Public

Introduction to cash-out and P305

Webinar

11 July 2016
ELEXON Market Operations

What we'll cover today

- Introduction to the cash-out price calculation
  - Key concepts
  - Key calculation steps

- BSC Modification P305

Next Webinar – 20 July 2016

- Key findings from ELEXON's post-implementation review of P305

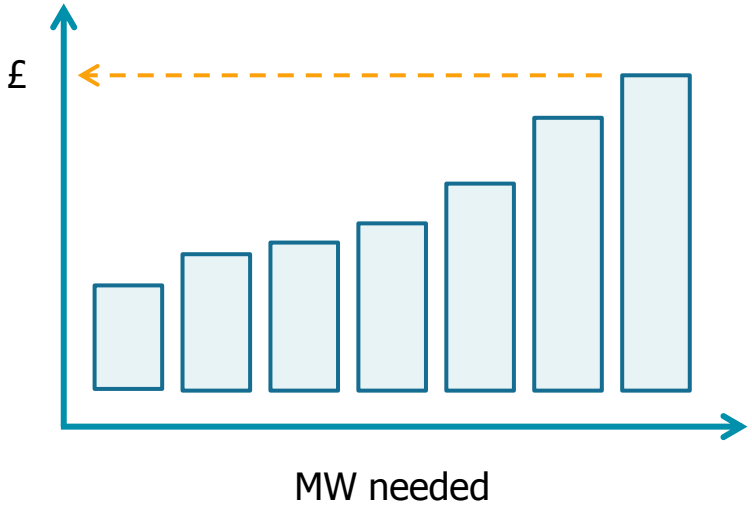
At a high-level – how does cash-out work?

Why

- A signal for the market to balance; a price for imbalances

What

- Based on the System Operator's **marginal** energy balancing actions
  - Sell Actions when the system is long
  - Buy Actions when the system is short



How

- System Operator's balancing role is greater than managing market imbalances
- Concept of '**energy balancing**' – creation of an appropriate price for 'market imbalances'
- The cash-out price calculation ensures only costs associated caused by **market imbalances** are reflected in the price

The SO

- Second-by-second balancing
- Locational constraints
- Reserve requirement

vs

The Market

- Half Hourly balancing
- One direction per HH
- A single price zone

1. Receive all balancing actions

1. Receive all balancing actions

2. Rank from least to most expensive

3. Determine the system direction

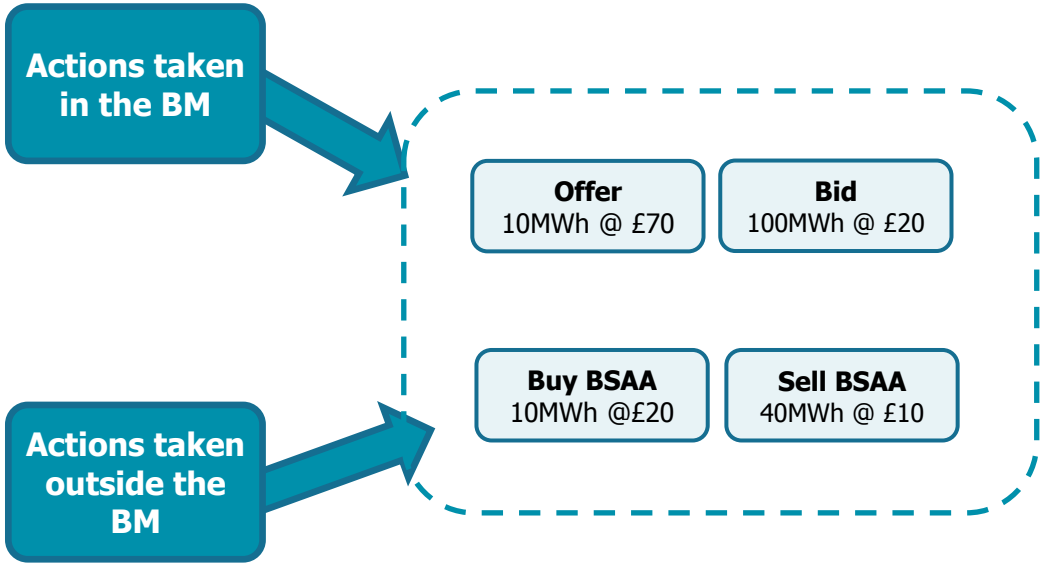
4. Determine the marginal balancing actions

Why?

- The price is based on the actions that the System Operator has taken to balance the system in that Settlement Period

How?

- Bids and Offers in the Balancing Mechanism (BM) are sent to ELEXON
- Any balancing actions taken outside the BM are sent separately, as **Balancing Service Adjustment Actions (BSAAs)**



2. Rank from least to most expensive

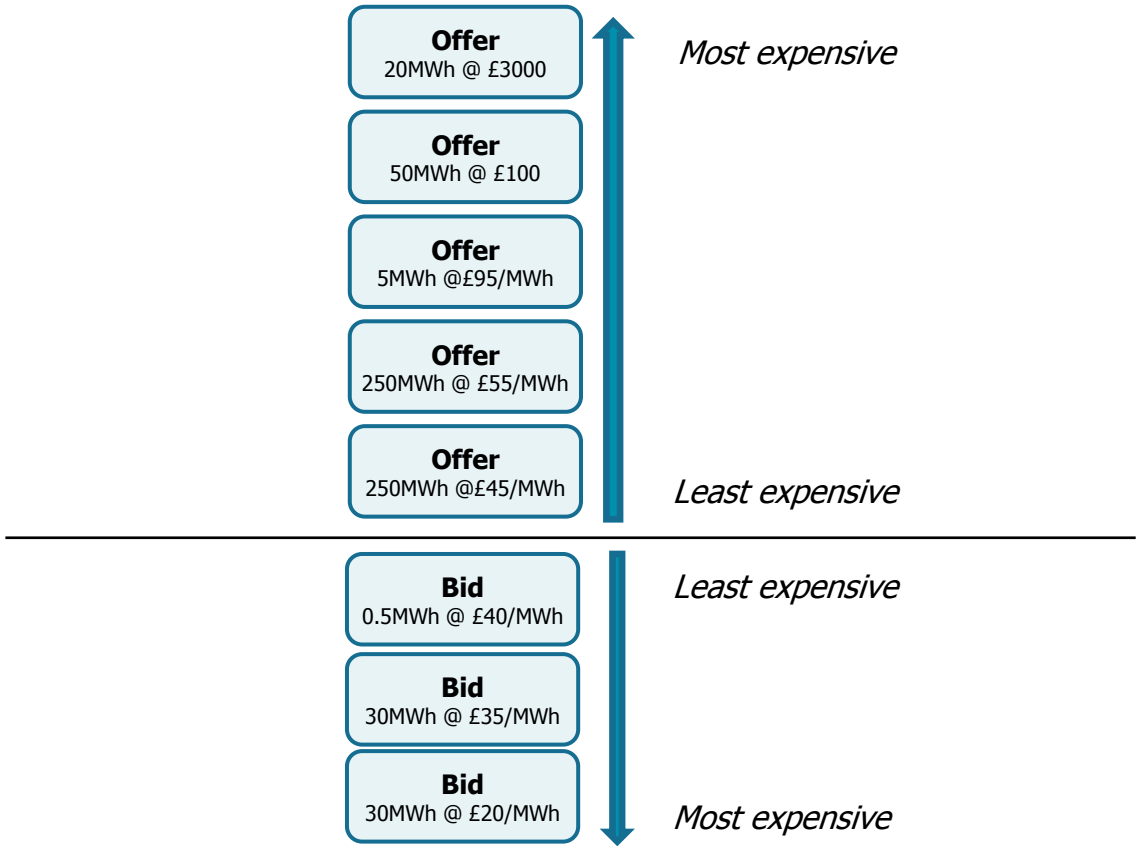
1. Receive all balancing actions
2. Rank from least to most expensive
3. Determine the system direction
4. Determine the marginal balancing actions

Why?

- Ranking allows the marginal actions to be determined

How?

- The highest priced Offers are the most expensive
- The lowest priced Bids are the most expensive



3. Determine the system direction

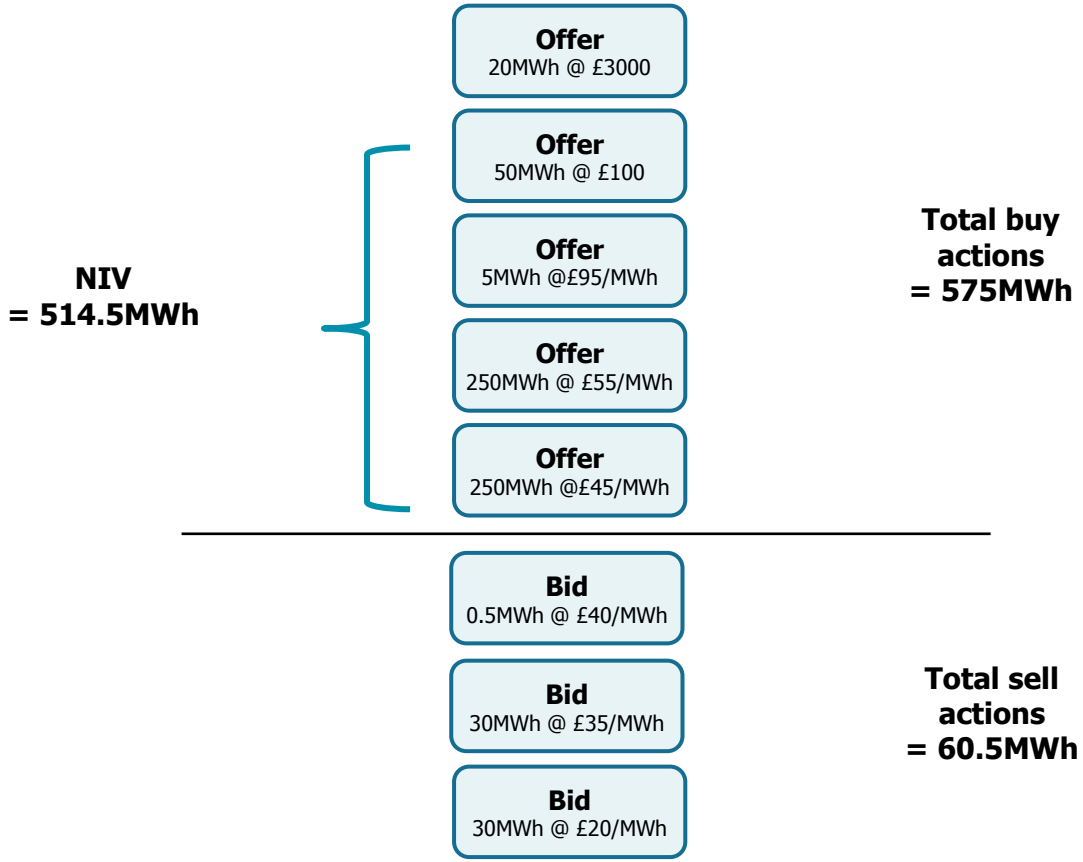
1. Receive all balancing actions
2. Rank from least to most expensive
3. Determine the system direction
4. Determine the marginal balancing actions

Why?

- From cash-out's perspective, there can only be one imbalance per Settlement Period (the system is either long or short)

How?

- The smaller stack of actions is subtracted from the larger stack of actions – starting with most the expensive
- If there are more Buy actions than Sell actions, the system is short (and vice versa)
- This is called **'Net Imbalance Volume (NIV) tagging'**



Key price calculation steps

1. Receive all balancing actions
2. Rank from least to most expensive
3. Determine the system direction
4. Determine the marginal balancing actions

How?

- A weighted average of the most expensive 50MWh of actions is used to set the price – the Price Average Reference (PAR)

Why?

- Marginal pricing to expose out-of-balance Parties to the cost of their imbalances; an 'efficient price signal'
- But 'fully marginal' pricing too risky – so some averaging still applied

Offer
10MWh @ £100

Offer
40MWh @£95/MWh

Offer
250MWh @ £55/MWh

Offer
250MWh @£45/MWh

$$\text{System Price} = \frac{((10\text{MWh} \times £100/\text{MWh}) + (40\text{MWh} \times £95/\text{MWh}))}{(10\text{MWh} + 40\text{MWh})} = £96/\text{MWh}$$

The Electricity Balancing Significant Code Review (EBSCR)

- Launched by Ofgem August 2012; Final Policy Decision May 2014

- Key concerns: "*Current balancing arrangements are not working as well as they could, undermining efficiency in balancing and security of supply*"

  (Ofgem's EBSCR Final Policy Decision)

- Desire to provide stronger signals to:
  - Encourage more efficient balancing behaviour
  - Provide stronger signals to market for provision of flexible capacity and interconnector flows

- BSC Modification P305:
  - Raised May 2014
  - Approved April 2015
  - Implemented 5 November 2015

Addition of Demand Control actions

Receive all balancing actions

Rank from least to most expensive

Determine the system direction

Determine the marginal balancing actions

What?

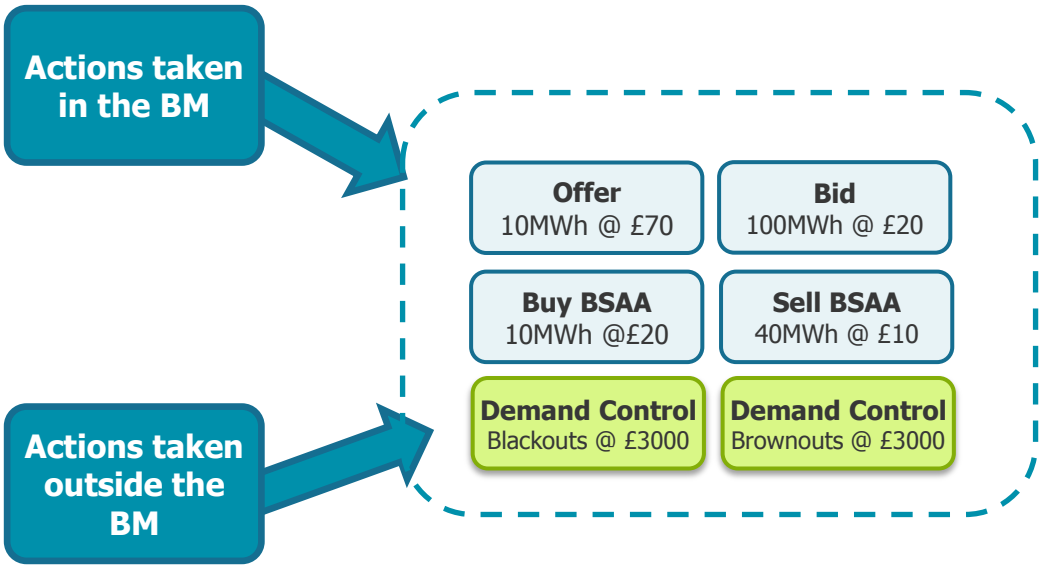
- **Demand Control** – when the SO instructs DNOs to reduce demand on their networks by reducing voltage or disconnecting customers (as a last resort).

Why?

- Before P305 prices or volumes of Demand Control were not accounted for in the price stack; all balancing actions should be reflected to create the right balancing signal

How?

- An estimate of Demand Control taken included in the stack, priced at **Value of Lost Load** (£,3000/MWh)
- Imbalance volumes also adjusted for Demand Control actions



Demand Side Balancing Reserve (DSBR) and Supplementary Balancing Reserve (SBR) also priced in at £3,000/MWh

Re-pricing STOR actions (1)

Receive all balancing actions

Rank from least to most expensive

Determine the system direction

Determine the marginal balancing actions

What?

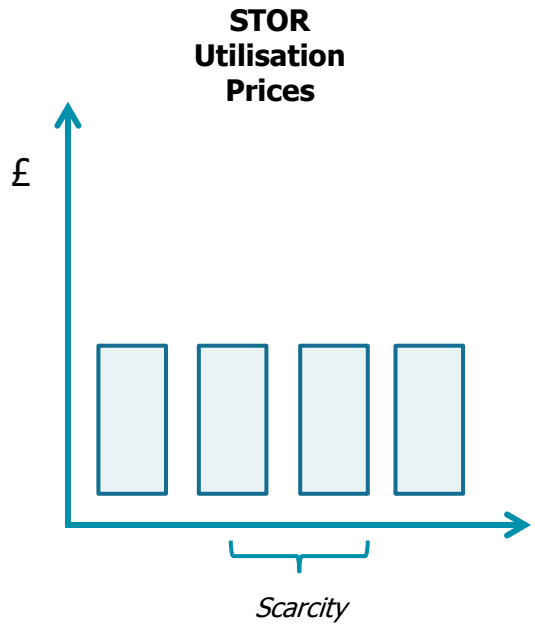
- P305 introduced re-pricing for Short Term Operating Reserve (STOR) actions

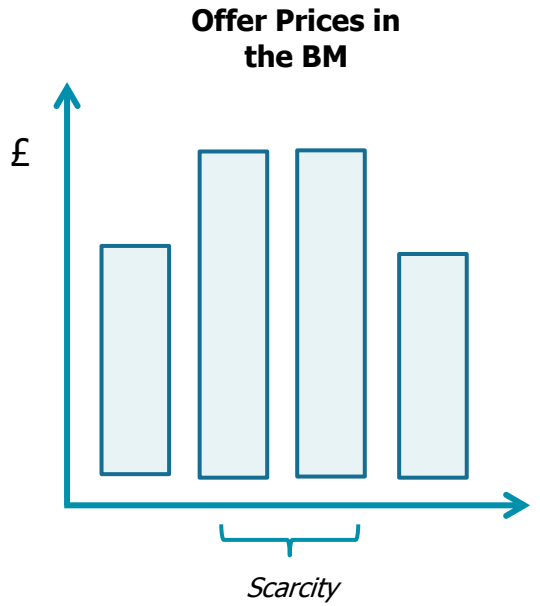
Why?

- STOR is procured in advance and this can undermine the scarcity signal:
  - Unlike Offers in the BM STOR plant have: (i) **Availability Payments**, and (ii) **Pre-determined Utilisation Payments**
  - Offers in the BM come as one price; should be representative of market conditions at the time

How?

- A **Reserve Scarcity Price (RSP)** is used to re-price STOR actions at times of scarcity





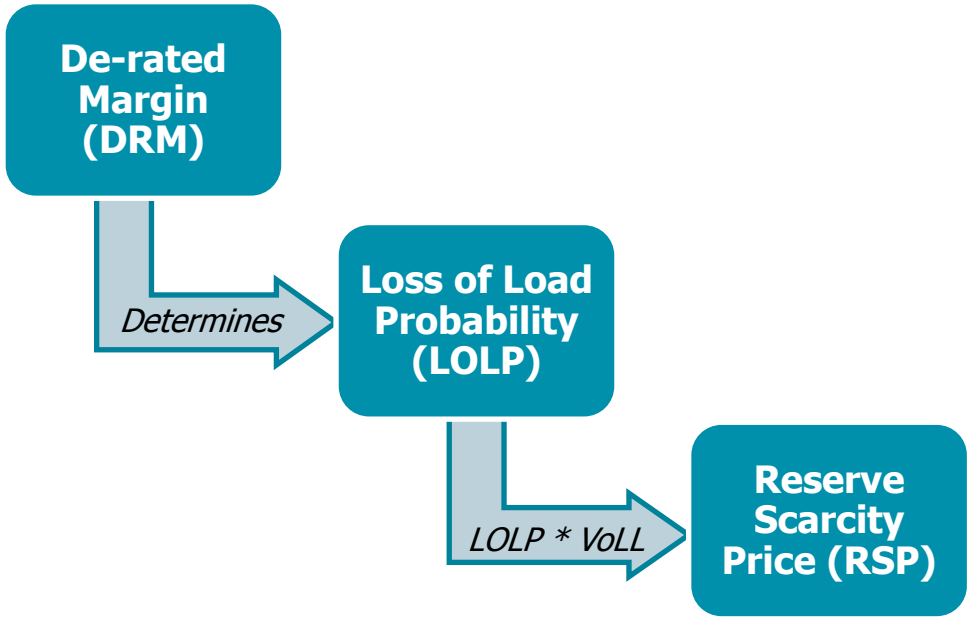
Re-pricing STOR actions (2): Setting the Reserve Scarcity Price

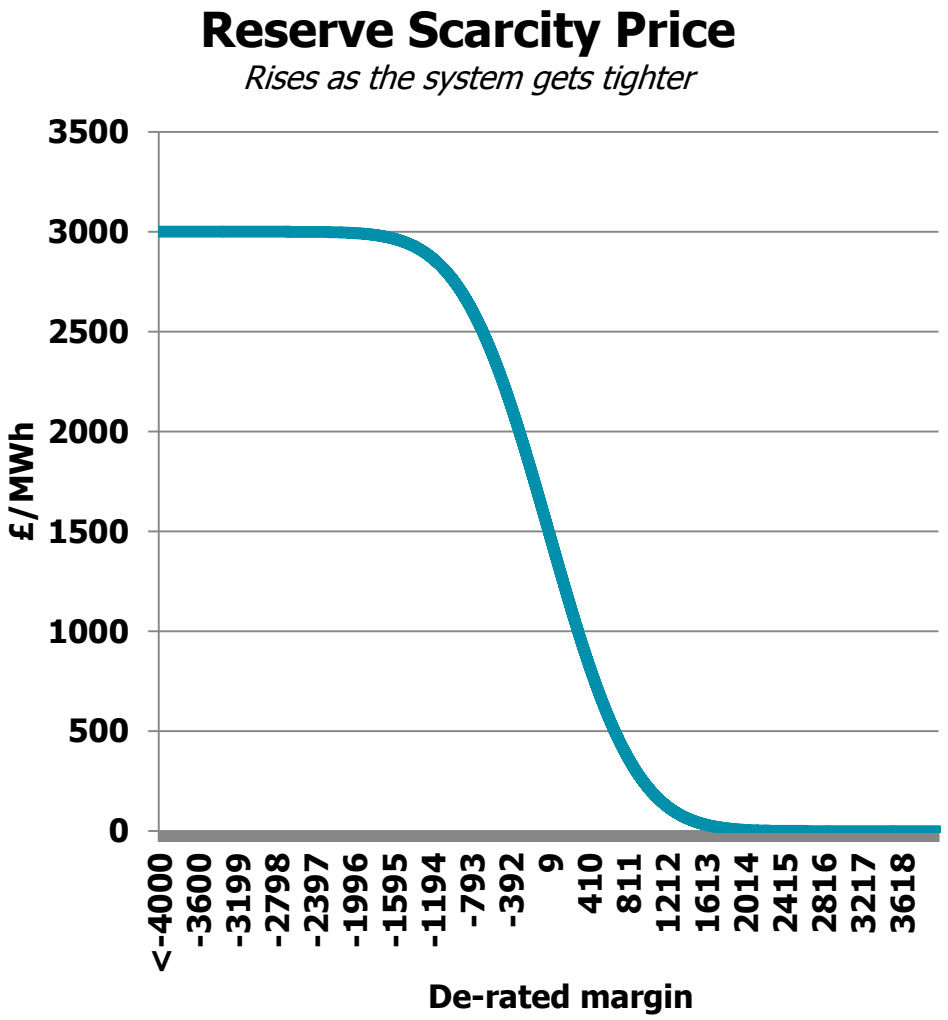
Why?

- The **Reserve Scarcity Price** is designed to reflect system scarcity
- It is used to re-price STOR actions when it exceeds their original price

How?

- The SO calculates the **De-Rated Margin (DRM)** at Gate Closure
- For each DRM there is an associated **Loss of Load Probability (LoLP);** between 0 and 1
- LoLP is multiplied by **Value of Lost Load (VoLL)** to determine the RSP





Re-pricing STOR actions (3)

Receive all balancing actions

Rank from least to most expensive

Determine the system direction

Determine the marginal balancing actions

How?

- STOR actions are:
  - Identified with a **STOR flag**
  - Re-priced when the RSP exceeds their original **Utilisation Price** (the price it is paid when dispatched)
- STOR actions are re-priced and then ranked

De-rated margin At Gate Closure = 1238MW

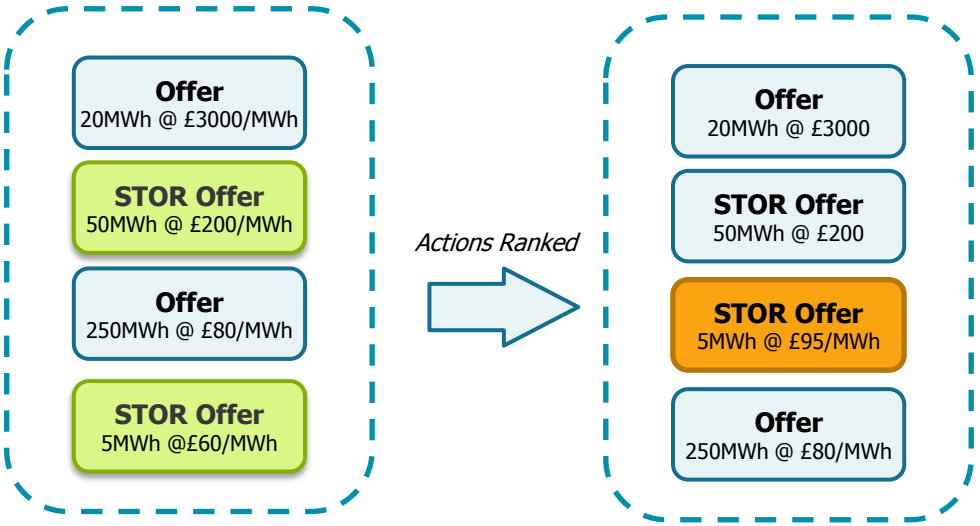
LOLP = 0.03167

Reserve Scarcity Price = LOLP * VOLL

= £95

1. RSP < Utilisation Price **No re-pricing**

2. RSP > Utilisation Price **Re-priced**



A single cash-out price

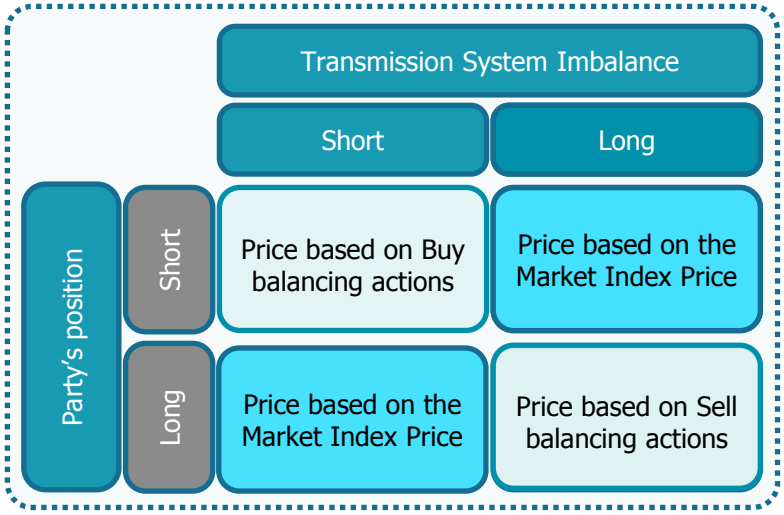
Receive all balancing actions

Rank from least to most expensive

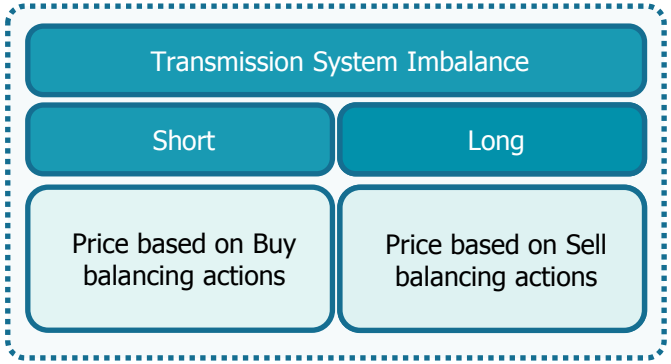
Determine the system direction

Determine the marginal balancing actions

- Pre-P305, there were two prices for each half-hour; the Party's direction determined which it paid
- **Main price**
  - Imbalances in the same direction as the system
  - Price based on prices of balancing actions
- **Reverse price**
  - Imbalances in the opposite direction as the system
  - Price based on trades in the market – the **Market Index Price (MIP)**



DUAL CASH-OUT



SINGLE CASH-OUT

Reduction in PAR

Receive all balancing actions

Rank from least to most expensive

Determine the system direction

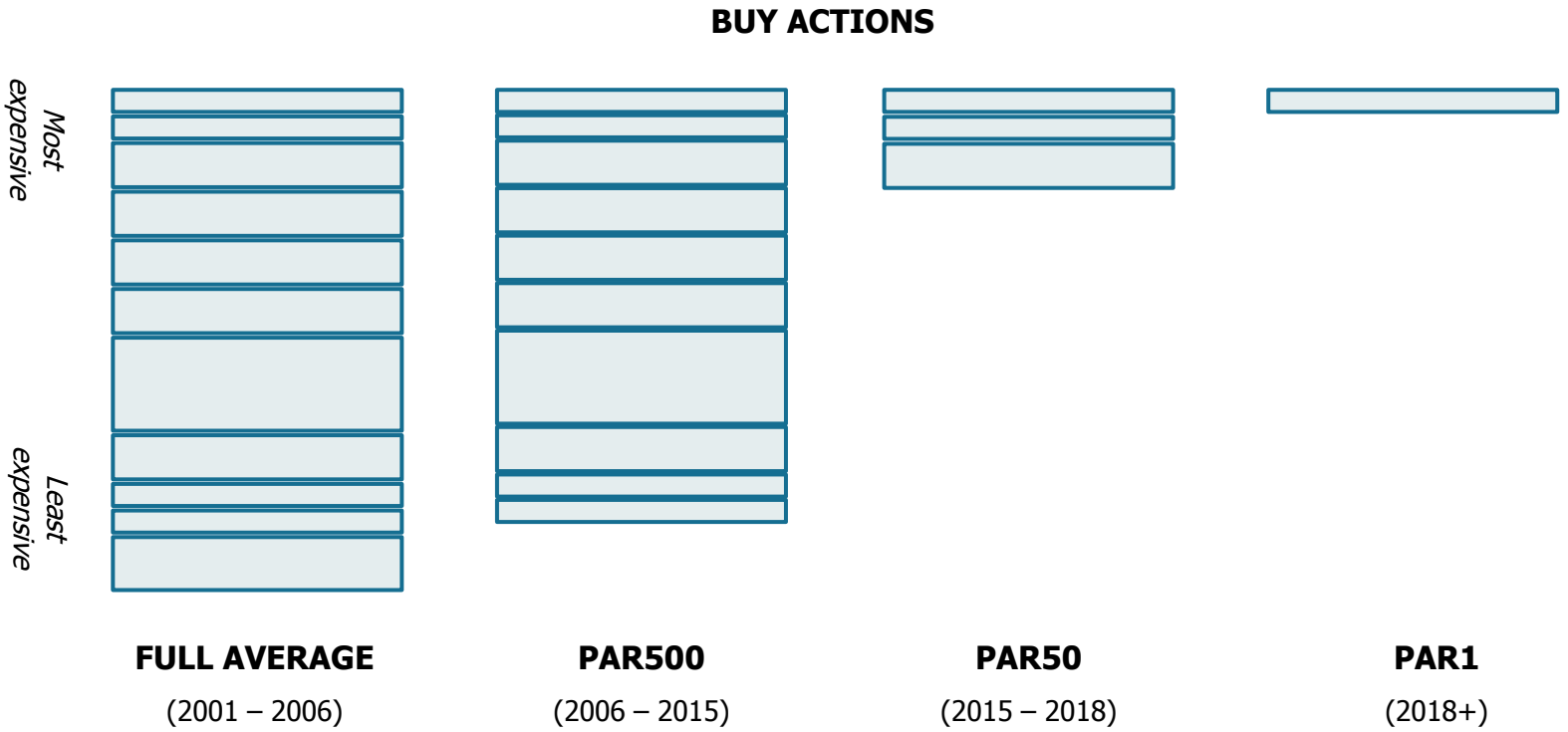
Determine the marginal balancing actions

Why?

- Marginal balancing actions should create the right signal to balance
- Better mechanisms for removing 'system costs' (eg SO-flagging) have allowed prices to become more marginal

How?

- P305 reduced the volume of actions averaged to set the price from the most expensive 500MWh to 50MWh.
- Further reduction to 1MWh in November 2018



Want to know more?

ELEXON Guidance

Imbalance Pricing Guidance

A guide to electricity imbalance pricing in Great Britain

This document explains the electricity imbalance pricing ("cash out") arrangements in the Balancing and Settlement Code (BSC).

Section 1 is a summary of imbalance pricing.

Section 2 introduces the key concepts for imbalance pricing.

Section 3 covers the individual steps for calculating the main energy imbalance price.

Section 4 provides a worked example of the main price calculation from start to finish.

Section 5 covers the reverse energy imbalance price (also known as the Market Price).

Section 6 explains when imbalance charges are billed to Parties.

Section 7 details how imbalance pricing data is published.

Section 8 contains a glossary of terms.

Section 9 contains Appendix 1 – BPA/SPA methodology

Where a term is first defined it appears in the document in **bold** font.

Throughout the document you will find references to the relevant paragraphs of the BSC, should you wish to use this document to help you interpret the BSC.

If you need help, or more information, please email bscservicedesk@cgi.com

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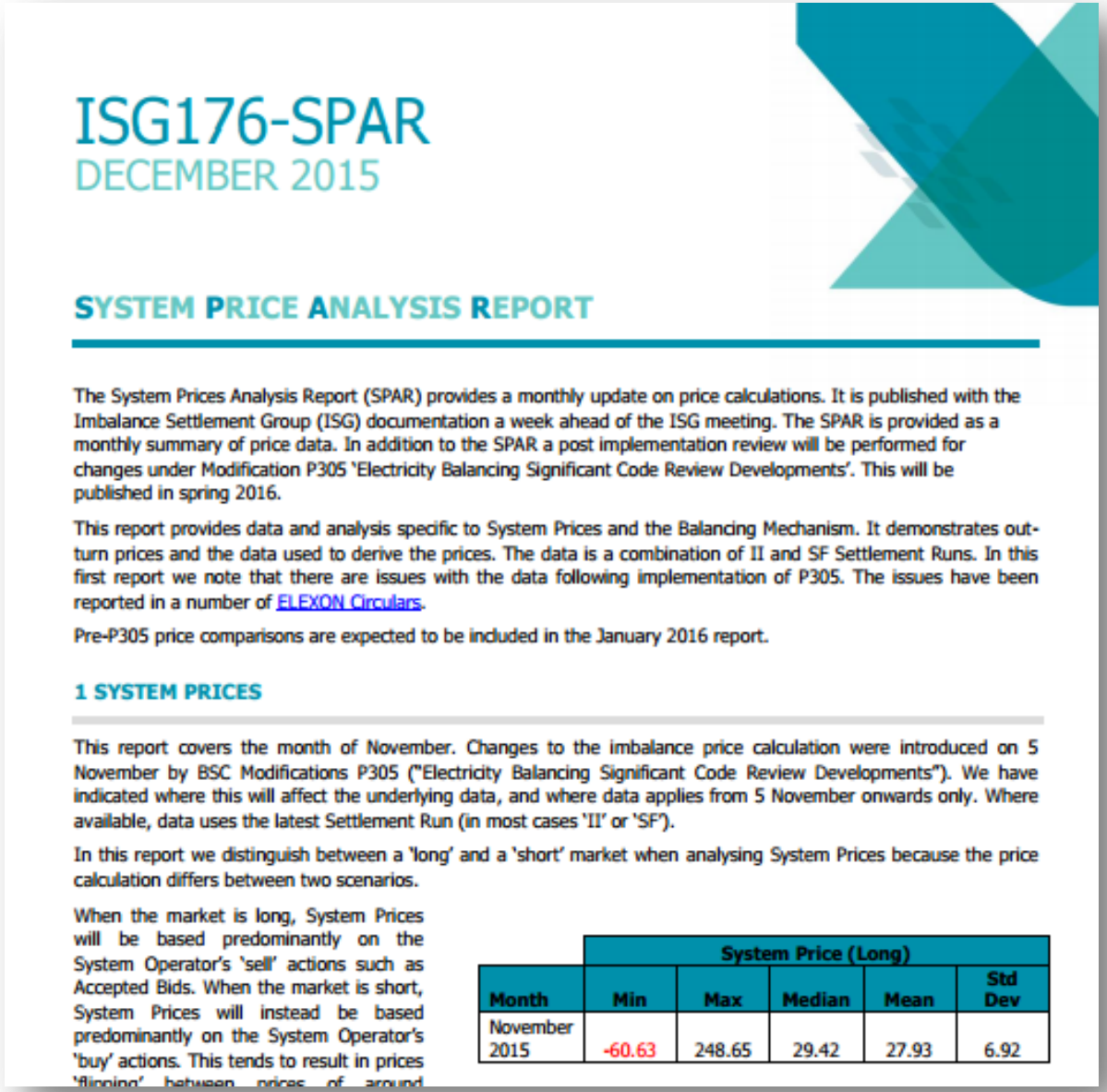
Want to know more?

https://www.elexon.co.uk/reference/technical-operations/trading-operations-report/



ISG176-SPAR
DECEMBER 2015

SYSTEM PRICE ANALYSIS REPORT

The System Prices Analysis Report (SPAR) provides a monthly update on price calculations. It is published with the Imbalance Settlement Group (ISG) documentation a week ahead of the ISG meeting. The SPAR is provided as a monthly summary of price data. In addition to the SPAR a post implementation review will be performed for changes under Modification P305 'Electricity Balancing Significant Code Review Developments'. This will be published in spring 2016.

This report provides data and analysis specific to System Prices and the Balancing Mechanism. It demonstrates out-turn prices and the data used to derive the prices. The data is a combination of II and SF Settlement Runs. In this first report we note that there are issues with the data following implementation of P305. The issues have been reported in a number of ELEXON Circulars.

Pre-P305 price comparisons are expected to be included in the January 2016 report.

1 SYSTEM PRICES

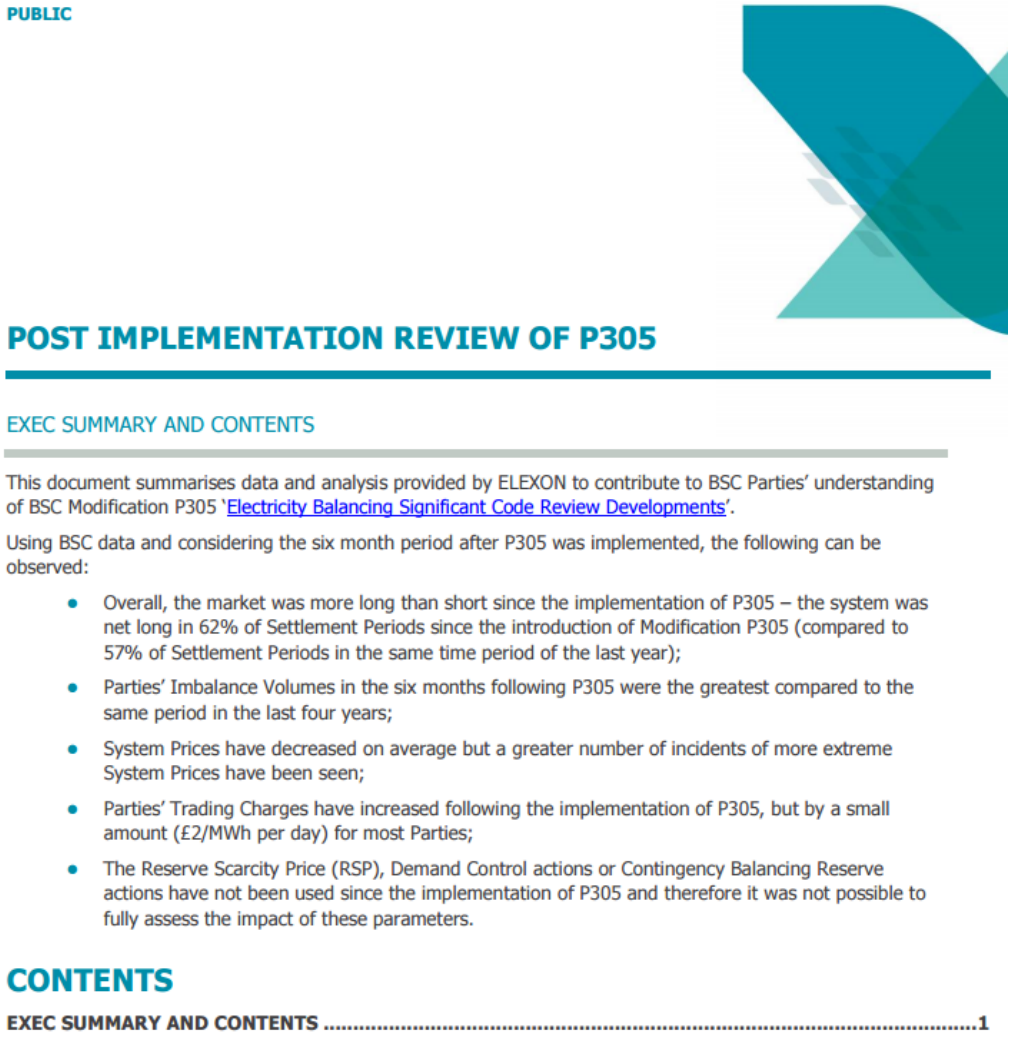
This report covers the month of November. Changes to the imbalance price calculation were introduced on 5 November by BSC Modifications P305 ("Electricity Balancing Significant Code Review Developments"). We have indicated where this will affect the underlying data, and where data applies from 5 November onwards only. Where available, data uses the latest Settlement Run (in most cases 'II' or 'SF').

In this report we distinguish between a 'long' and a 'short' market when analysing System Prices because the price calculation differs between two scenarios.

When the market is long, System Prices will be based predominantly on the System Operator's 'sell' actions such as Accepted Bids. When the market is short, System Prices will instead be based predominantly on the System Operator's 'buy' actions. This tends to result in prices 'flipping' between prices of around

	System Price (Long)				
Month	Min	Max	Median	Mean	Std Dev
November 2015	-60.63	248.65	29.42	27.93	6.92

Post-implementation review of P305



PUBLIC

POST IMPLEMENTATION REVIEW OF P305

EXEC SUMMARY AND CONTENTS

This document summarises data and analysis provided by ELEXON to contribute to BSC Parties' understanding of BSC Modification P305 'Electricity Balancing Significant Code Review Developments'.

Using BSC data and considering the six month period after P305 was implemented, the following can be observed:

- Overall, the market was more long than short since the implementation of P305 – the system was net long in 62% of Settlement Periods since the introduction of Modification P305 (compared to 57% of Settlement Periods in the same time period of the last year);
- Parties' Imbalance Volumes in the six months following P305 were the greatest compared to the same period in the last four years;
- System Prices have decreased on average but a greater number of incidents of more extreme System Prices have been seen;
- Parties' Trading Charges have increased following the implementation of P305, but by a small amount (£2/MWh per day) for most Parties;
- The Reserve Scarcity Price (RSP), Demand Control actions or Contingency Balancing Reserve actions have not been used since the implementation of P305 and therefore it was not possible to fully assess the impact of these parameters.

CONTENTS

https://www.elexon.co.uk/reference/technical-operations/trading-operations-report/

Next Webinar

- 20 July 2016
  - Key findings from ELEXON's post-implementation review of P305

Questions or comments?

- Please email communications@elexon.co.uk