reality with stochastic shocks and unpredictable global supply dynamics.
- However, there are several reasons why we would consider the deterministic mechanisms in our modelling to hold, though recognising some degree of uncertainty:
  - We measure the relative impacts of options/sensitivities against the SQ and the policy options under the same market condition.
  - Deterministic trends are based on global supply dynamics taken from the WEO, a well recognised public source.
  - The model has previously been tested against alternative scenarios (FES, Steady Progression) and the general mechanisms continue to hold.

Limitations of modelling

- Our modelling structure was developed to evaluate the potential impacts of tariff policy options on consumer welfare. We model policy changes within a defined gas supply and demand scenario (FES 2020, CT).
- Our model is not intended to forecast future flows or prices. Modelling choices have been made which allow for policy choices to be analysed and compared against a counterfactual. Some choices sacrifice how well the model can capture certain market dynamics observed in real life.
- In particular our model is deterministic. It does not incorporate stochastic supply or demand shocks which can have important impacts on gas supply sources and prices in the market.
- While we consider our model to be suitable for analysis of tariff policy change. However, as with any model, care should be taken with interpretation of results.
- For a broader discussion of assumptions and limitations, please see our report to Ofgem on UNC678.[14]
- We summarise some of the key limitations on the next slide.

[14]See CEPA May 2020, UNC678 Analytical Support report for Ofgem.

Limitations of modelling

Approach	Impacts on modelled outcomes	Relevance for interpretation
Deterministic model: Our gas market model is deterministic, and optimises at daily granularity, assuming perfect foresight.	Our approach likely underestimates the role of assets that respond to short-term volatility in gas prices. While this may also affect interconnector and storage flows, it predominantly impacts on LNG flows which are likely underestimated by our modelling approach.	The balance of supply sources in our model will not be fully reflective of the complexities of the gas market. The mechanism for consumer benefit through changes to the wholesale price are subject to a bound of uncertainty. While the model can demonstrate mechanisms for benefit and provide an understanding of the conditions under which benefits are realised, care should be taken in drawing directly to infer exact impacts on prices or consumers.
Existing contracts: Existing contracts are included in the tariff model, but not in the gas market model.	The use of existing contracts is not included within the flow options at individual entry points, but volumes are netted off in the tariff model and their impact on the tariffs is reflected.	This may lead to lower modelled flows from points where significant volumes of existing contracts are held (e.g. LNG entry). This broadens the bounds of uncertainty for consideration of precise flow and wholesale price impacts.
Price elasticity of demand: We model domestic and I&C gas consumers as inelastic (save for some demand-side response from I&Cs at very high gas prices)	This assumption means that these consumers will largely not respond to increases in the price or exit tariff through any reduction in demand.	This is particularly relevant for our consideration for changes to the Entry-Exit split where we identify benefits to consumers from shifting revenue recovery from more elastic supply to demand. While economic theory suggests some benefit may arise, our assumption may magnify the extent of this benefit.

Appendix C – Discussion of gas price impacts

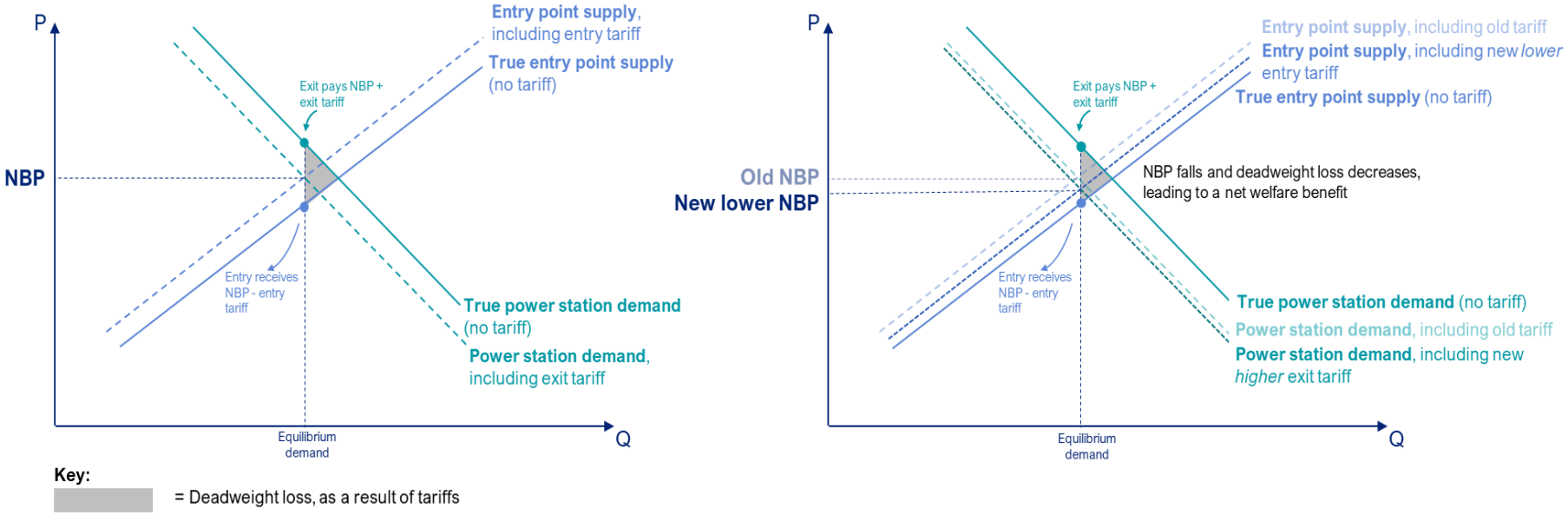
Impacts of an IC adjustment on the gas market price

- Given that the marginal unit of gas may be assumed to set the wholesale gas price, **the change in the market price on any given day relative to the SQ will depend on whether the tariff option increases or reduces the tariff of the marginal unit**.
  - A tariff option may increase the tariff of inframarginal units but would still reduce the market price where the tariff of the marginal unit falls, and vice versa.
- The overall impact of an IC adjustment on the market price relative to SQ will depend on which one of the following two opposing effects dominates on average:
  1. In periods where ICs are the marginal source of gas entry, we observe a decrease in the gas price under those options that provide a adjustment to IC entry capacity.
  2. In periods where non-ICs are the marginal source of entry, the gas price increases/decreases depending on the direction of impact on the reference entry tariff for non-SH flows. This can happen:
     a) when ICs were marginal under the SQ but become inframarginal due to the adjustment, or
     b) when non-ICs are marginal to begin with
- The figures in the following slides provide a simplified representation of these effects.

Impact of adjusting the En-Ex split

- Given that gas demand is less elastic that supply, economic theory (Ramsey pricing) would suggest that recovering more of the revenues from exit would be beneficial.
- This is also the case in our modelling, where the revenue re-allocation has less of an effect on exit bookings than on entry due to lower elasticity of demand.
- This effect is also amplified because of the 1-in-20 booking assumptions at GDNs which magnifies the amount of inelastic demand.
- Overall this means that recovering a greater proportion of revenues from exit tariffs leads to a smaller increase in the exit tariff than the decrease in the entry tariff and as such it is less distortionary. This results in higher consumer welfare from a reduction in the deadweight loss :

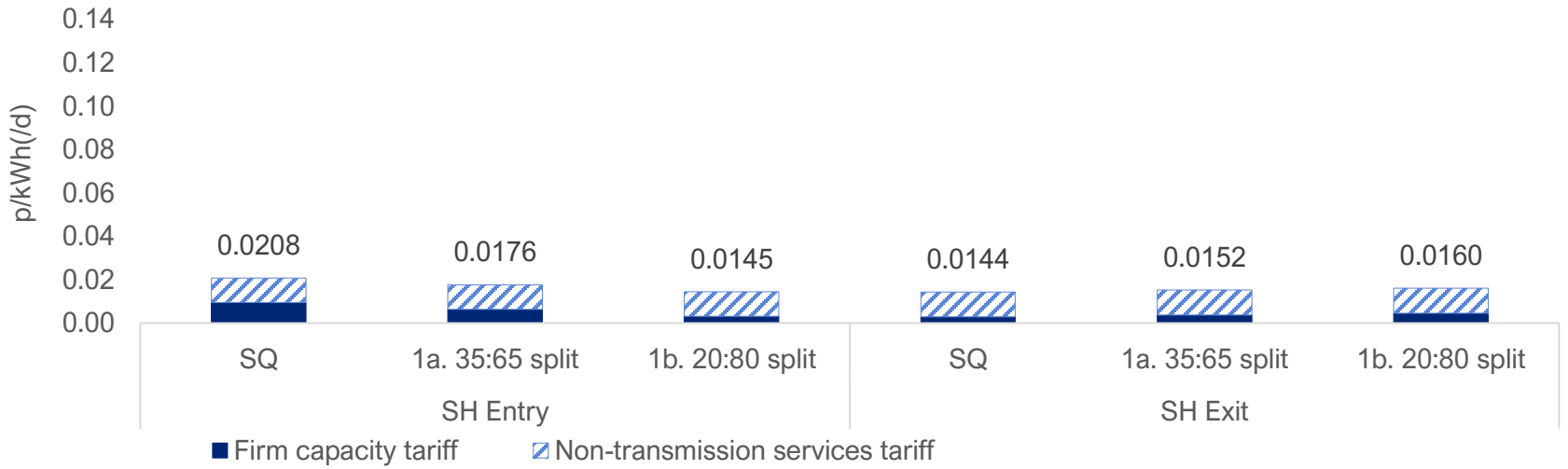
Illustrative deadweight-loss under a 50:50 split vs. the impact of increasing weight on exit



Appendix D – Shorthaul and storage tariffs

Comparison of shorthaul tariffs – entry-exit split options

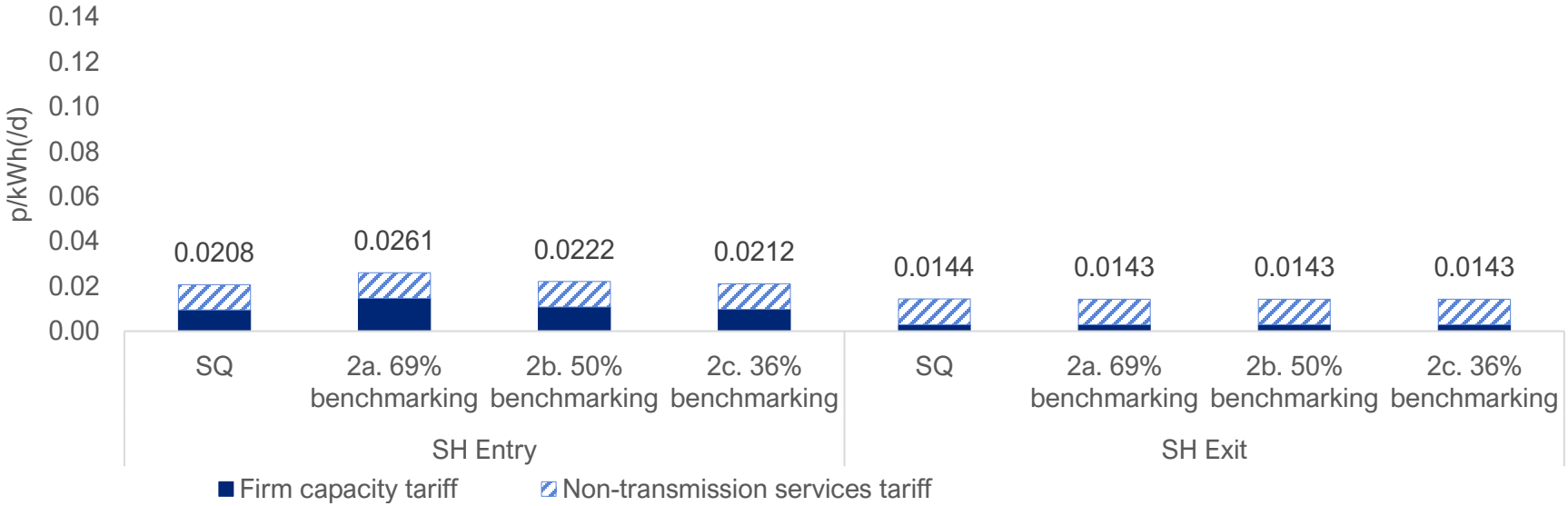
Interconnector shorthaul entry and exit tariffs (transmission and non-transmission services) under each option (2022-23)



- Under the policy option definition modelled, shorthaul IC bookings do not benefit from any IC adjustments, as the shorthaul entry tariffs were already in the range of other NWE ICs.
- As a result, SH interconnector tariffs reflect an 88-90% adjustment (with the majority of routes having 0km distance) *relative to the non-SH non-IC reference tariffs*.
  - I.e. SH IC bookings do not receive a 'compounded' adjustment. Rather, the impact on SH IC tariffs is in line with the impact on non-IC tariffs.

Comparison of shorthaul tariffs – benchmarking options

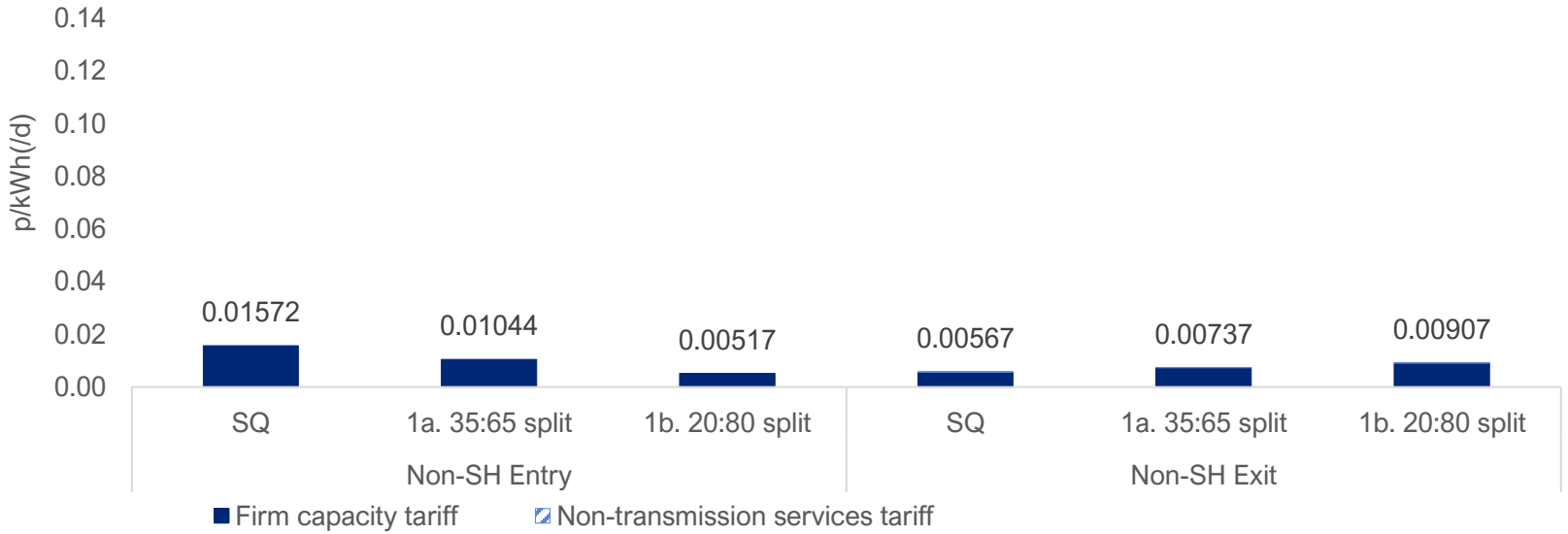
Interconnector shorthaul entry and exit tariffs (transmission and non-transmission services) under each option (2022-23)



- Under the policy option definition modelled, shorthaul IC bookings do not benefit from any IC adjustments, as the shorthaul entry tariffs were already in the range of other NWE ICs.
- As a result, SH interconnector tariffs reflect an 88-90% adjustment (with the majority of routes having 0km distance) *relative to the non-SH non-IC reference tariffs* (slide 26).
  - I.e. SH IC bookings do not receive a 'compounded' adjustment. Rather, the impact on SH IC tariffs is in line with the impact on non-IC tariffs.

Comparison of storage tariffs – entry-exit split options

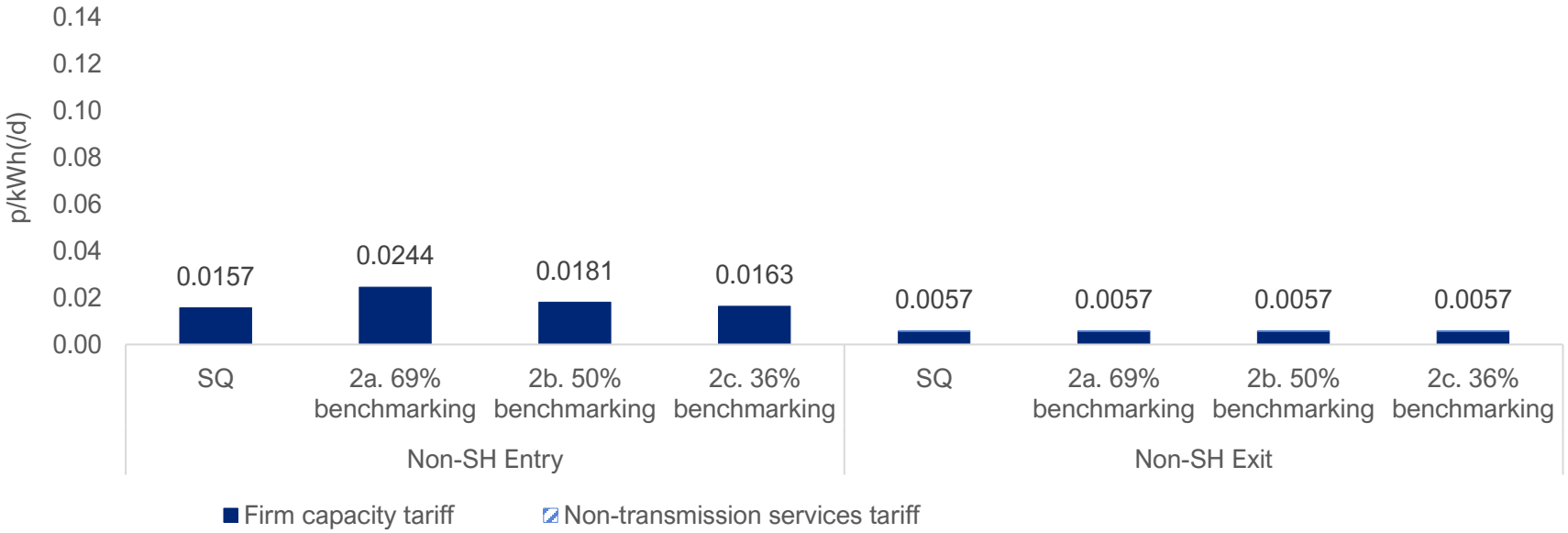
Storage point tariffs, entry and exit (transmission and non-transmission services) under each option (2022-23)



- Storage site tariffs reflect an 80% adjustment relative to the non-SH reference transmission services tariffs.
- Storage sites only pay the non-transmission services tariff for 'own use gas' at exit (~0.06% of total exit flows).

Comparison of storage tariffs – benchmarking options

Storage point tariffs, entry and exit (transmission and non-transmission services) under each option (2022-23)



- Again, storage site tariffs reflect an 80% adjustment relative to the non-SH reference transmission services tariffs (at both entry and exit), and only pay the non-transmission services tariff for 'own use gas' at exit (~0.06% of total exit flows).

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