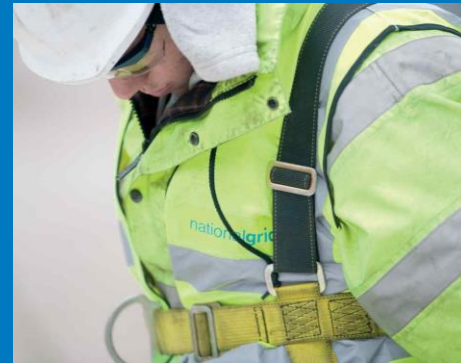


Gas Charging Review



NTSCMF – 6 April 2016

Update provided on 31 March 2016. All slides added or updated are marked with a blue star ★

Agenda

- Terms of Reference and work plan
- Gas Charging Review
 - Quick overview of current approach
 - Introducing Capacity Weighted Distance
 - Assumptions for modelling
 - Initial calculations and comparisons
 - Considering EU TAR NC compliance
 - Additional elements to consider
 - (e.g. Revenue recovery, commodity charges, other products)
 - Next steps

Terms of Reference, Work plan and schedule of workshops

Item	Detail
Terms of Reference (including Scope)	<ul style="list-style-type: none">• Updated following NTS CMF in February• Updated version on Joint Office website• Scope should be subject to change and continually reviewed.
Work Plan	<ul style="list-style-type: none">• Updated following NTS CMF in February• Updated version to be added on Joint Office website• Keep under review for discussions as workshops progress
Scheduled workshops	<ul style="list-style-type: none">• Monthly NTS CMF meetings scheduled from April 2016 to February 2017<ul style="list-style-type: none">• Hosted by Joint Office of Gas Transporters• Website: http://www.gasgovernance.co.uk/ntscmf• Ad hoc workshops may be held• These provide an opportunity to participate or to follow the developments

Gas Charging Review



Overview of current approach

Reminder of Charging Obligations / Relevant Objectives

Licence Obligations	Detail
Licence Standard Special Conditions <ul style="list-style-type: none">A4 - Charging GeneralA5 - Charging Methodology	<ul style="list-style-type: none">Keep charging methodology under reviewUse reasonable endeavours regarding methodology and charge changes:<ul style="list-style-type: none">Not to make changes more frequently than twice a year (on 1 April and 1 October)In relation to exit capacity once a year on 1 October

Relevant Objectives	
<ul style="list-style-type: none">Cost reflectivityPromote efficiencyAvoid undue preference in the supply of transportation servicesBest promotes competition between gas suppliers and gas shippers	<ul style="list-style-type: none">Take account of developments in the transportation businessCompliance with Regulation and decisions from the EC and ACERFollow any alternative arrangement determined by the Secretary of State

Current methodology for Capacity Charges: The Transportation Model (1/2) nationalgrid

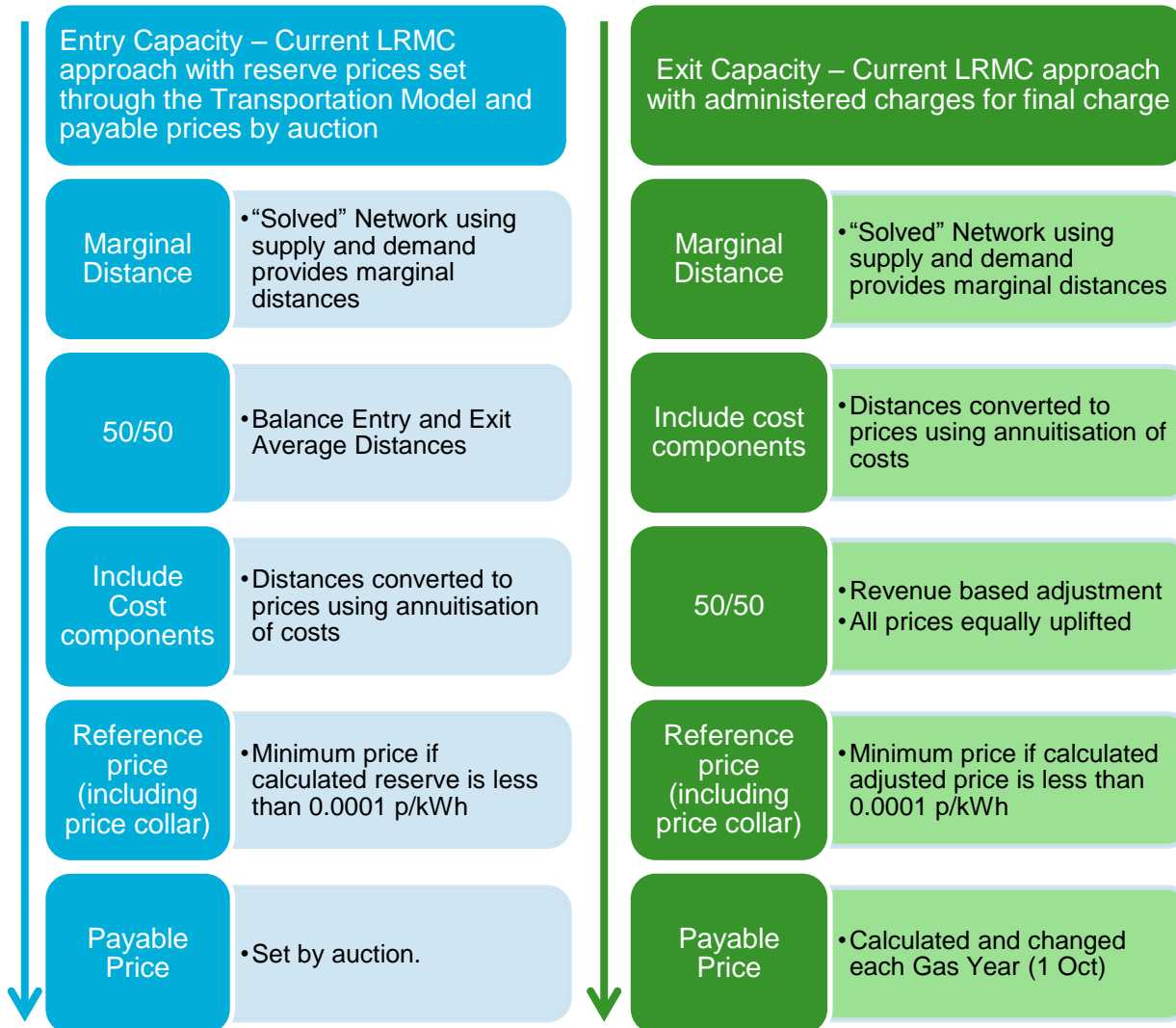
- The NTS Transportation Model, available to the industry, is a Microsoft Excel spreadsheet run using Microsoft Excel Solver and Macros
- Calculates:
 - NTS Entry Capacity auction reserve prices
 - Long Run Marginal Cost
 - NTS Exit Capacity charges
 - Administered to recover allowed revenue
- Inputs are:
 - Allowed Revenue (in respect of Exit)
 - Forecast 1-in-20 peak day demand data and forecast supplies – linked to a flow scenario
 - Obligated capacity levels
 - Transmission pipelines between each node (km)
 - Expansion Constant (£/GWh/km) to calculate costs
 - Anuitisation Factor to calculate prices



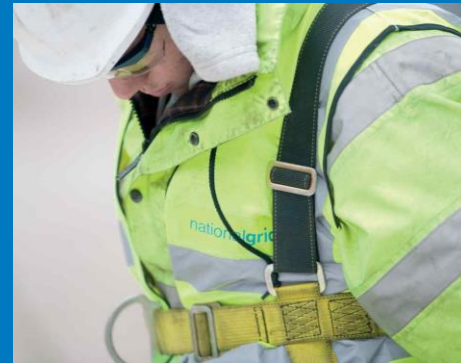
Current methodology for Capacity Charges: The Transportation Model (1/2) nationalgrid

- Transportation Model has two components
- The NTS Transport Model that calculates the long run marginal costs (LRMCs) of transporting gas from each Entry Point (for the purposes of setting NTS Entry Capacity Prices) to a “reference node” and from the “reference node” to each relevant offtake point.
 - Long Run – Investment costs
 - Marginal Cost – adding an extra unit of supply or demand at a relevant node on the system
- The Tariff Model (in respect of Exit) calculates a Revenue Adjustment Factor, which when added to the LRMC at each demand, gives a revised marginal distance for each demand, such that the total revenue to be recovered from exit charges equals the target revenue.

Current methodology - Core steps nationalgrid for reference prices and payable prices



Gas Charging Review



Introducing Capacity Weighted Distance

Why consider an alternative reference price methodology for capacity?

- Under the charging review one area for discussion is the underlying charging methodology for capacity
 - GB uses LRMC (investment focused)
 - Under EU Tariff Network Code (EU TAR NC) there is a requirement, irrespective of method chosen as a Reference Price Methodology (RPM), to compare it to a pure Capacity Weighted Distance (CWD) as a counterfactual – pure meaning the calculation followed exactly as given under the EU TAR NC
 - Proposed RPM to be subject to an industry consultation

Introducing Capacity Weighted Distance (CWD)

- The Capacity Weighted Distance (CWD) calculation we have followed is from the “Network Code on Harmonised Transmission Tariff Structures for Gas” dated 31 July 2015
- <http://www.entsog.eu/publications/tariffs>
- This is an initial look at CWD to assess how it compares to LRMC. Future work will likely require some additional components / refinements however this version is the comparative under the draft EU TAR NC, even if an alternative form of CWD is used
- CWD does differ from the current methodology for capacity (LRMC + Adjustments)

LRMC and CWD comparison:

Initial thoughts

LRMC approach

- Bottom up approach to generate prices
- Builds up prices with components
- Capacity expectations different to Entry and Exit
 - Entry – auctions
 - Exit – Baseline bookings

CWD approach

- Top down approach to generate prices
- Starts with Target Revenue then distributes this across capacity booking expectations
- Capacity expectations require forecast to be as close as possible to actuals

Core steps to determining reference national grid prices / payable prices (LRMC and CWD)

Entry Capacity – Current LRMC approach with reserve prices set through the Transportation Model and payable prices by auction

Marginal Distance

- “Solved” Network using supply and demand provides marginal distances

50/50

- Balance Entry and Exit Average Distances

Include Cost components

- Distances converted to prices using annuitisation of costs

Reference price (including price collar)

- Minimum price if calculated reserve is less than 0.0001 p/kWh

Payable Price

- Set by auction.

Exit Capacity – Current LRMC approach with administered charges for final charge

Marginal Distance

- “Solved” Network using supply and demand provides marginal distances

Include cost components

- Distances converted to prices using annuitisation of costs

50/50

- Revenue based adjustment
- All prices equally uplifted

Reference price (including price collar)

- Minimum price if calculated adjusted price is less than 0.0001 p/kWh

Payable Price

- Calculated and changed each Gas Year (1 Oct)

Capacity Weighted Distance calculation for both Entry and Exit to determine reserve prices. Payable price set each year.

Shortest path between all Entry points and Exit Points

- Shortest path using physical distances between nodes on the Network

Overall Target Revenue

- Total Allowed Revenue for all Capacity to aim to recover

50/50

- Revenue split to determine target revenue for Entry and Exit

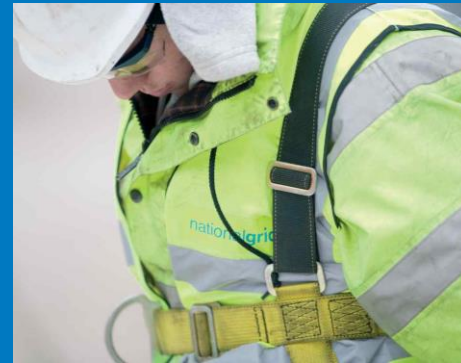
Reference Price using Weighted Average Price (WAP) calculation

- Revenue distributed across points to determine WAP based on forecast contracted capacity.

Payable Price

- Linked to charge calculated and changed each Gas Year (1 Oct) (excluding any protected capacity)

Gas Charging Review - Modelling



Current Method compared to Capacity Weighted Distance



High level key assumptions for Modelling CWD compared to LRMC

- We have assumed that GB has a single methodology for all points (Interconnection Points (IPs) and Non Interconnection Points (Non-IPs)).
- We have assumed no change in behaviour for capacity
- We have not included any discount structure, therefore all capacity at each point attracts the same price
- The purpose of this is to show the high level workings of CWD, comparisons to current methodology, to gain an understanding of how it may be developed or refined
- In the following slides we list the main requirements and remaining assumptions for this modelling



Key Requirements for modelling CWD compared to current approach

Comparison of Methodologies	Long Run Marginal Cost (current methodology as used in GB)	Capacity Weighted Distance (EU TAR NC)
Network and Distances	<ul style="list-style-type: none">• Uses an overall “Solved network” based on supplies and demand to provide all distances• Unconstrained system	<ul style="list-style-type: none">• Considers all points to all points• Unconstrained
Cost Components	<ul style="list-style-type: none">• Cost of Expansion (£/GWh/km)• Annuitisation	<ul style="list-style-type: none">• Not used
Allowed Revenues	<ul style="list-style-type: none">• Target Revenue used for Exit only.	<ul style="list-style-type: none">• Used for Entry and Exit
Supplies and Demand	<ul style="list-style-type: none">• 1 in 20 peak for Demand• Forecast Supplies• Linked to a flow scenario	<ul style="list-style-type: none">• Not linked to flow scenario• Unconstrained network
Capacity	<ul style="list-style-type: none">• Uses Licence requirements (obligated levels, baselines)	<ul style="list-style-type: none">• Using Licence requirements (obligated levels, baselines) and historical / sold values as a proxy for forecasted contracted capacity
Adjustments	<ul style="list-style-type: none">• Price collar as no –ve prices.• No zero prices in Model (zero payable does apply for certain auctions where 100% discount applied)	<ul style="list-style-type: none">• No negative prices possible under the pure calculation• Zero prices possible (if forecast capacity = zero). Subject to discussion if appropriate.



Key assumptions for capacity: Modelling CWD compared to LRMC

	LRMC (Current Methodology)		CWD	
Years Modelled	Gas Years 14/15 and 15/16		Gas Years 14/15 and 15/16	
	Entry	Exit	Entry	Exit
Capacity Input	Obligated Entry Capacity as per Licence and included into the current Transportation Model.	Non-incremental Obligated Exit Capacity as per Licence and included into the current Transportation Model.	Forecasted contracted capacity, in the form of: <ul style="list-style-type: none"> Obligated Entry Capacity as per Licence and included into the current Transportation Model. Sold capacity for the year (where known). If not then used previous years / months. 	Forecasted contracted capacity, in the form of: <ul style="list-style-type: none"> Non-incremental Obligated Exit Capacity as per Licence and included into the current Transportation Model. Sold capacity for the year (where known). If not then used previous years / months.
Method of applying Entry / Exit Split (kept 50/50)	Average LRMCs	Administered prices	Administered prices	Administered prices

Key assumptions for network: Modelling CWD compared to LRMC

Item		LRMC	CWD
Network		<ul style="list-style-type: none"> As per Transportation Model issued for each year in question used to set Entry and Exit Prices 	<ul style="list-style-type: none"> Based on network as at December 2015 Any new points added in, linked to closest node on the existing network
Cost Components	Expansion Constant	<ul style="list-style-type: none"> Entry and Exit. As per Models. No change. 	<ul style="list-style-type: none"> Not used
Cost Components	Annuity Rate	<ul style="list-style-type: none"> As given in UNC. No change to values used. 	<ul style="list-style-type: none"> Not used
Supply / Demand		<ul style="list-style-type: none"> Entry as per MSEC models Exit as per year and also updated with that years Supply /Demand values 	<ul style="list-style-type: none"> Not used



Key assumptions for Revenue: nationalgrid Modelling CWD compared to current approach

Item	LRMC	CWD
If applicable for Revenue purposes, Entry and Exit Split	<ul style="list-style-type: none">Using 50/50 where used (exit only)	<ul style="list-style-type: none">Using 50/50 for both Entry and Exit
Revenue for Entry Capacity	<ul style="list-style-type: none">n/a	<ul style="list-style-type: none">More than one used to help show impacts. Based on TO Revenue less DN Pensions (assumes “K” is zero).Using Allowed Revenues from 14/15 and 15/16; andUsing flat revenue profile
Revenue for Exit Capacity	<ul style="list-style-type: none">As per final Exit models from 14/15 and 15/16Based on TO Revenue less DN Pensions (assumes “K” is zero).	<p>More than one used to help show impacts. Based on TO Revenue less DN Pensions (assumes “K” is zero).</p> <ul style="list-style-type: none">Using Allowed Revenues from 14/15 and 15/16; andUsing flat revenue profile

“K” represents any under or over recovery from a previous year that would be carried forward



Key terms and what they mean for the purposes of the models shown nationalgrid

Item	Entry	Exit
“TO MAR” (LRMC & CWD)	Allowed Transmission Owner Revenue as provided in the Long Term Revenue Forecast (http://www2.nationalgrid.com/UK/Industry-information/System-charges/Gas-transmission/Tools-and-Models/) for the given year less DN Pensions without a zero value for “K”* then applying Entry / Exit split.	
“Obligated Capacity Forecast” (CWD only)	Obligated Entry Capacity (i.e. Non-incremental Obligated Entry Capacity + Incremental Obligated Entry Capacity) as per the current Transportation Model	Non-incremental Obligated Exit Capacity as per the current Transportation Model
“Sold Capacity Forecast” (CWD only)	Obligated Firm Capacity sold for the relevant year (where known, for the remaining months of 2016 for which there is no data, the equivalent data from 2015 has been used). Note: For Bacton IP and Bacton UKCS, Obligated Firm Capacity sold at Bacton in 2014/15 has been used and split proportionally between the two locations using the Licence Baseline proportions.	Obligated Firm Capacity sold for the relevant year (where known, for the remaining months of 2016 for which there is no data, the equivalent data from 2015 has been used).

*“K” represents any under or over recovery from a previous year that would be carried forward



Which prices are being shown in each chart

- For Entry Capacity we show the prices for individual points on the charts
- For Exit Capacity, due to the number of points, we show averages by zone
 - Zones aggregated (e.g. SO1 and SO2 are shown as SO)
 - Any Interconnector, Storage, Power Generation and Industrial are in the “Other” average value
 - This may not show the full extent of change for individual points however will give a good overview
- All individual prices for each model shown are available in the accompanying spreadsheet available on the Joint Office website (<http://www.gasgovernance.co.uk/ntscmf/060416>)

LRMC Models for 14/15 and 15/16

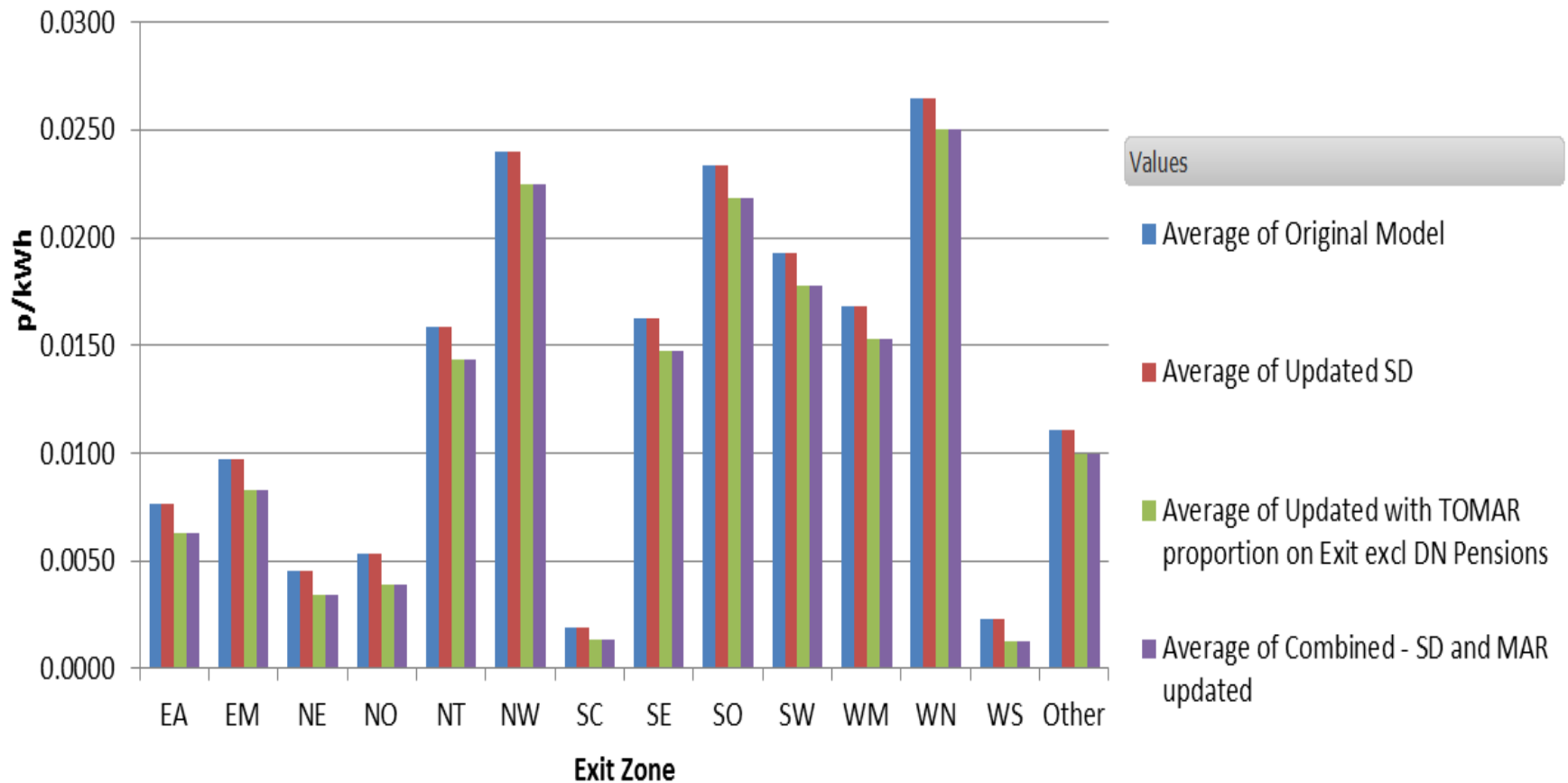
- We have provided some of the current modelled charges to help as a comparison for capacity charging
- In order to help the comparison we are updating supply and demand* to be up to date for the relevant year in all models

Entry	Exit
Start with models for each gas year	
<ul style="list-style-type: none"> • Using MSEC model and values (issued in each June) 	<ul style="list-style-type: none"> • Start with October model and charges issued in each May
	<ul style="list-style-type: none"> • Updated for Supply / Demand values
	<ul style="list-style-type: none"> • Updated for changes to Revenue as given in Revenue assumptions



LRMC Models – Exit Capacity 2014/15

Average Capacity price (2014/15) per Exit Zone

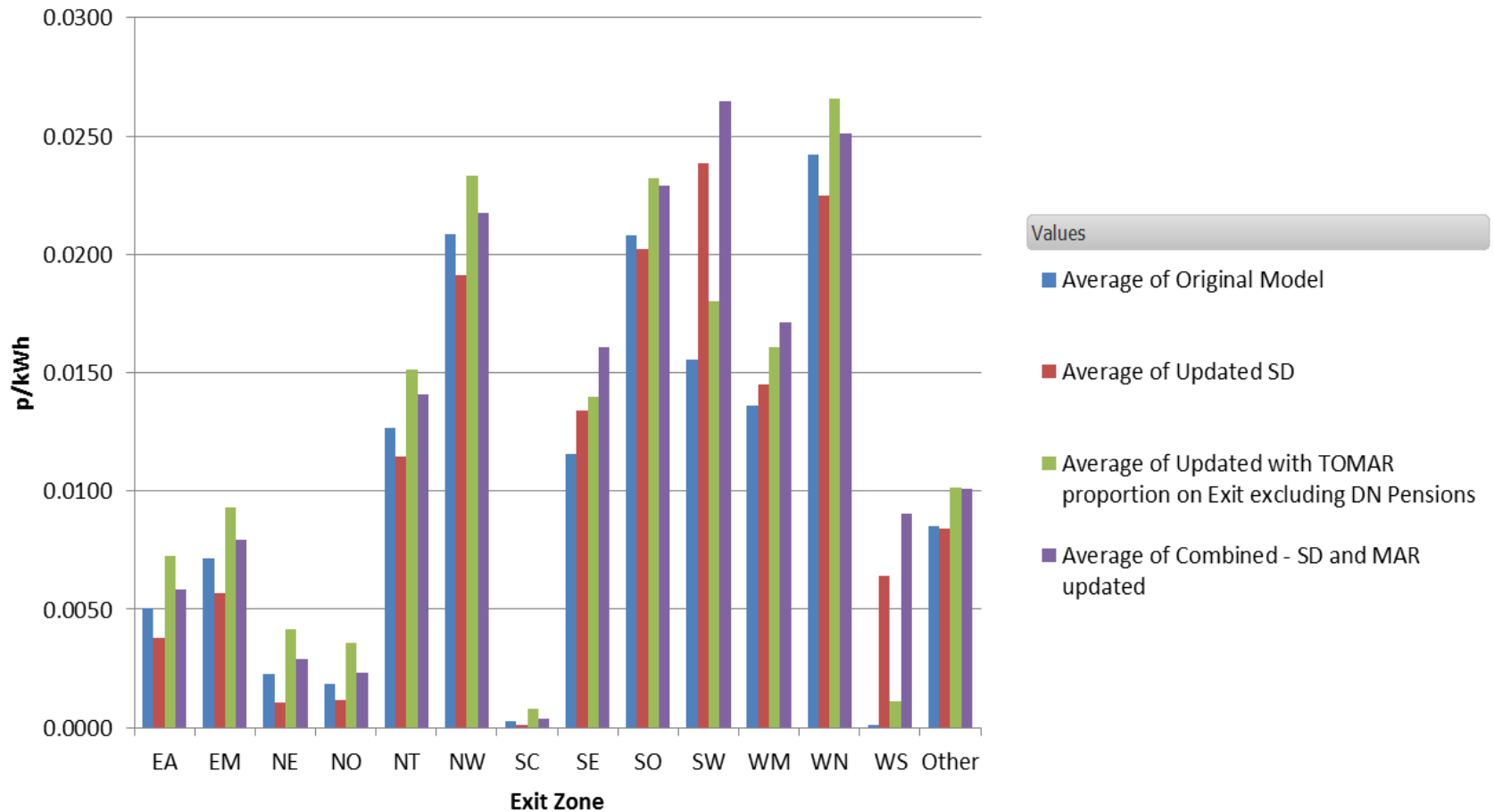


*Other contains Interconnector, Storage, Power Generation and Industrial



LRMC Models – Exit Capacity 2015/16

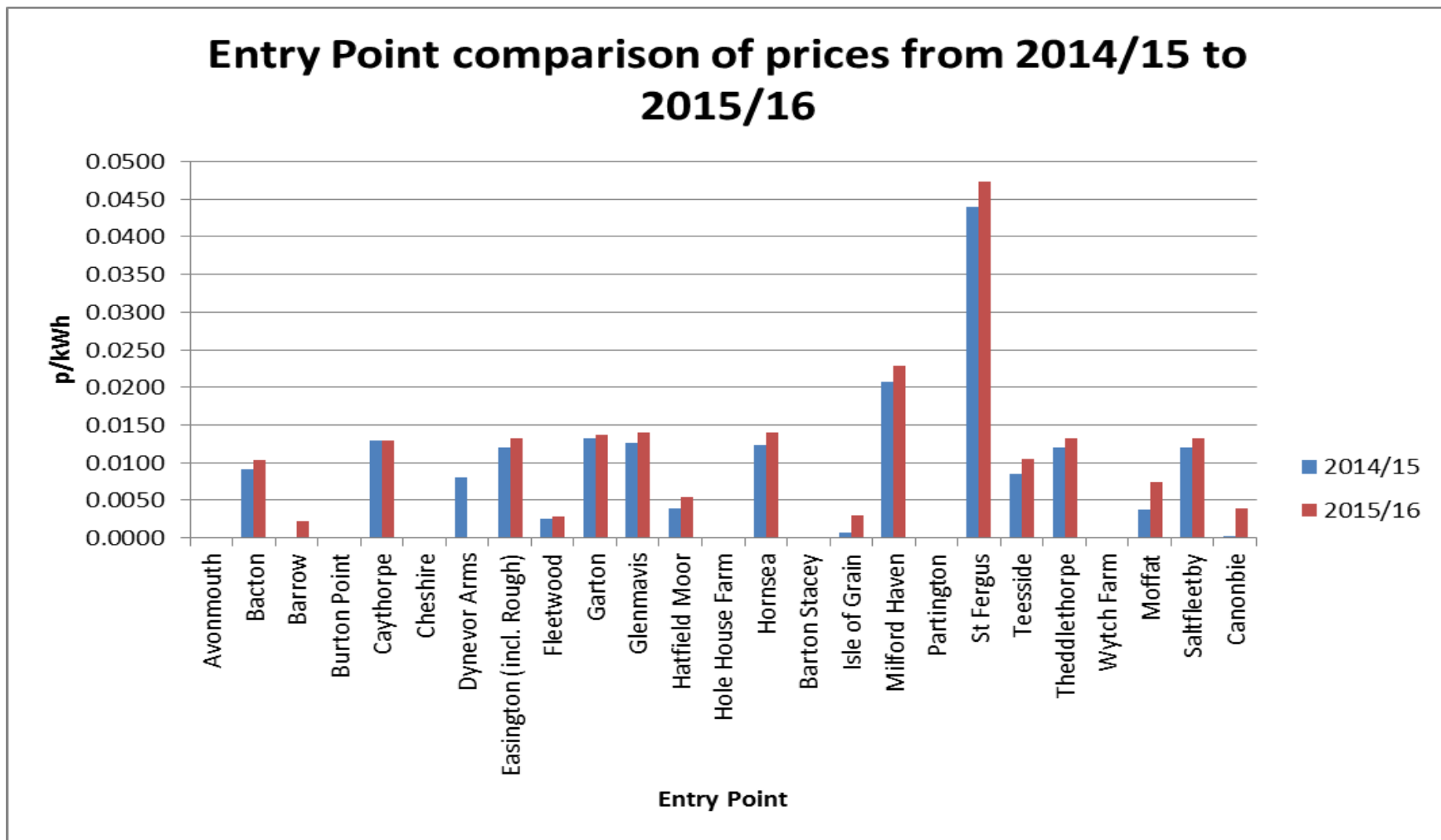
Average Capacity price (2015/16) per Exit Zone





LRMC Entry Capacity

14/15 and 15/16 prices and comparisons

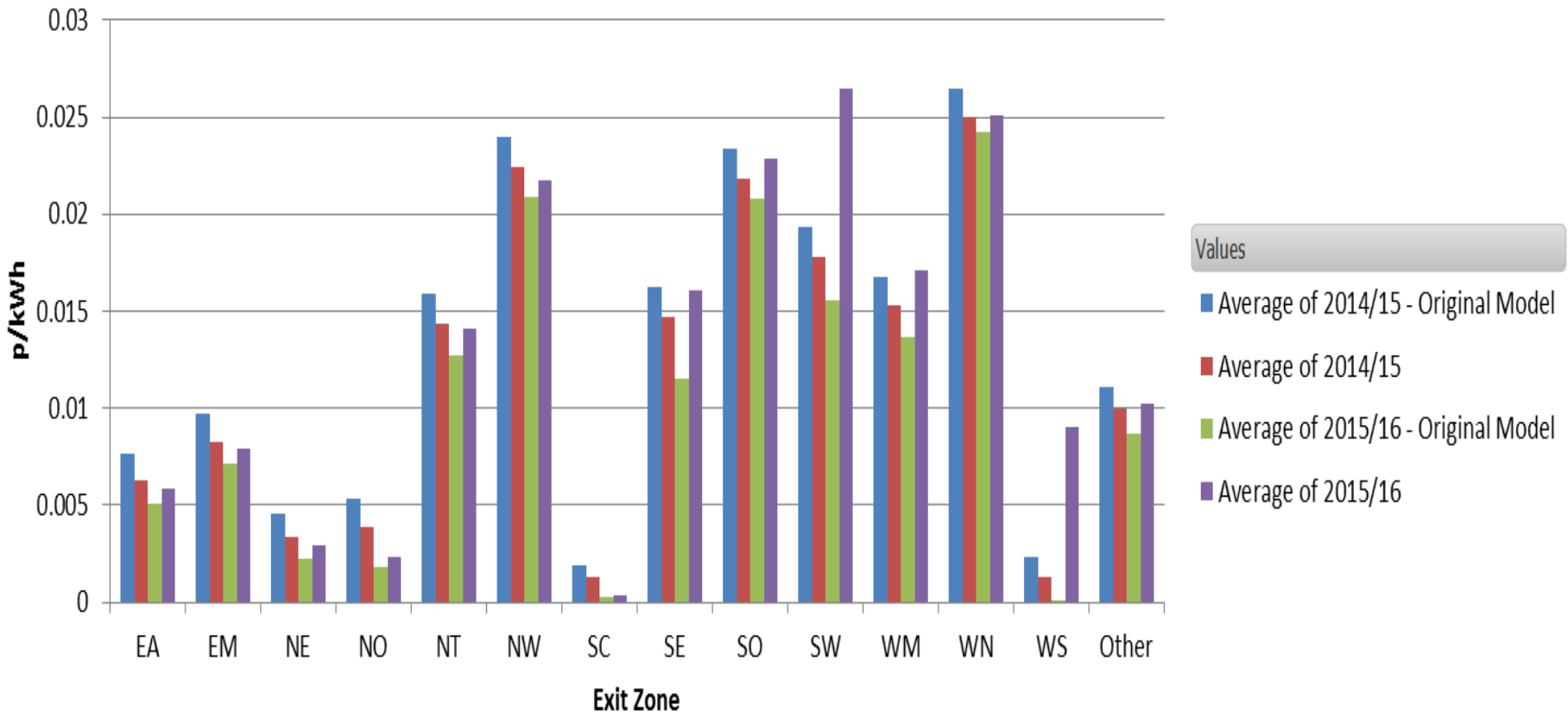




LRMC Exit Capacity

14/15 and 15/16 prices and comparisons

Exit Zone comparison of prices from 2014/15 to 2015/16





CWD Models for 14/15 and 15/16

- Using the CWD calculation we have provided a number of modelled options to help as a comparison for capacity charging

Entry	Exit
Start with the modelled network to show shortest paths on the network	
<ul style="list-style-type: none">• Model using Licence obligated levels for capacity	<ul style="list-style-type: none">• Model using Licence baseline levels for capacity
<ul style="list-style-type: none">• Model using forecasted contracted capacity (as per capacity assumptions)	<ul style="list-style-type: none">• Model using forecasted contracted capacity (as per capacity assumptions)
Apply range of revenue options as given in Revenue Assumptions	

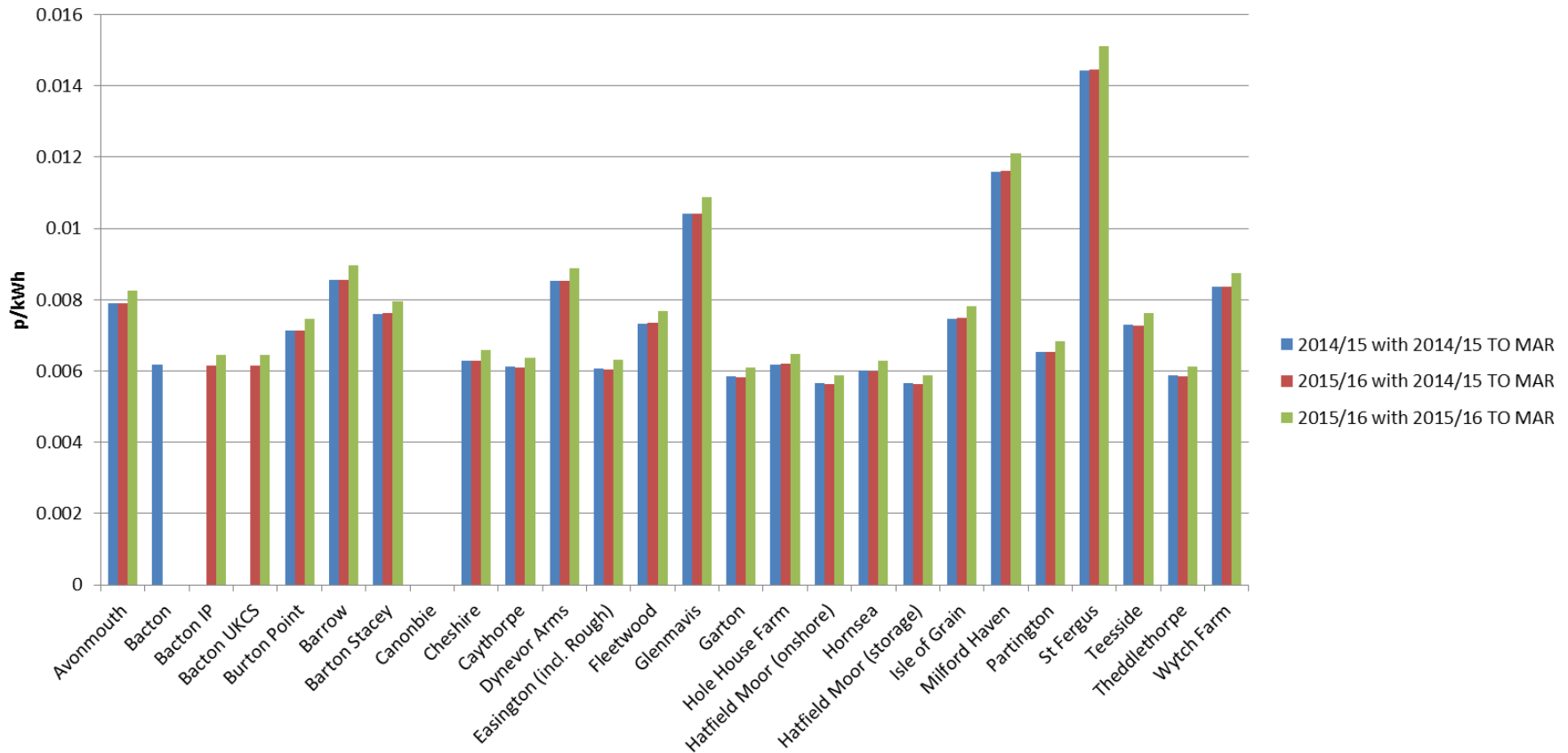
- This provides a range of models to compare resulting charges



CWD – Entry Capacity

14/15 and 15/16 prices and comparisons

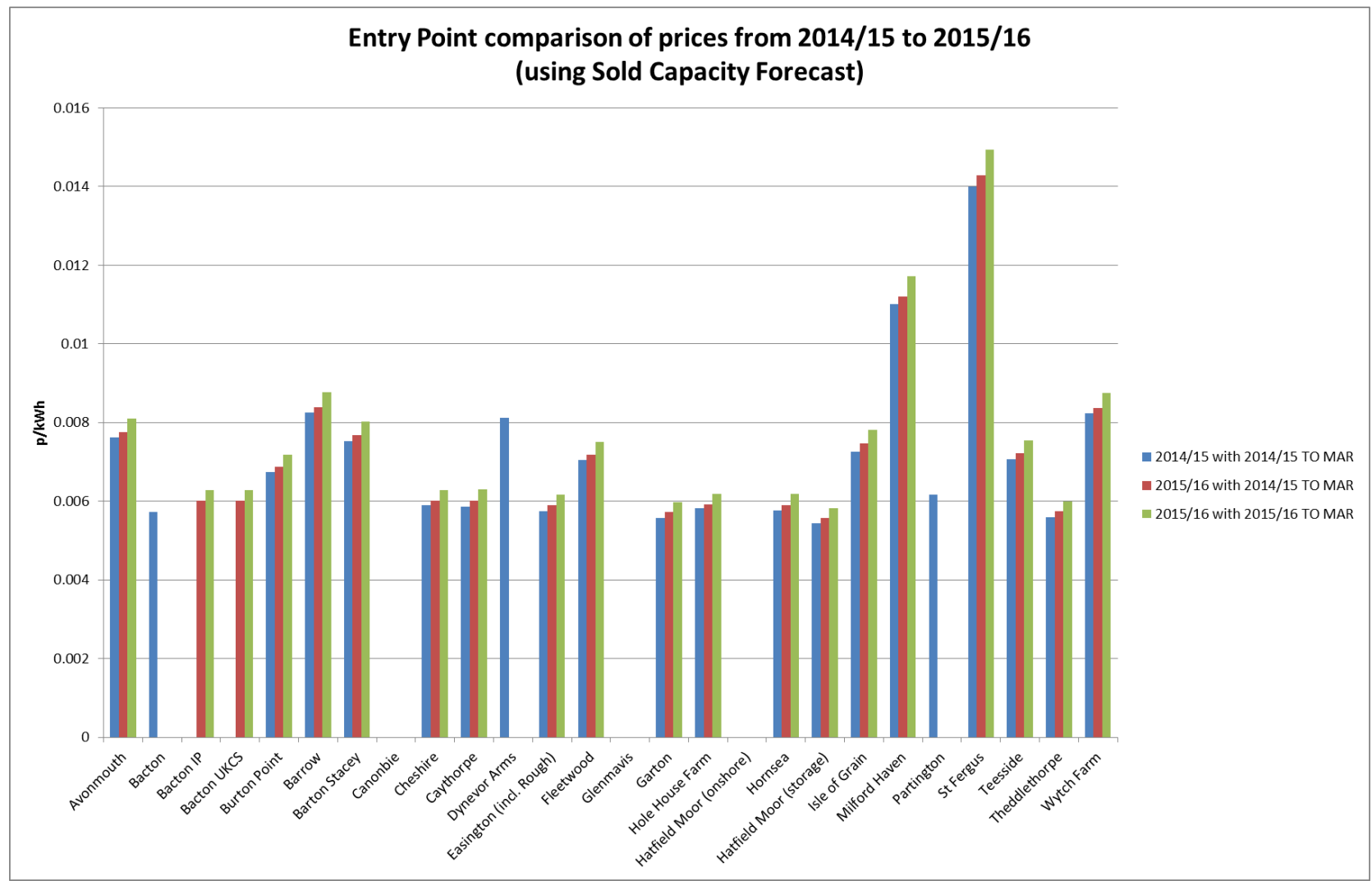
Entry Point comparison of prices from 2014/15 to 2015/16
(using Obligated Capacity Forecast)





CWD – Entry Capacity

14/15 and 15/16 prices and comparisons

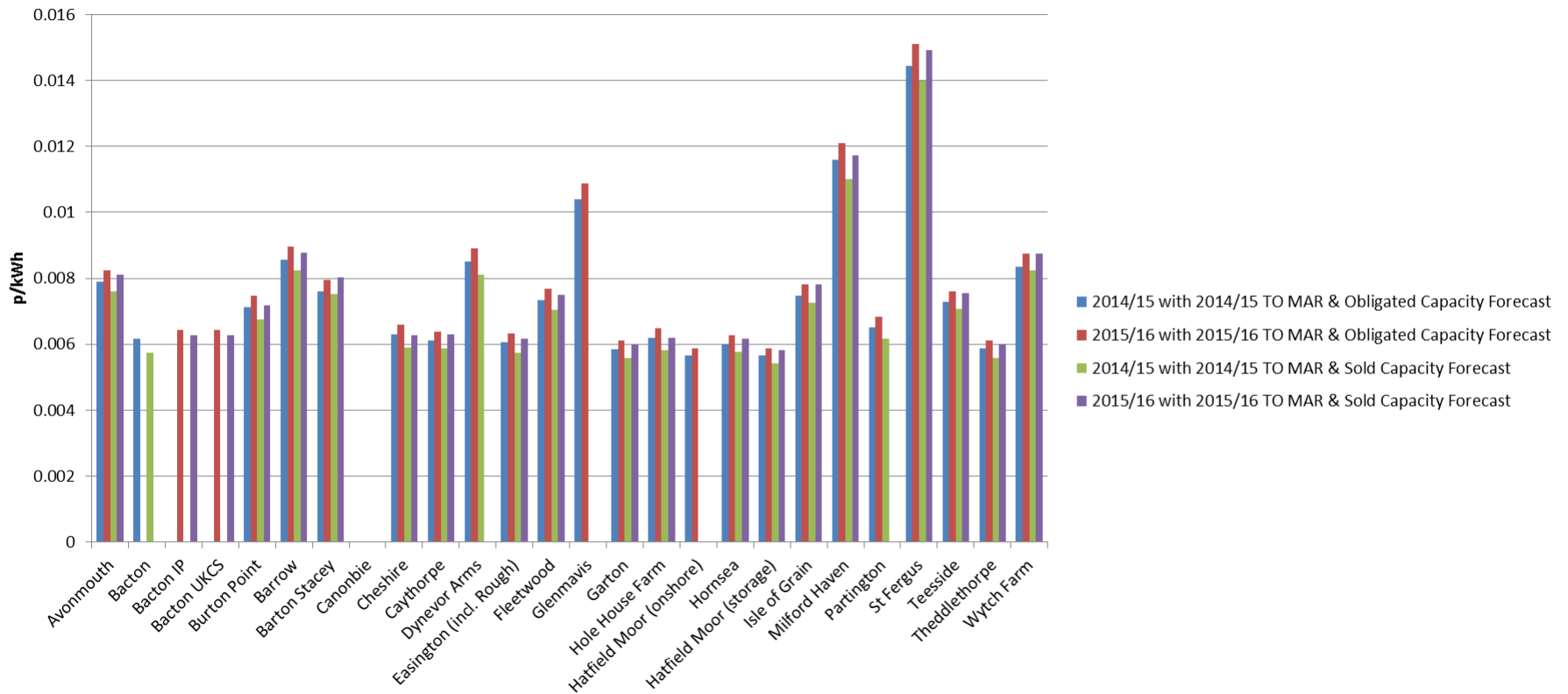




CWD – Entry Capacity

14/15 and 15/16 prices and comparisons

Entry Point comparison of prices in 2014/15 to 2015/16 using different Forecast Contracted Capacity figures



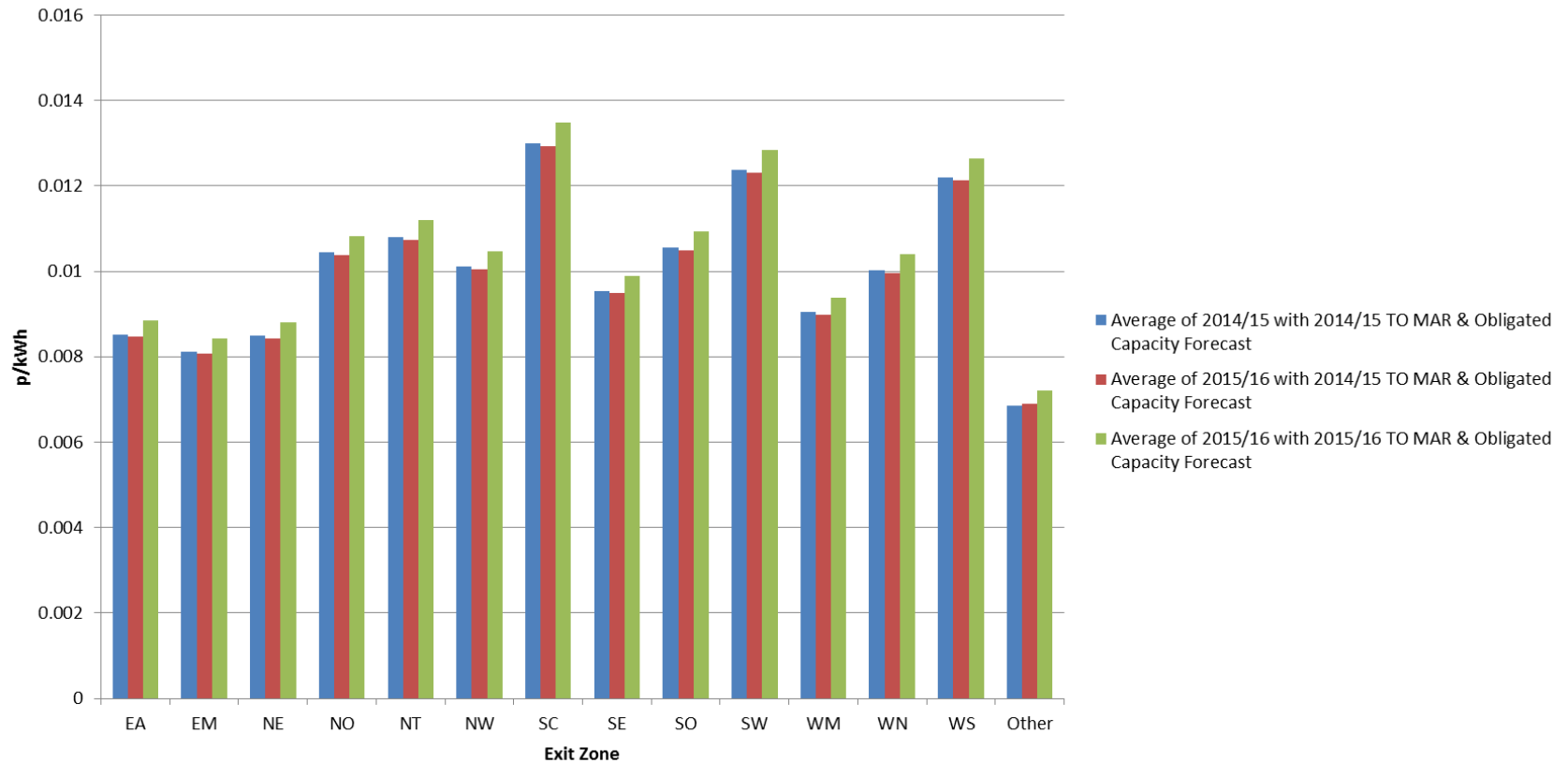
*Other contains Interconnector, Storage, Power Generation and Industrial



CWD – Exit Capacity

14/15 and 15/16 prices and comparisons

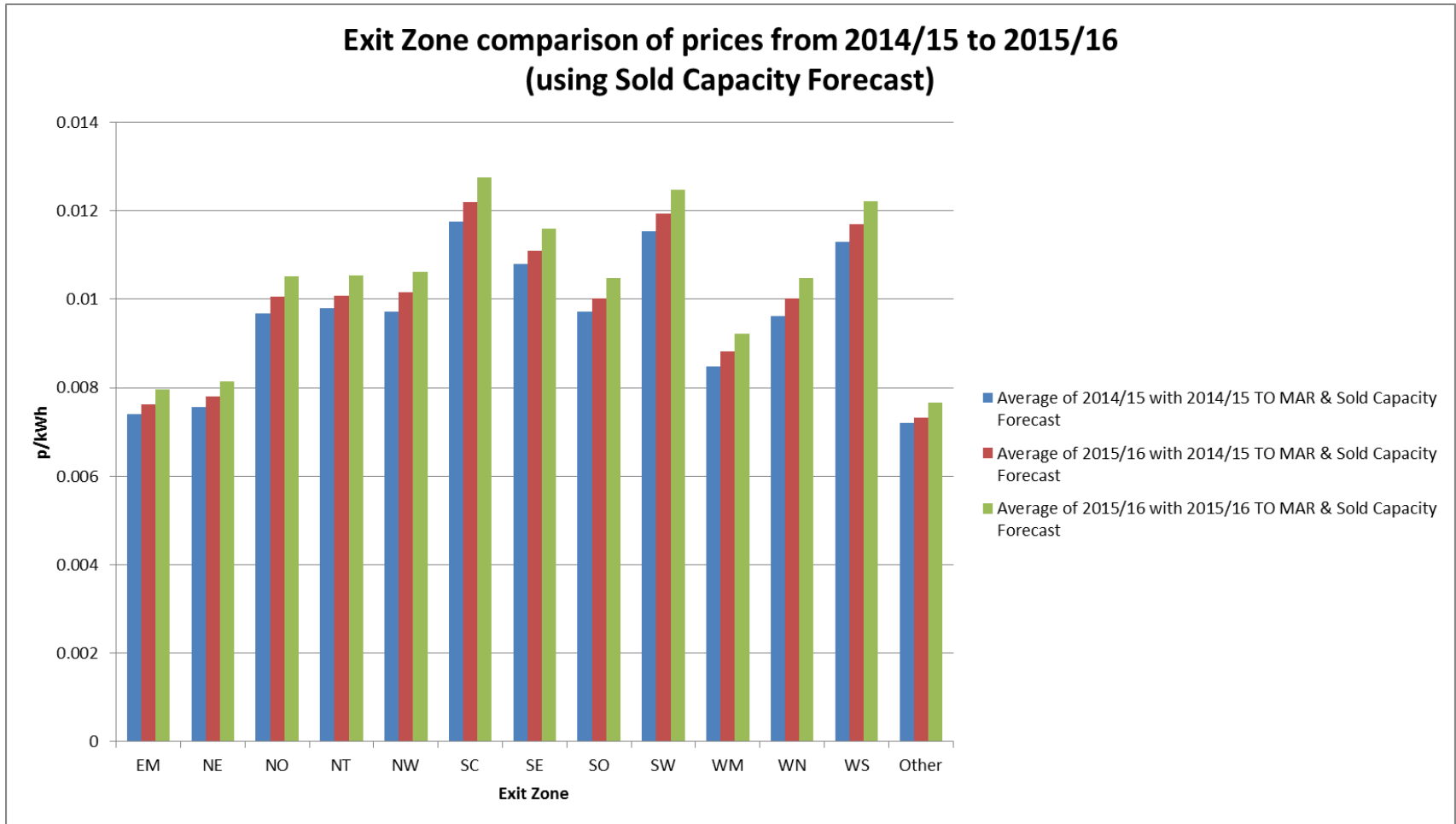
Exit Zone comparison of prices from 2014/15 to 2015/16
(using Obligated Capacity Forecast)





CWD – Exit Capacity

14/15 and 15/16 prices and comparisons

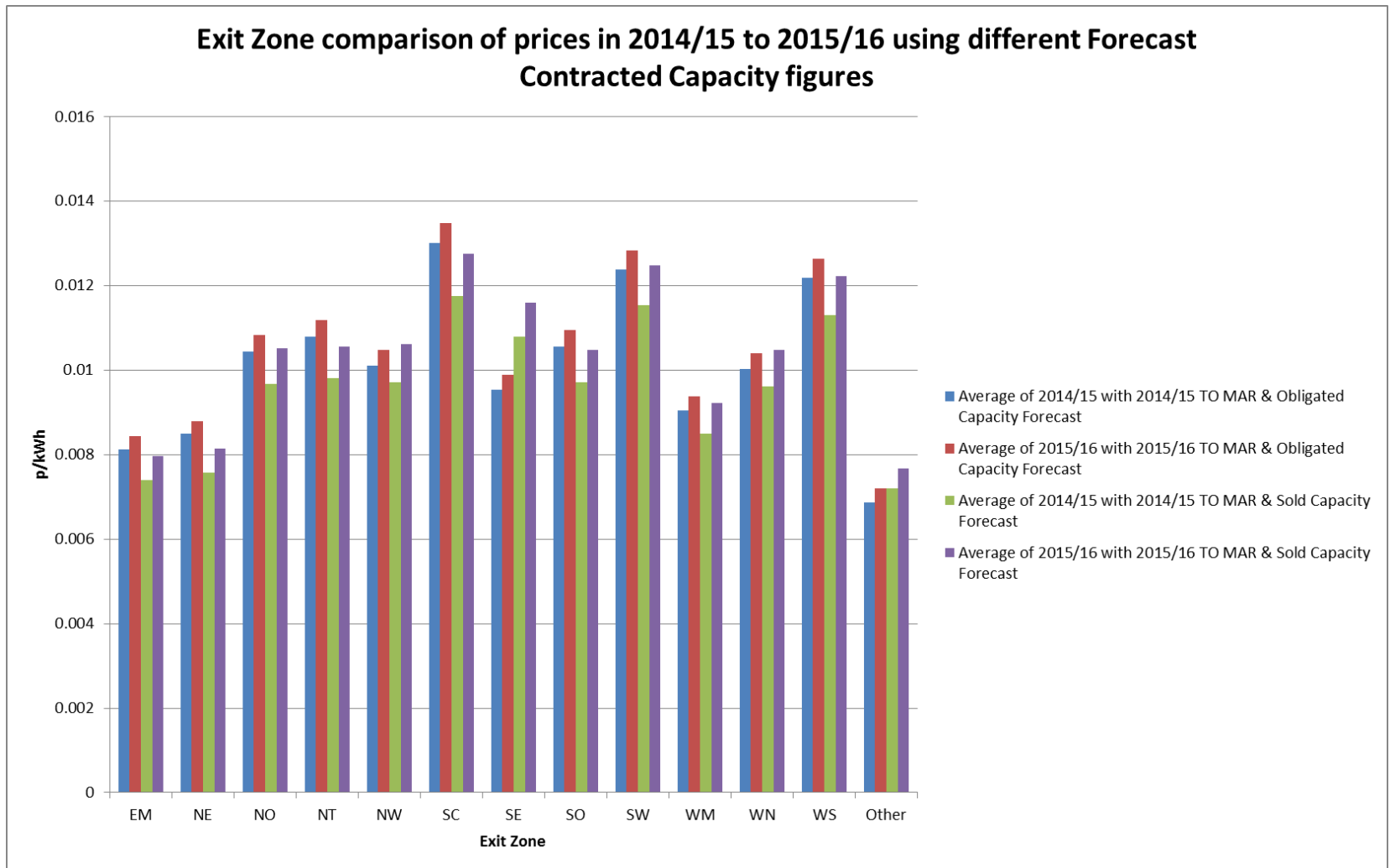


*Other contains Interconnector, Storage, Power Generation and Industrial

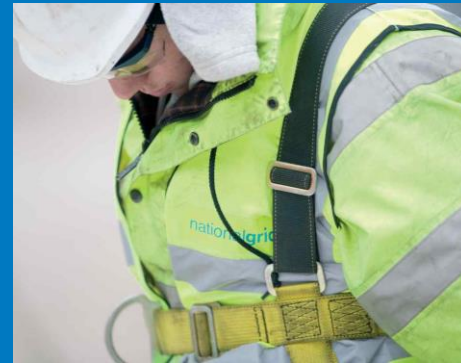


CWD – Exit Capacity

14/15 and 15/16 prices and comparisons



*Other contains Interconnector, Storage, Power Generation and Industrial



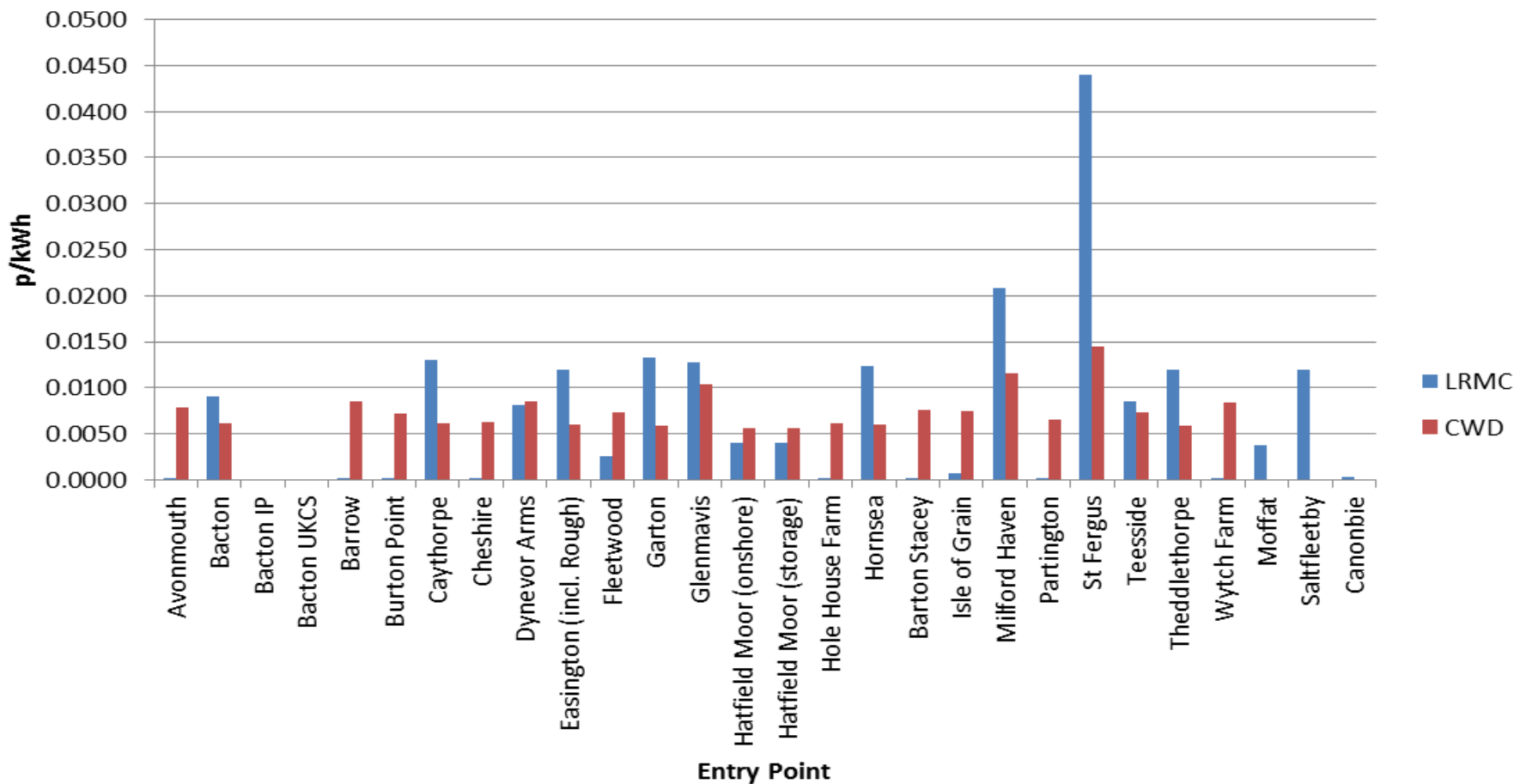
LRMC Compared to CWD



LRMC vs CWD

Entry Capacity 2014/15

Entry Point prices for 2014/15

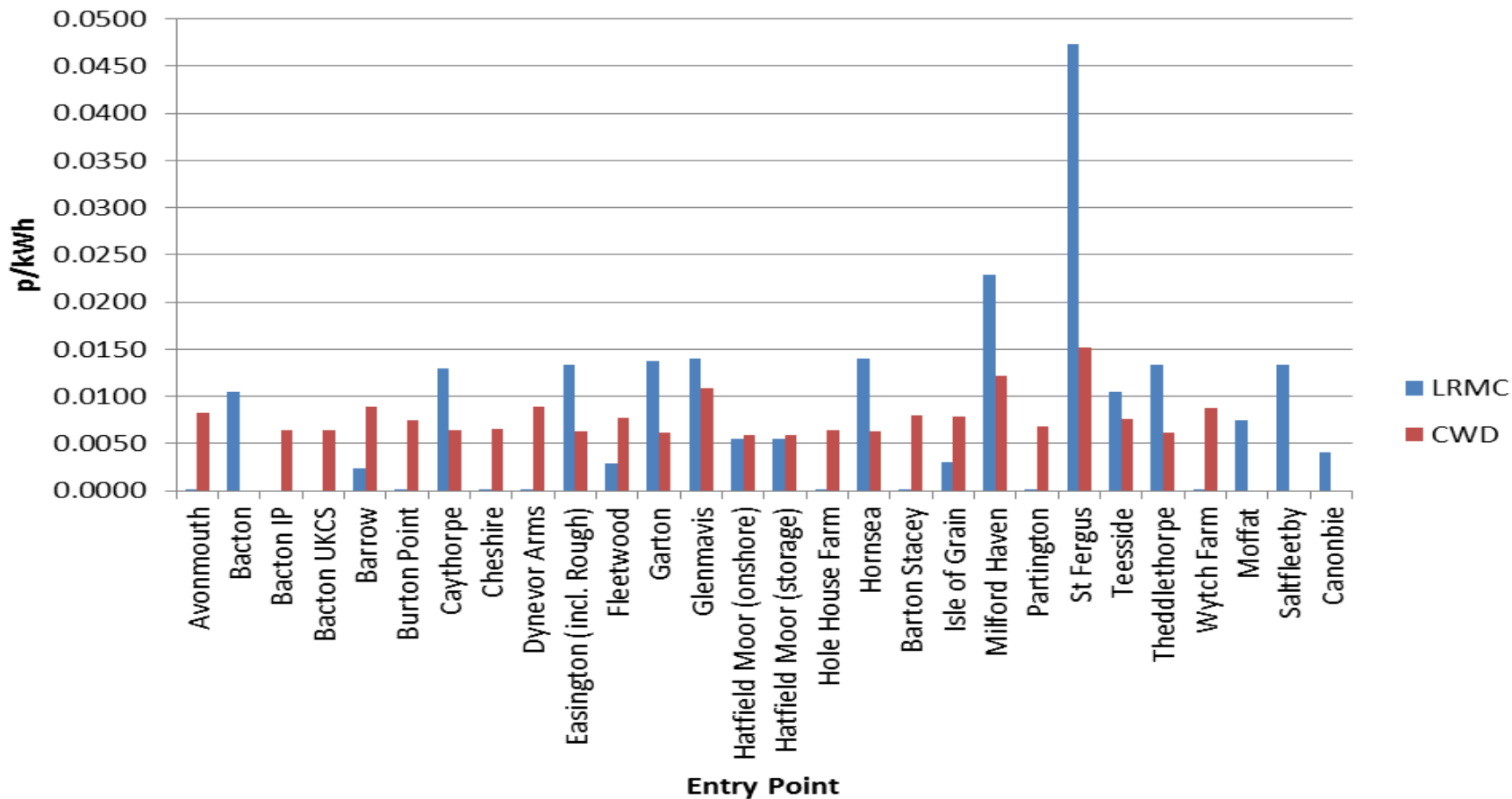




LRMC vs CWD

Entry Capacity 2015/16

Entry Point prices for 2015/16

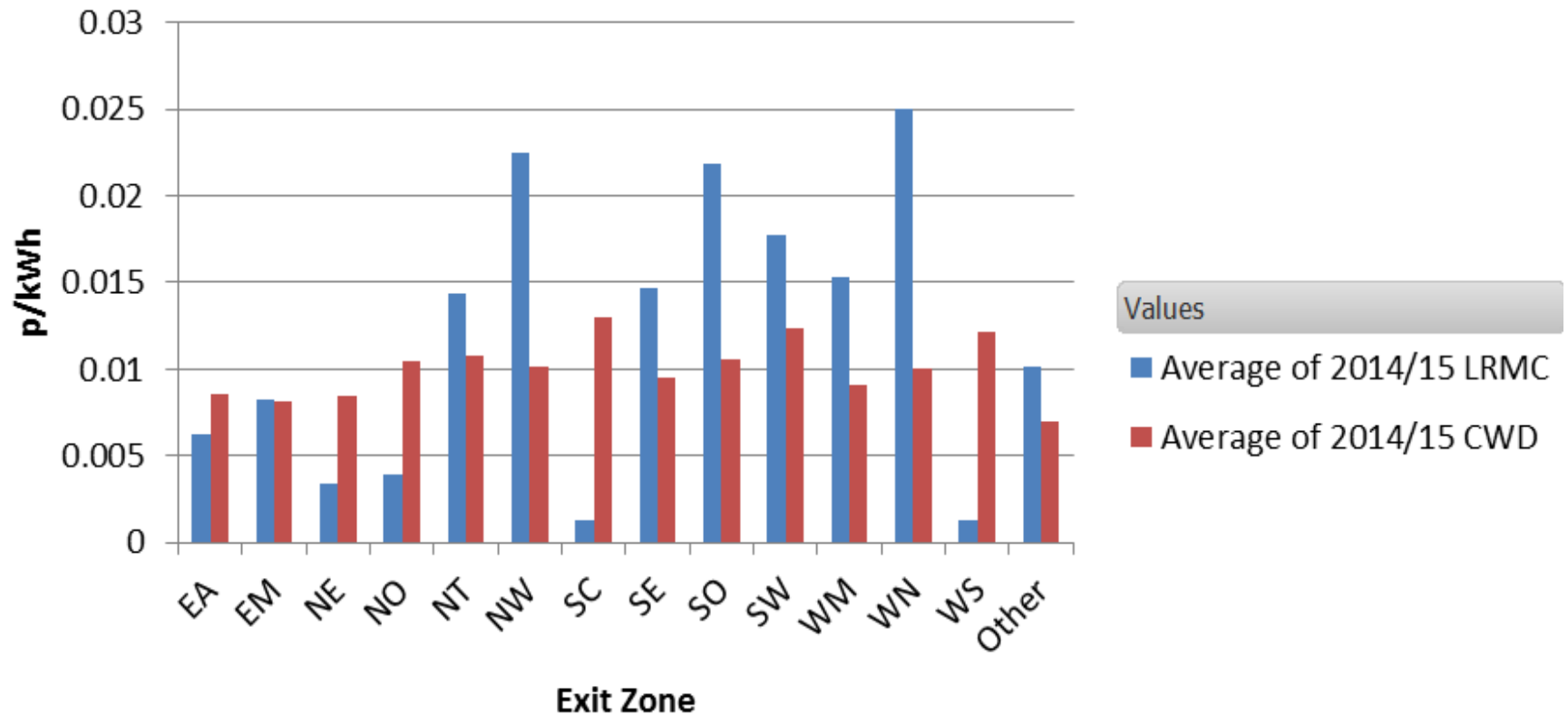




LRMC vs CWD

Exit Capacity 2014/15

Exit Zone Average Prices for 2014/15

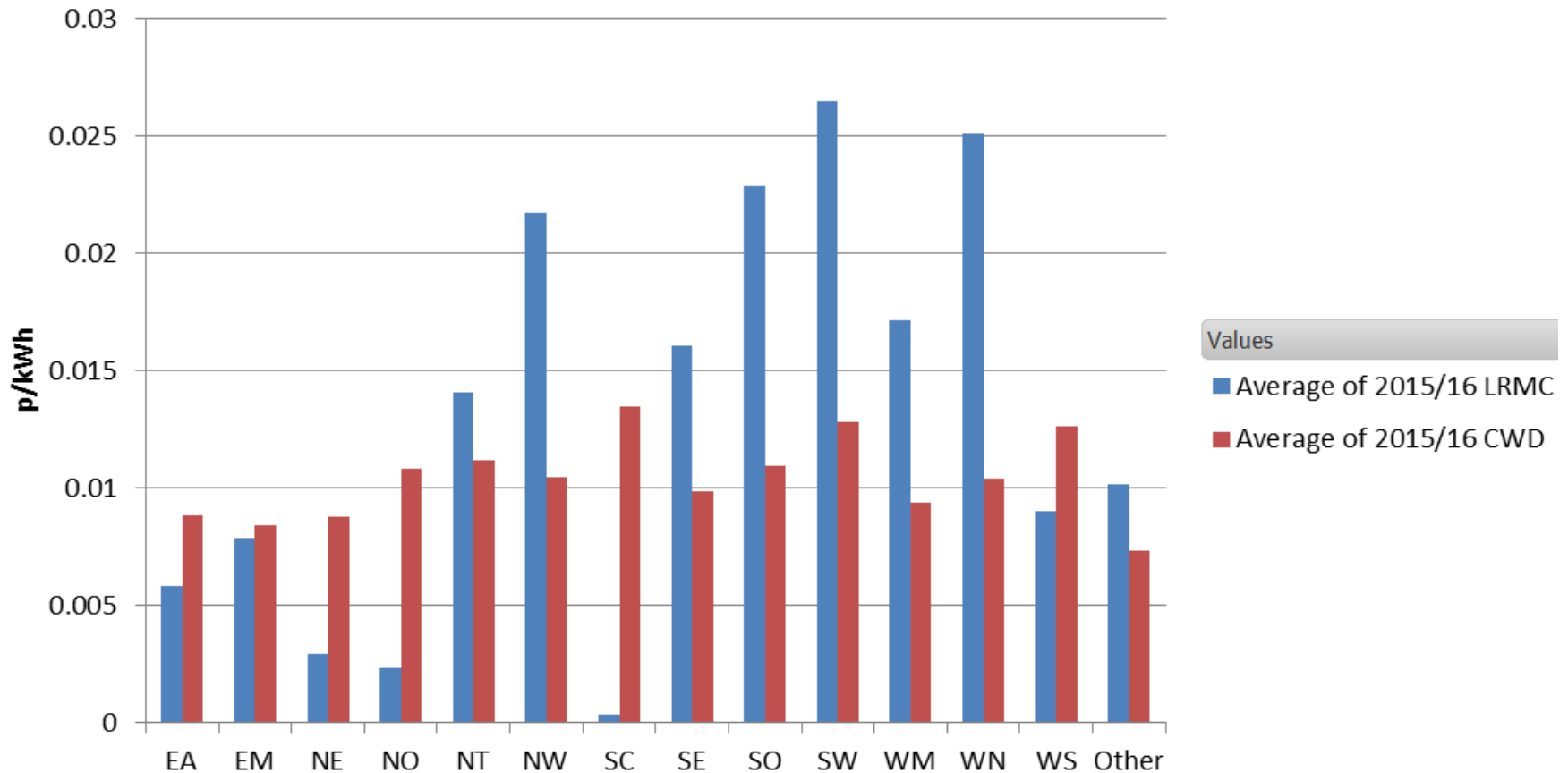




LRMC vs CWD

Exit Capacity 2015/16

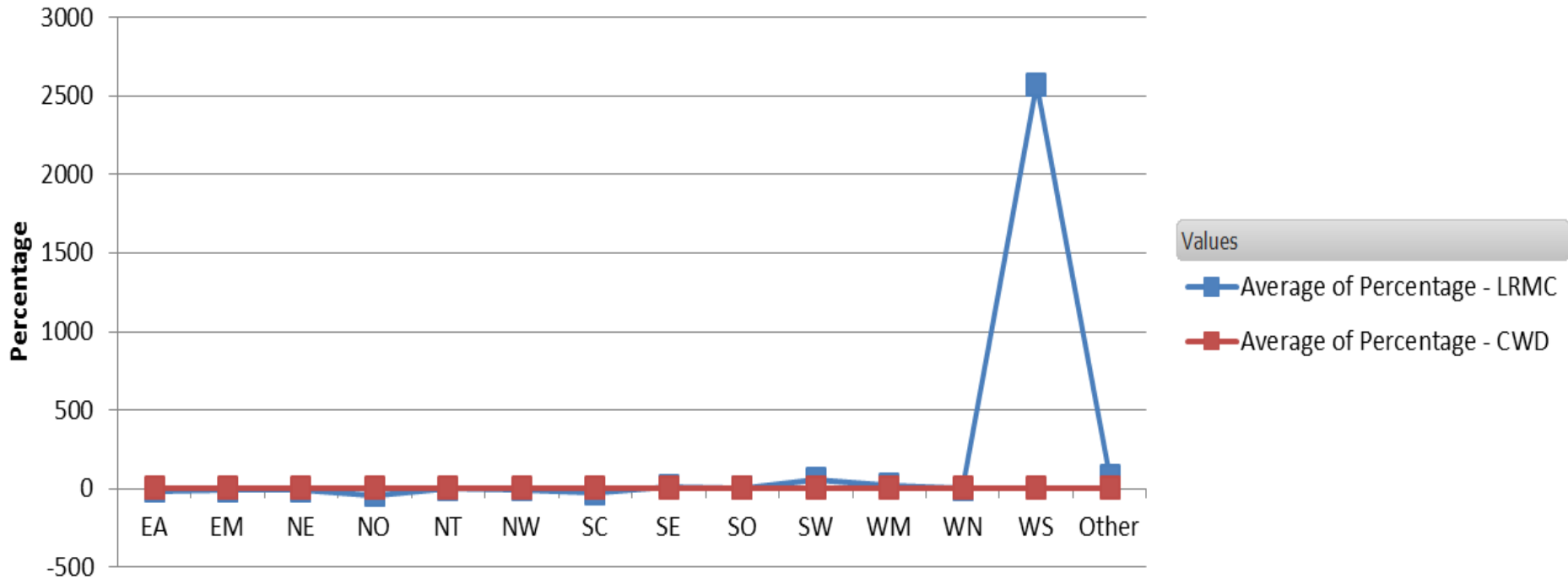
Exit Zone Average Prices for 2015/16





Percentage Difference 2014/15 to 2015/16

Percentage Variance in Prices from 2014/15 to 2015/16

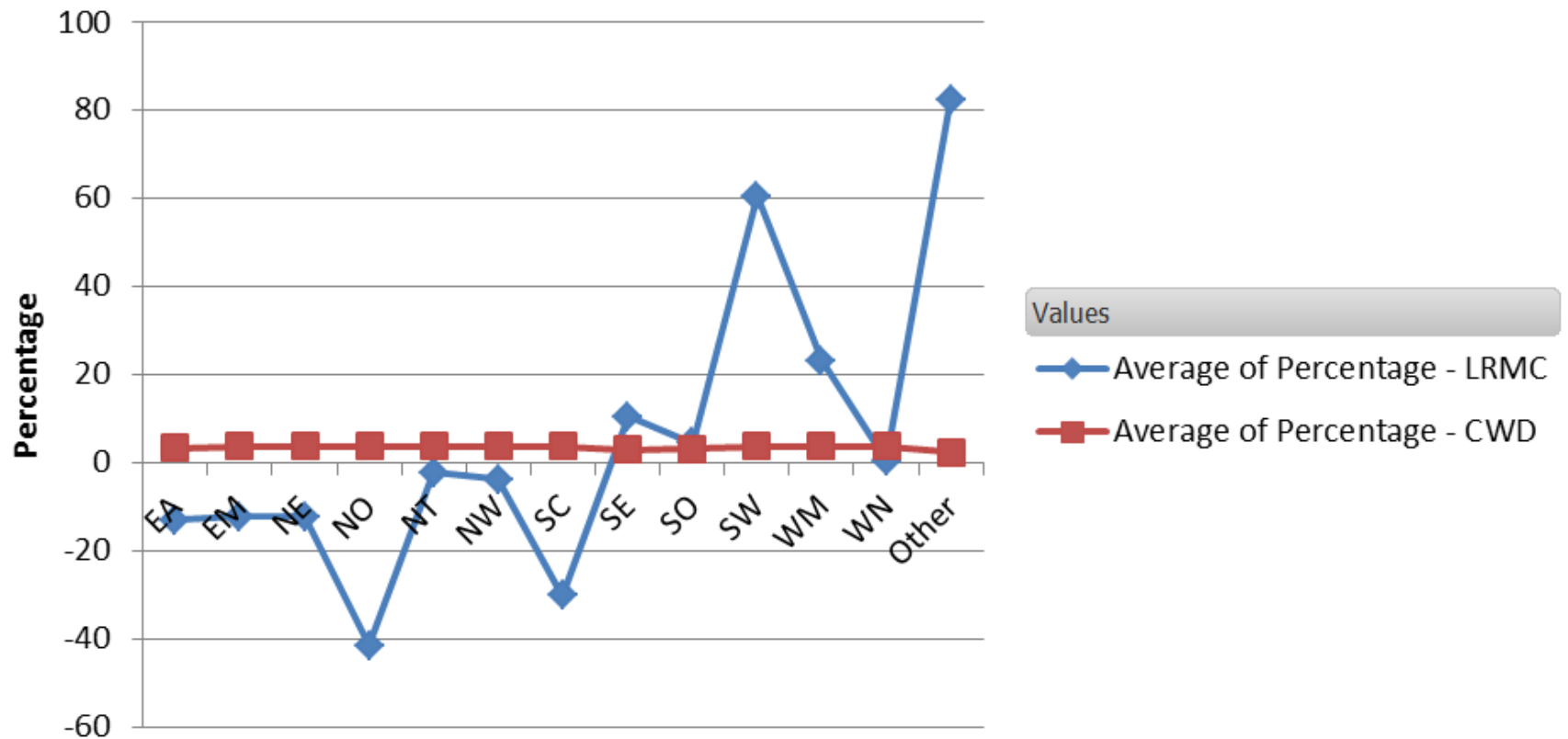


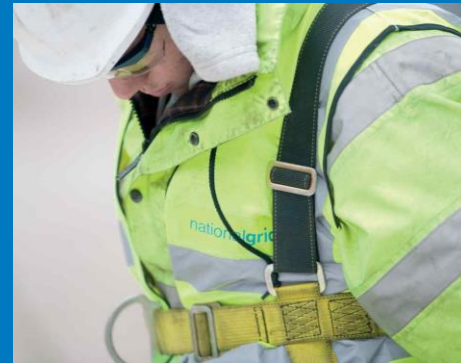
Including those points in WS produces what looks like an anomalous large change for LRMC. This was driven largely by updating supply/ demand values moving several points from minimum price upwards. In order to see other % variances more easily WS can be excluded as shown in the following slide



Percentage Difference 2014/15 to 2015/16 (excl zone WS)

Percentage Variance in Prices from 2014/15 to 2015/16 - Excl WS





EU TAR NC Compliance and Additional items



EU TAR NC Compliance Commentary on initial CWD

- The CWD approach modelled here is in line with the approach to produce annual prices as given in EU TAR NC
 - Here we show these as daily prices to allow the comparison to the current methodology
- CWD Model shown does not accommodate certain “Existing contracts” under the EU TAR NC for which price changes are not permitted
 - Will need to be considered as developing CWD
- This assumes that all capacity is sold at the annual price (i.e. discounts or multipliers not applied)
 - Will need to be considered as developing CWD

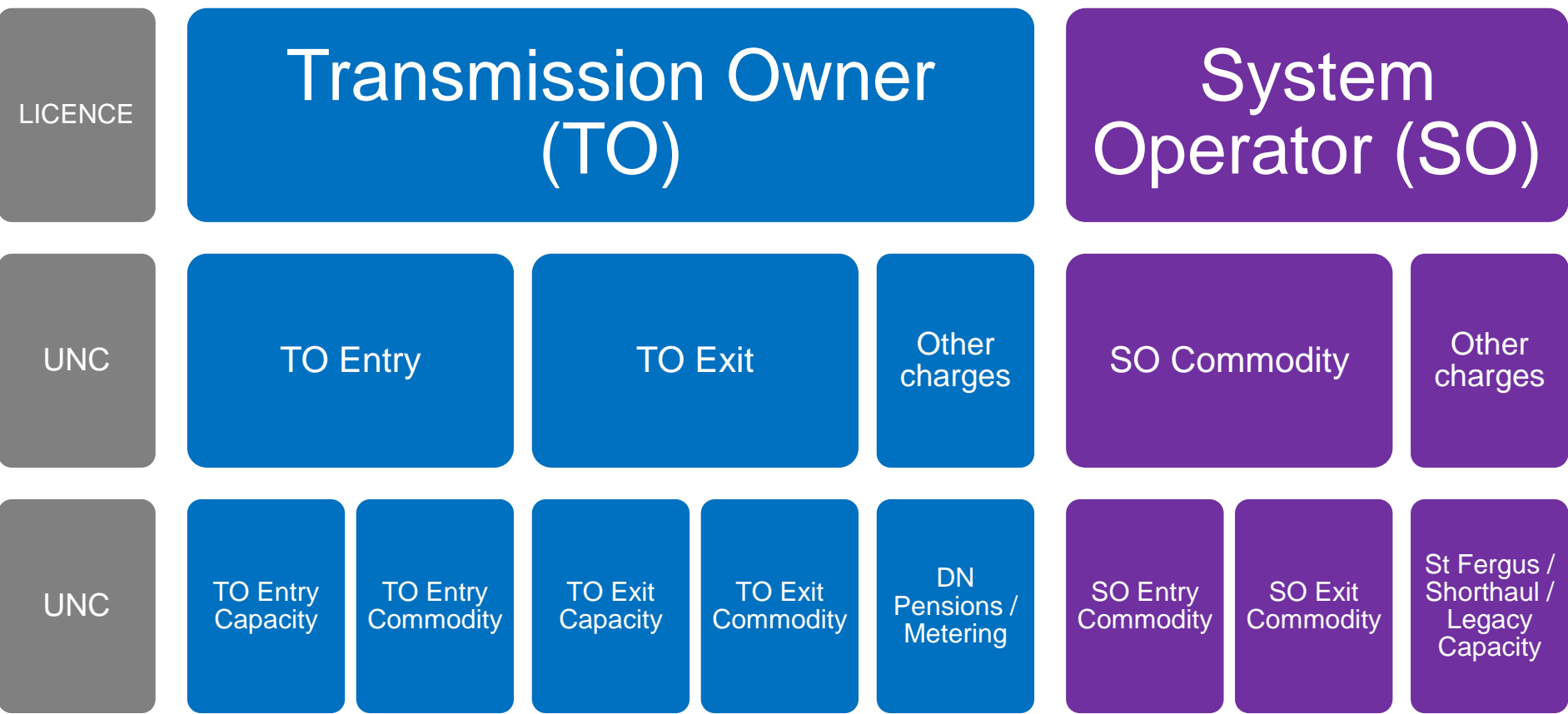


Additional items – Revenue recovery

- Under any methodology there is the potential for under or over recovery.
- As we move more into reviewing an alternative approach it is useful to highlight this might work
- Under the EU TAR NC the requirement around revenue recovery, specifically when including any potential under or over recovery, is different to the current GB approach
- Here we highlight some of these differences



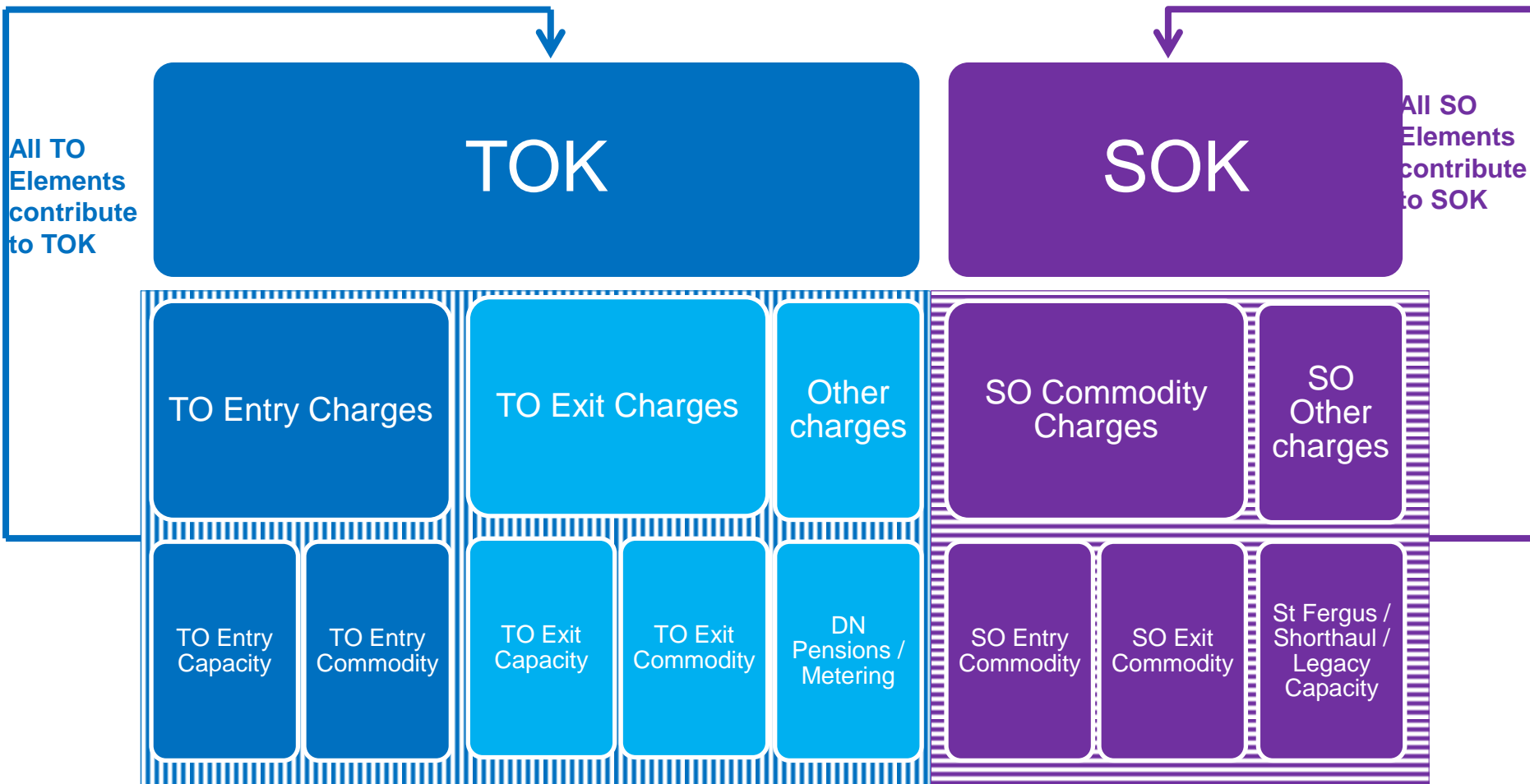
Current GB Framework for Revenues and recovery





Revenue over / under recovery

("K") relationships – Current method

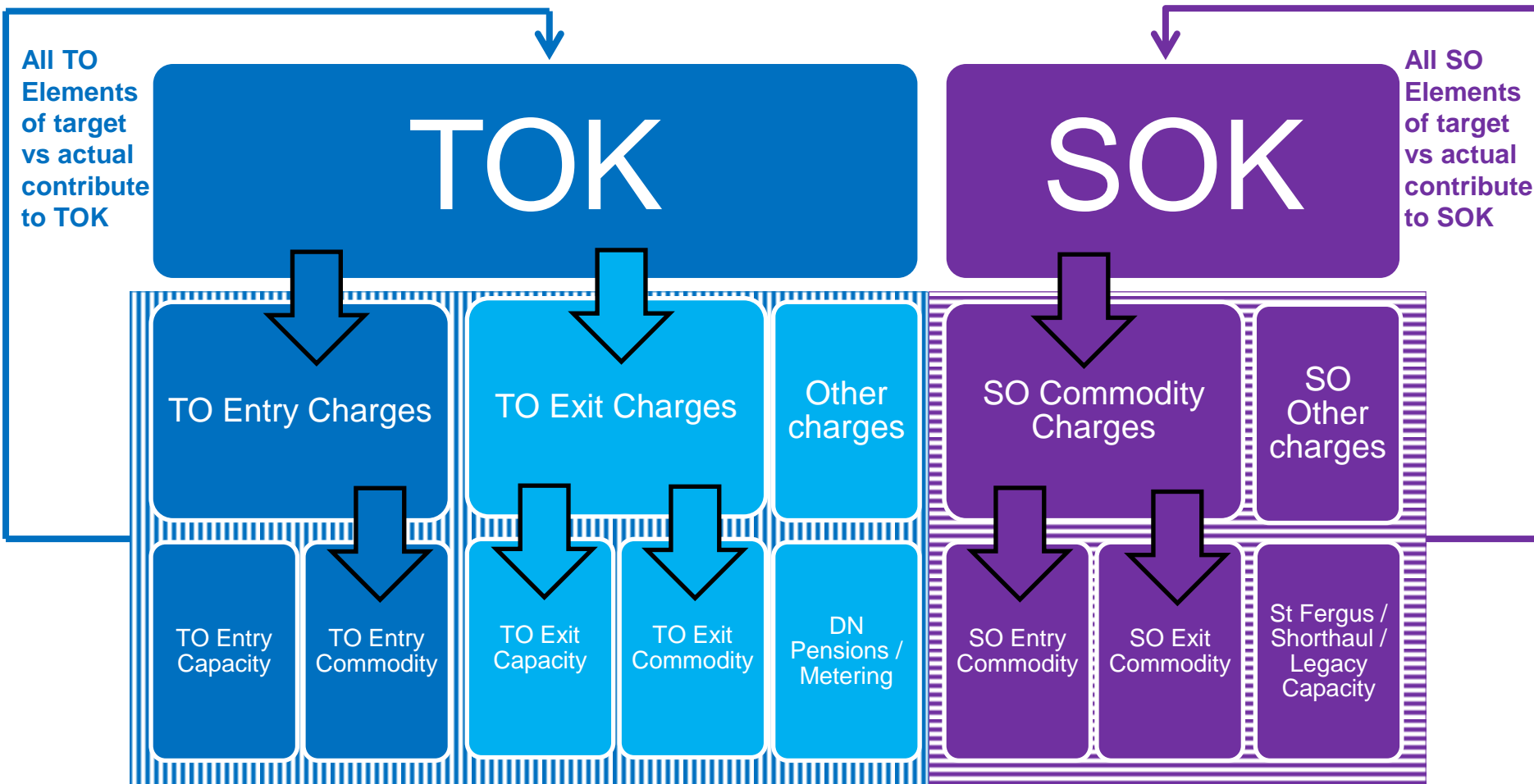


TOK is just "K" in the Licence – referred to as TOK to help illustrate the examples



Revenue over / under recovery

("K") relationships – how it filters into charges



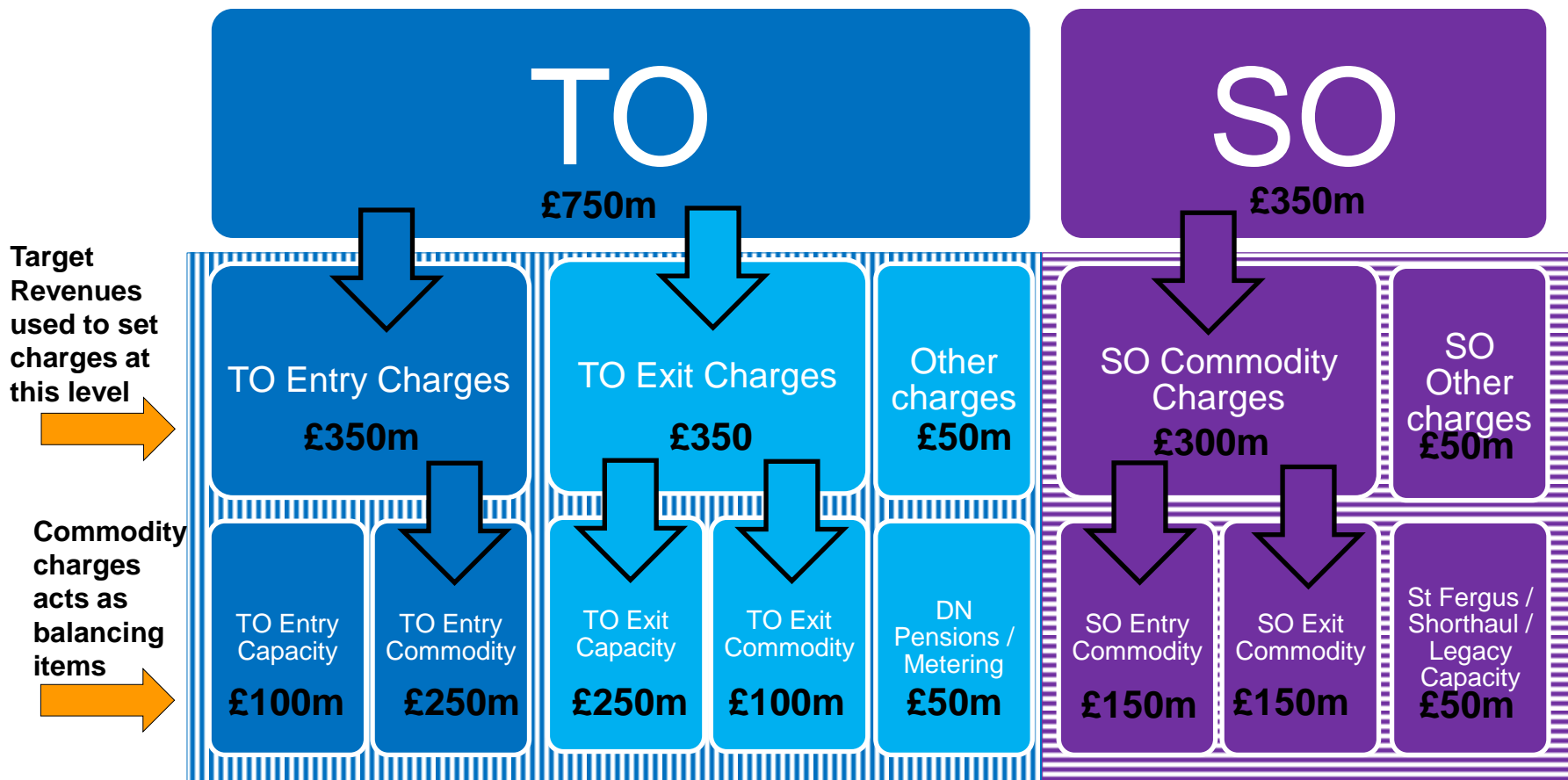
TOK split between Entry and Exit as per UNC (i.e. not 50/50) with some special arrangements if over recover on TO Entry

SOK feeds through into the SO Commodity only and therefore evenly into Entry and Exit



Revenue over / under recovery

("K") relationships – Setting charges example



TOK split between Entry and Exit as per UNC (i.e. not 50/50) with some special arrangements if over recover on TO Entry

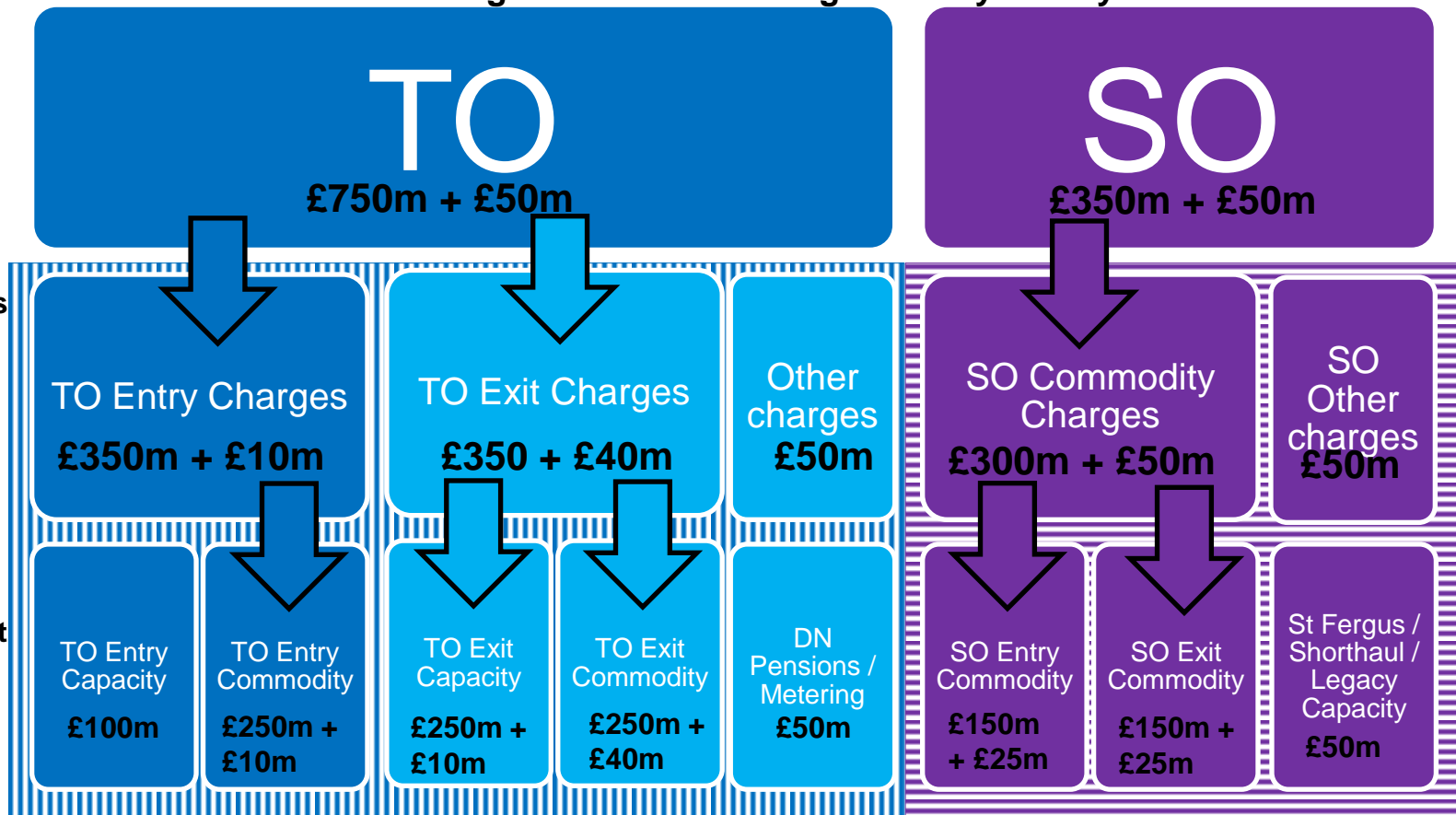
SOK feeds through into the SO Commodity only and therefore evenly into Entry and Exit



Revenue over / under recovery

("K") relationships – Setting charges example

Assuming revenues year to year remain flat. Assume an under collection on TO by £50m (£10m Entry and £40m Exit) and also under collection on SO by £50m. This assumes Commodity collects the value it aimed to and allowed revenues and bookings remained unchanged from year to year.



Target Revenues used to set charges at this level

Commodity charges act as balancing items for revenues not collected from capacity

TOK split between Entry and Exit as per UNC (i.e. not 50/50) with some special arrangements if over recover on TO Entry

SOK feeds through into the SO Commodity only and therefore evenly into Entry and Exit



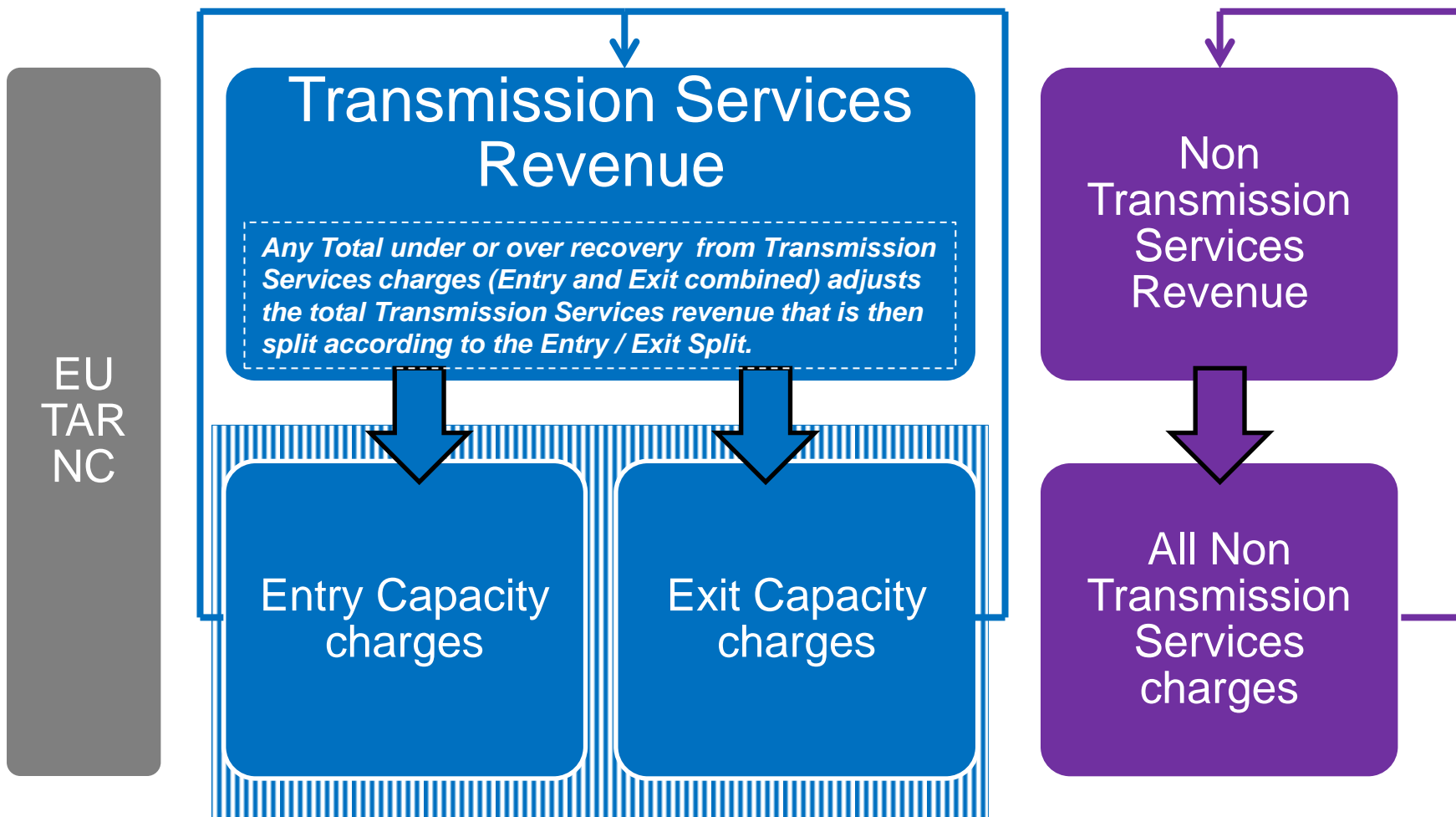
Revenue Reconciliation

EU TAR NC Commentary

- The revenue reconciliation (use of under or over recovery) is based on the Entry and Exit split for capacity charges
 - Using GB value is 50/50
 - Different to the current approach that isolates Entry and Exit (on TO)
- Capacity reconciliation using the reference price methodology is for Transmission Services Revenue
 - Working assumption this equates to TO Revenue less DN Pensions.
- Non Transmission Services can be treated differently to Transmission Services



EU Tariff Code General Revenue Reconciliation / recovery structure



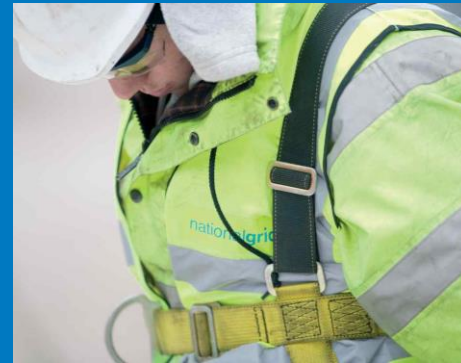
For example, if only have capacity, then any over or under recovery will adjust the revenues these charges will be required to collect.



Under and over recovery

Adjusting Charges (Current and EU TAR NC)

Under / over recovery	Current approach	Potential under draft EU TAR NC
Under Recovery (Entry or Exit)	<ul style="list-style-type: none">• Specific to Entry and Exit. Adjusts charges (Entry Commodity, Exit Capacity and Exit Commodity) in line with RIIO-T1 timescales.	<ul style="list-style-type: none">• Net value will adjust Entry and Exit charges used to recover Transmission Services Revenue and potentially in line with RIIO-T1 timescales.
Over Recovery (Exit)	<ul style="list-style-type: none">• Specific to Exit. Adjusts Exit Capacity charges in line with RIIO-T1 timescales.	<ul style="list-style-type: none">• Will adjust Entry and Exit charges used to recover Transmission Services Revenue and potentially in line with RIIO-T1 timescales.
Over Recovery (Entry)	<ul style="list-style-type: none">• Given back to Entry flows as a credit in next formula year.	<ul style="list-style-type: none">• Will adjust Entry and Exit charges used to recover Transmission Services Revenue and potentially in line with RIIO-T1 timescales.



Update on concerns and opportunities



Charging workshop

22nd March 2016 – Engagement exercise

- At the recent Gas Transmission Charging Education Event 22 March we asked those attending about concerns and opportunities of the charging review
- This helps form a list that can be referred to assess the development of any change
- Next slide shares the top 5 concerns and opportunities
- For information slides from the workshop will be available on the National Grid website:
<http://www2.nationalgrid.com/uk/Industry-information/System-charges/Gas-transmission/Tools-and-Models/>
- If you have any issues accessing these please contact us and we can provide you with a copy



Gas Charging Review – Concern and Opportunities - Workshop

Top 5 Concerns*	Top 5 Opportunities*
<ul style="list-style-type: none">• Volatility and Predictability	<ul style="list-style-type: none">• Move to simple/more transparent approach
<ul style="list-style-type: none">• Stability of prices	<ul style="list-style-type: none">• Move away from investment signal based model
<ul style="list-style-type: none">• Predictability	<ul style="list-style-type: none">• Develop a more flexible/responsive network
<ul style="list-style-type: none">• Fairness of users	<ul style="list-style-type: none">• Get maximum use of system
<ul style="list-style-type: none">• Relevant objectives	<ul style="list-style-type: none">• Harmonization and simplification

* In no particular order



Next Steps

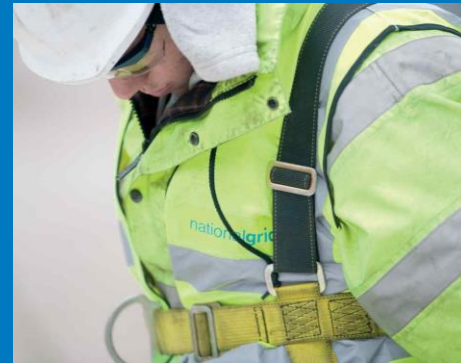




Some thoughts for next steps over the coming NTSCMFs

- Comments and questions welcome on all aspects
- Build on the analysis presented here
- Refine CWD with any refinements and amendments to look into impact of any capacity that may have protections under the EU TAR NC
- Consider Multipliers and discount structures
- Consider under what scenarios there may be a “dual regime” based on EU TAR NC
- Begin discussions on behavioural impacts and how to incorporate

Contact us



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