

# Electricity System Operator Incentives BSUoS Seminar



**Tuesday 15<sup>th</sup> February 2011**

# Welcome and Introduction

Alan Smart, Energy Operations Manager

# Agenda

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- Welcome and Introduction
- Overview of SO Incentives Review – David Smith
- BSUoS methodology – Colin Williams
- BSUoS Forecasts and input assumptions:
  - Energy – Katharine Clench
  - Constraints – Guilherme Susteras
- BSUoS Reporting – Jo Faulkner
- Closing remarks and next steps – Alan Smart

## Things to note

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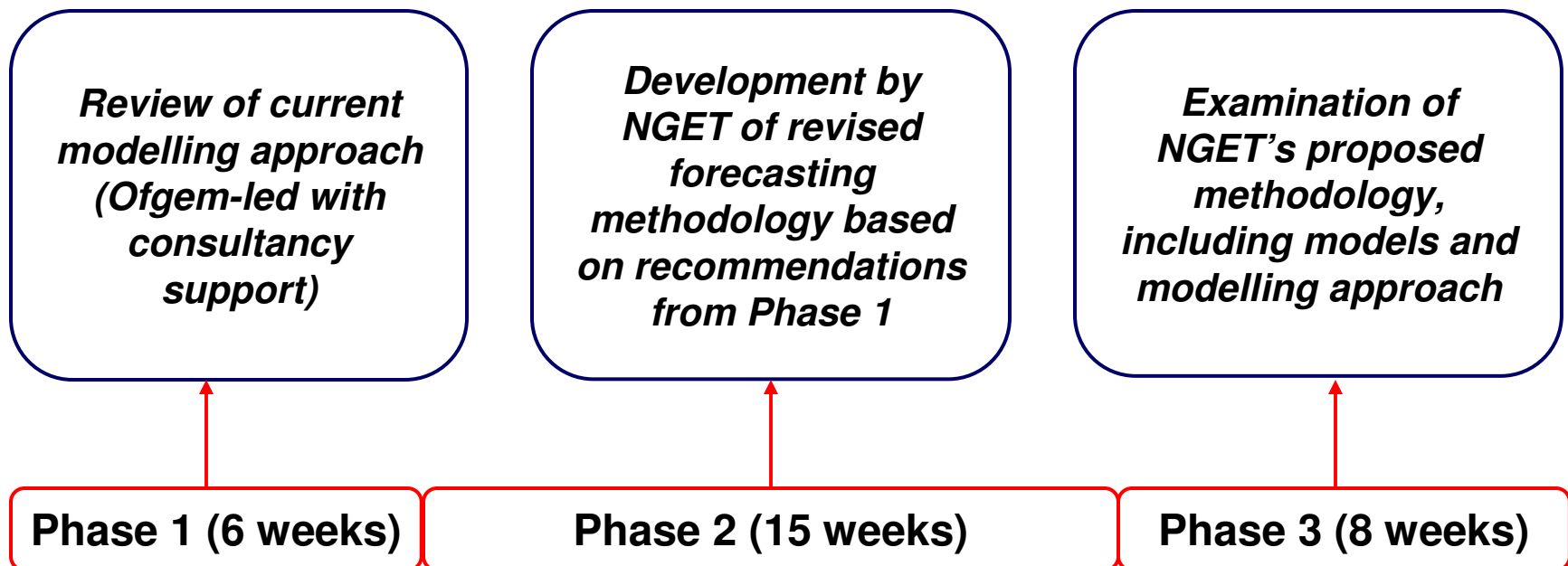
- Health and Safety
- Feedback forms

# Overview of the Electricity SO Incentives Review

**David Smith, Electricity Codes Manager**

# Where are we in the SO Incentives Review process?

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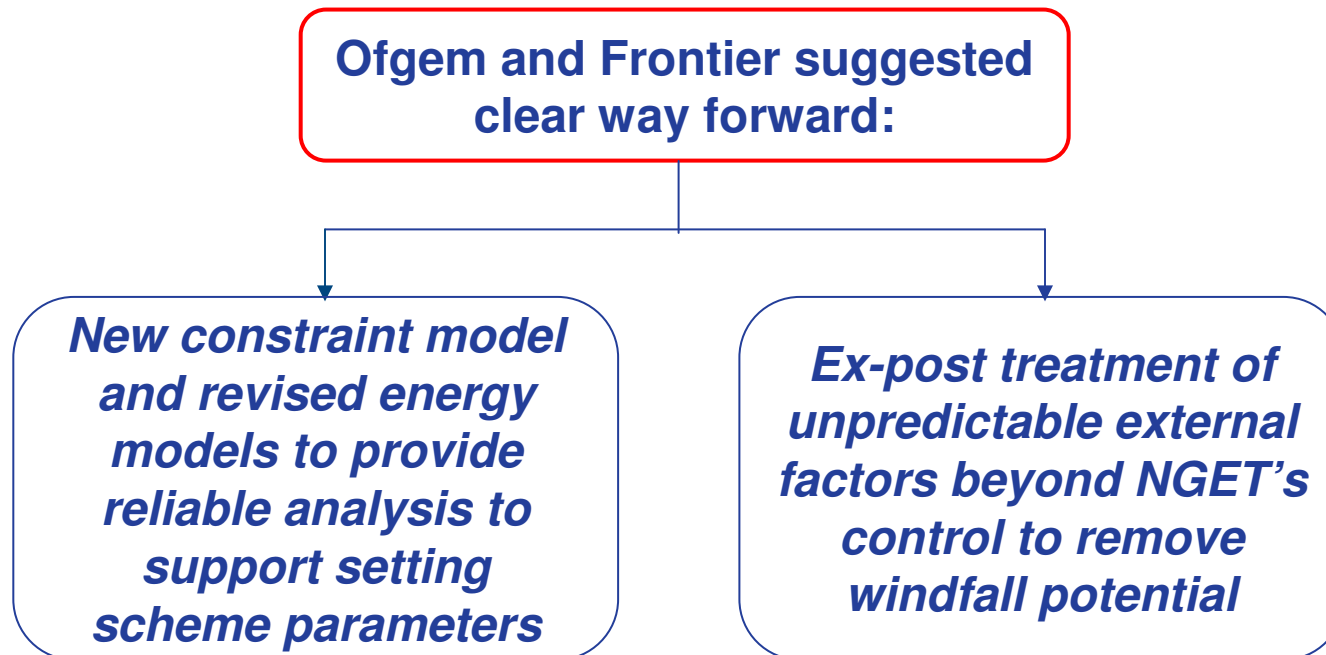


# Summary of Phase 1 key findings

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Aim: **Multi-year scheme:**

- Promote system operation efficiency
- Reduce regulatory and industry burden

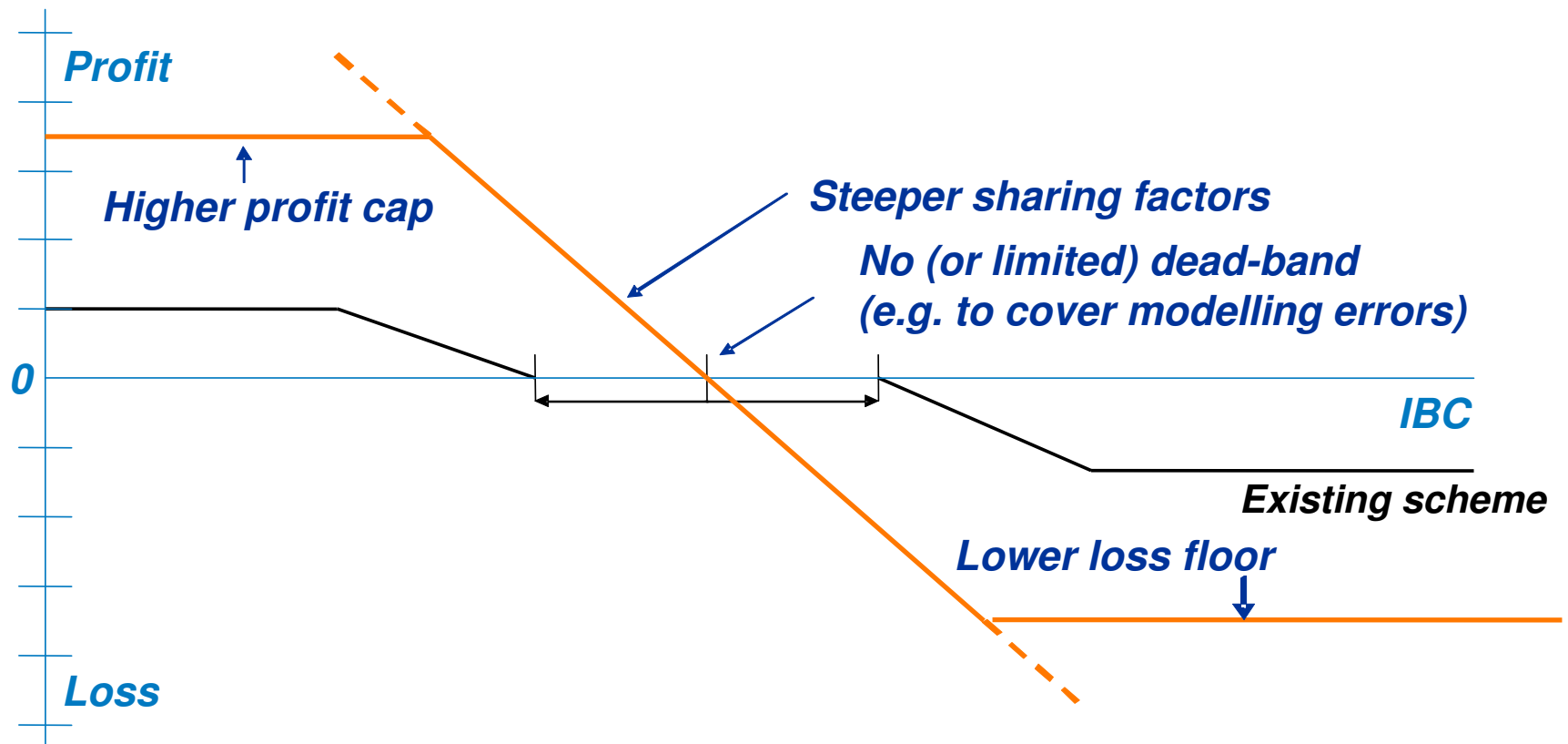


# Evolution of the proposed incentivisation approach

	<i>Current</i>	<i>Proposed</i>
<i>Target IBC</i>	<i>Ex-ante</i>	<i>Ex-ante forecast updated ex-post</i>
<i>Adjustments to Target IBC</i>	<i>Two ex-post adjusters</i>	<i>Multiple ex-post adjustments</i>
<i>Adjustments to out-turn costs</i>	<i>Ex-post NIA</i>	<i>None</i>
<i>BSUoS Charges</i>	<i>Ex-ante forecast</i>	<i>Ex-ante forecast</i>

# New scheme structure

We believe the proposed approach will remove volatility and allow for sharper scheme parameters:



# BSUoS Charging Methodology – Impact of BSIS Initial Proposals

Colin Williams - Charging and Revenue

# Agenda

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- ◆ Calculation of BSUoS Charges
  
- ◆ Impact as a result of BSIS 2011/13
  - ◆ Internal Incentive
  - ◆ External Incentive

# BSUoS – Calculation and Billing

- ◆ Charges apportioned on a £/MWh proportionality basis
- ◆ £/MWh - one price per HH period, paid by all
- ◆ Calculated half-hourly
- ◆ Billed Daily
- ◆ Two stage Financial Settlement

Run Type	Definition	Processing / Billing Timescales
II*	Interim Initial	Settlement Day + 5 working days *No invoice sent
SF	Settlement Final	Daily, Settlement Day + 16 working days
RF	Reconciliation Final	Daily, Settlement Day + 14 months

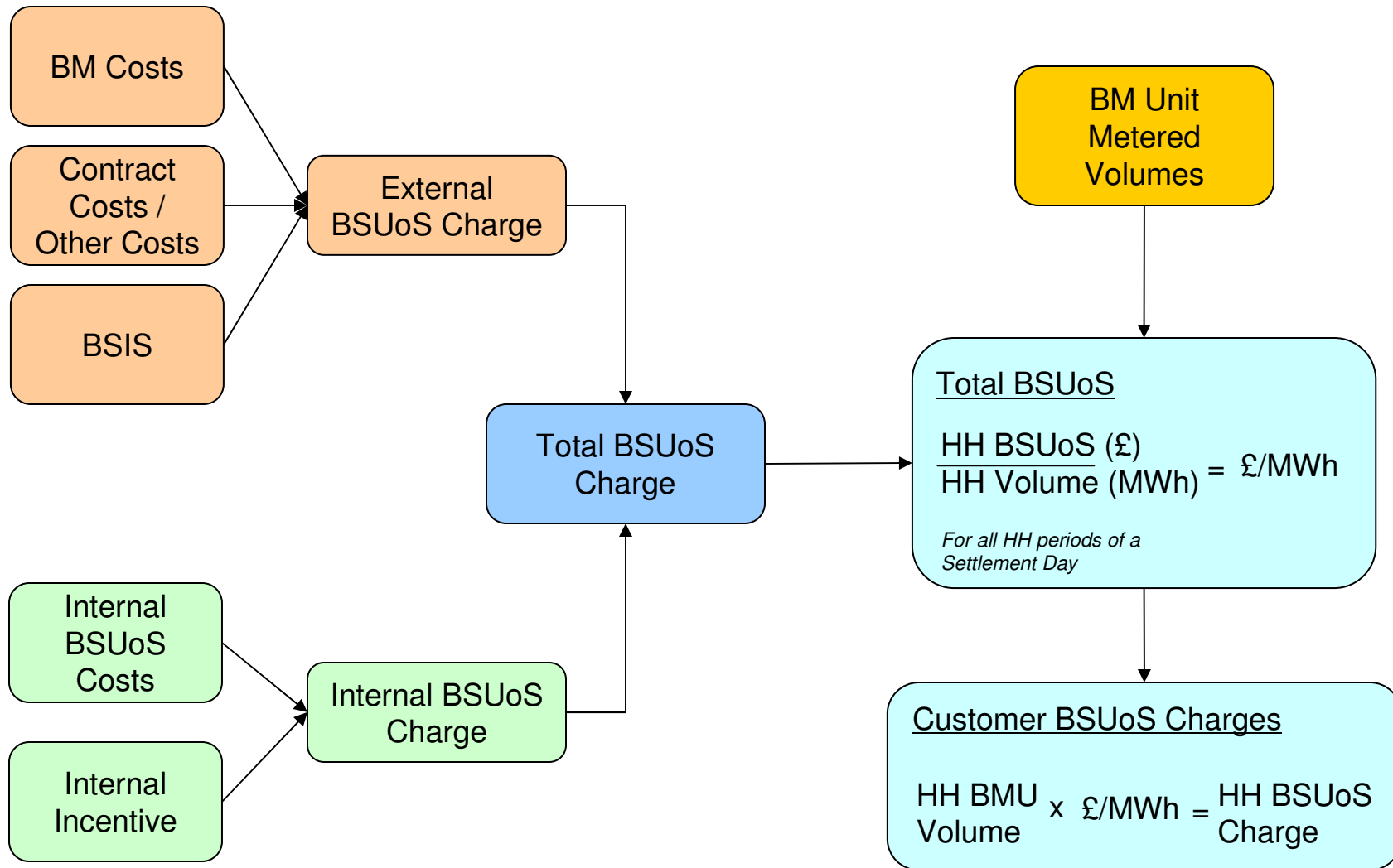
**This will remain unchanged**

## BSUoS Charges - Calculation

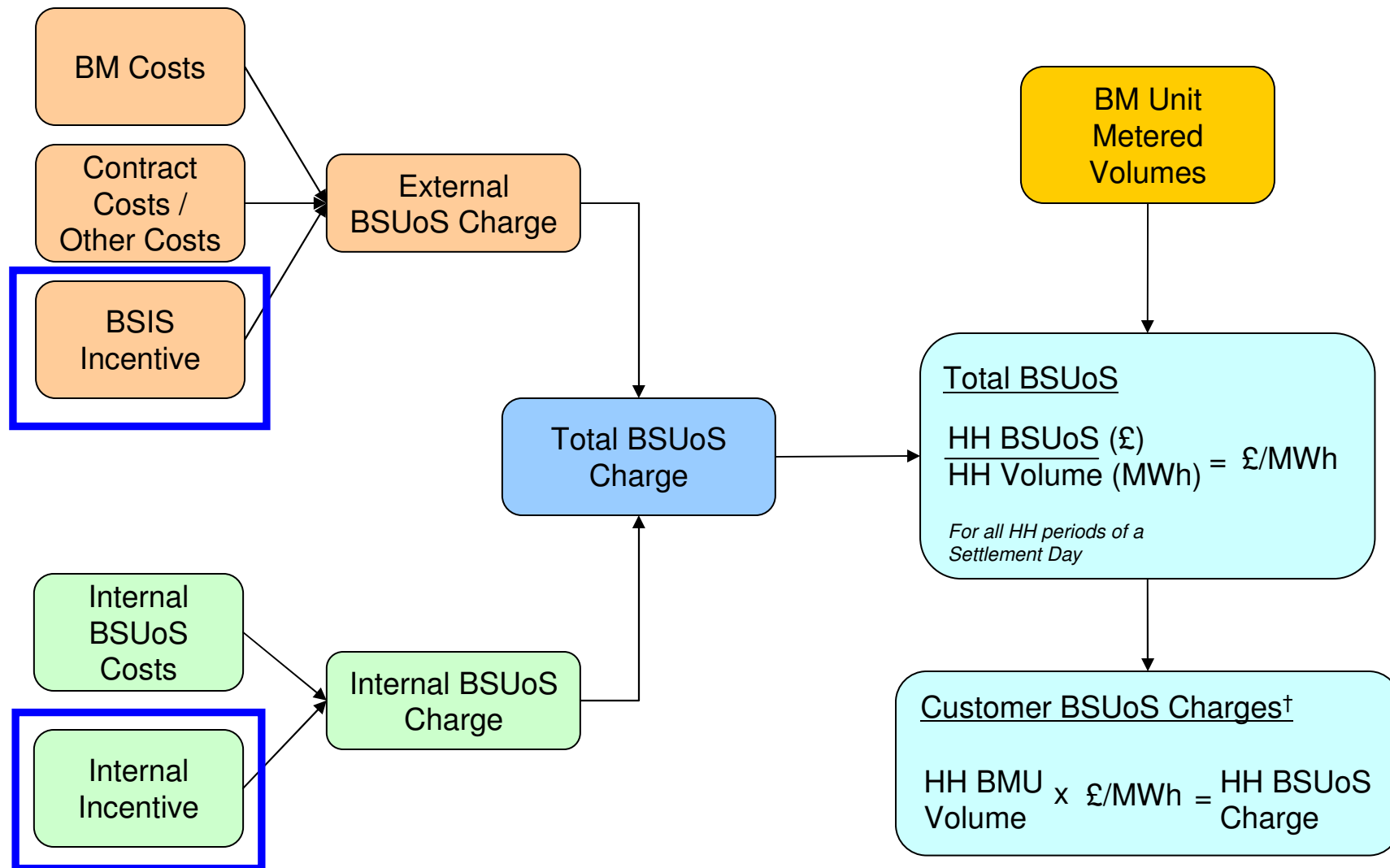
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- ◆ Two main components of BSUoS
  - ◆ Internal - internal SO costs e.g. staff, buildings, IS
  - ◆ External - costs of the services used to balance the system
    - ◆ Electricity related products
      - ◆ Balancing Services Contract Costs
      - ◆ Balancing Mechanism Bids and Offers
  
- ◆ Both Internal and External Costs have an Incentive Scheme Adjustment

# BSUoS Calculation – Simplified

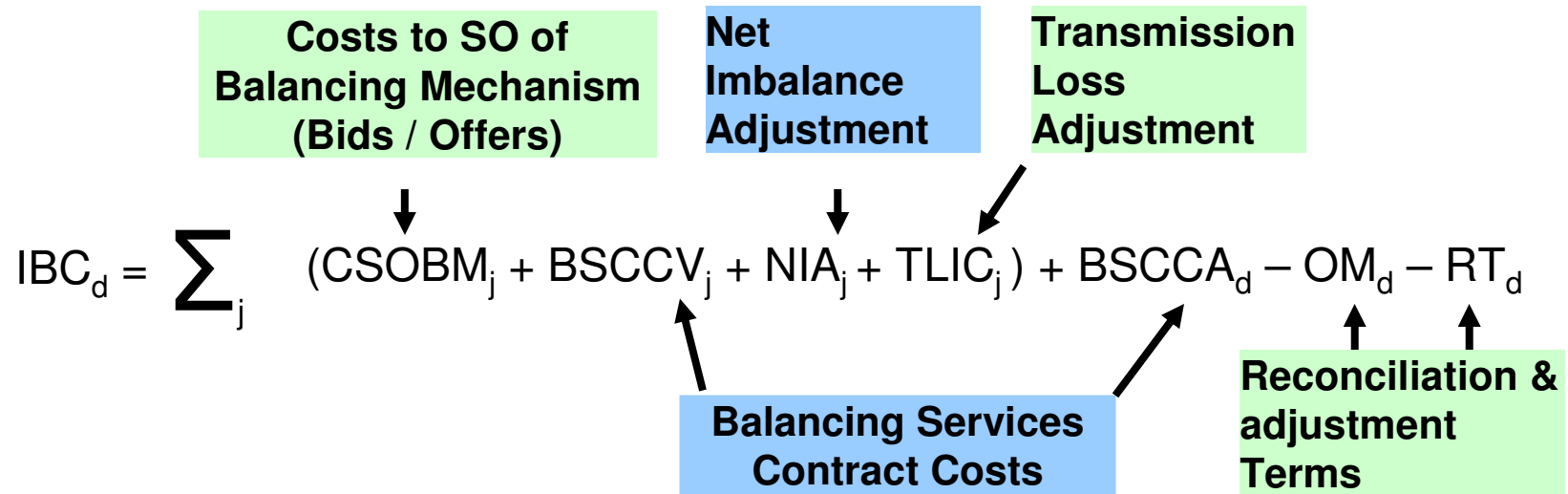


# BSUoS Calculation – Simplified



# Incentivised Balancing Costs – Current Methodology

◆ 2010/11 IBC Calculation

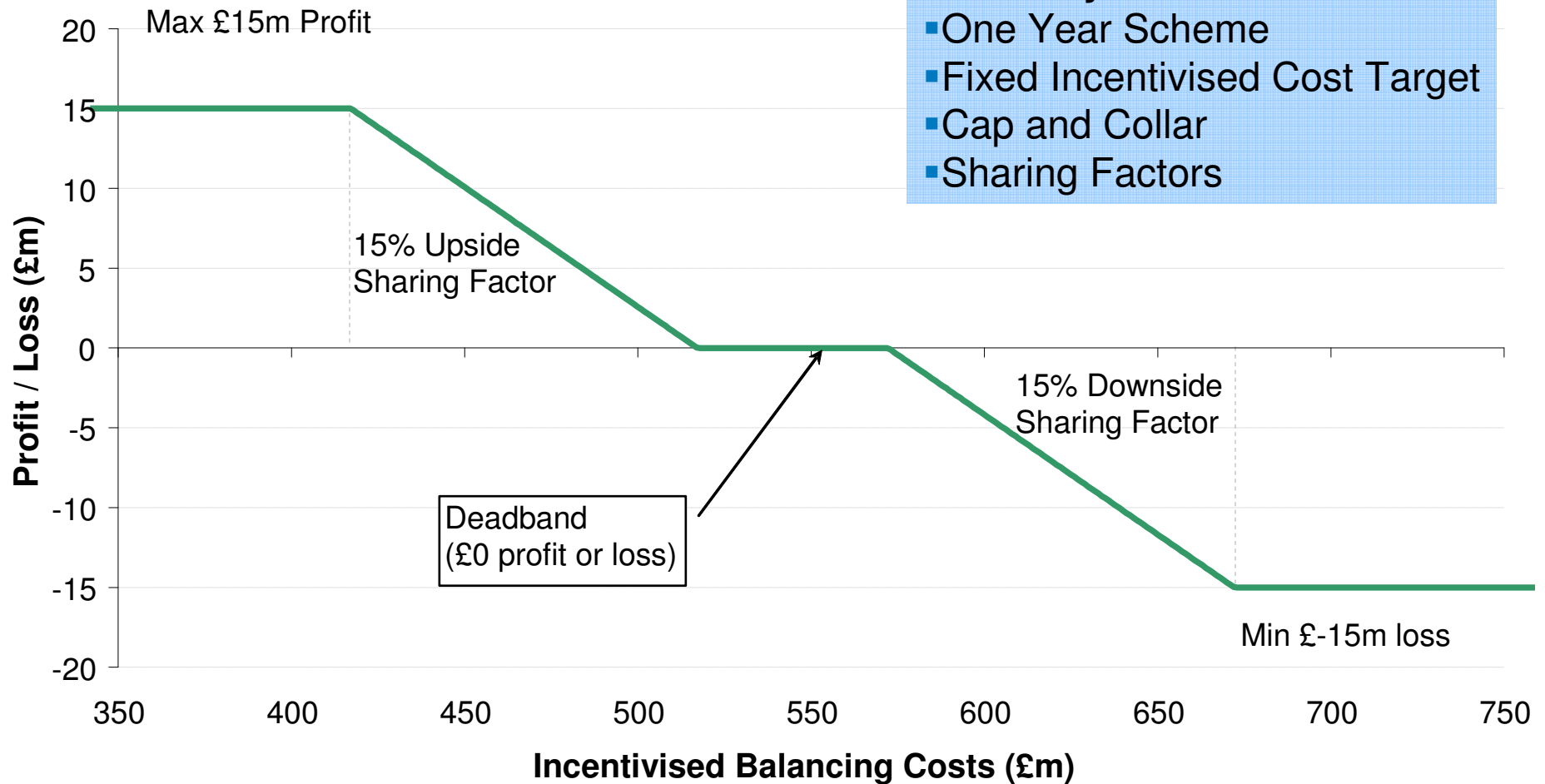


- ◆ To determine the value of the incentive adjustment to BSUoS Charges the average IBC is calculated. Against this number the incentive adjustment is calculated by comparing against the Incentivised Target

# BSIS – 2010/11 - Summary

## Summary of Current Scheme

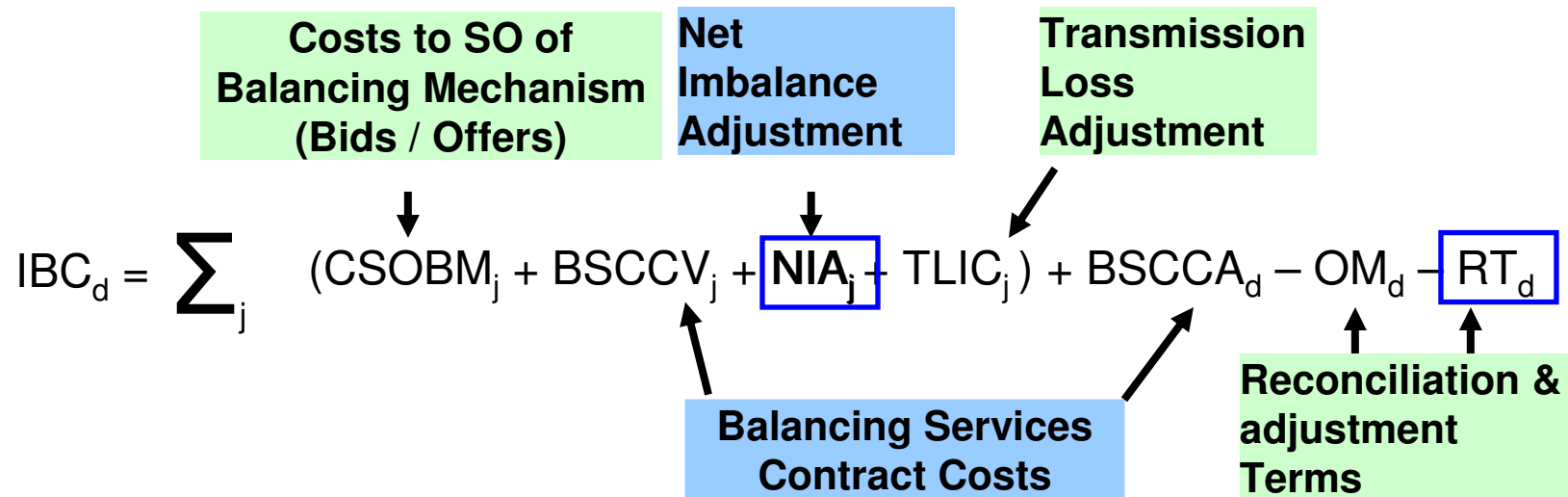
- One Year Scheme
- Fixed Incentivised Cost Target
- Cap and Collar
- Sharing Factors



— Scottish Generation and IFA Adjusted Scheme

# Impact on Incentivised Balancing Costs from Initial Proposals

## ◆ 2011/13 IBC Calculation



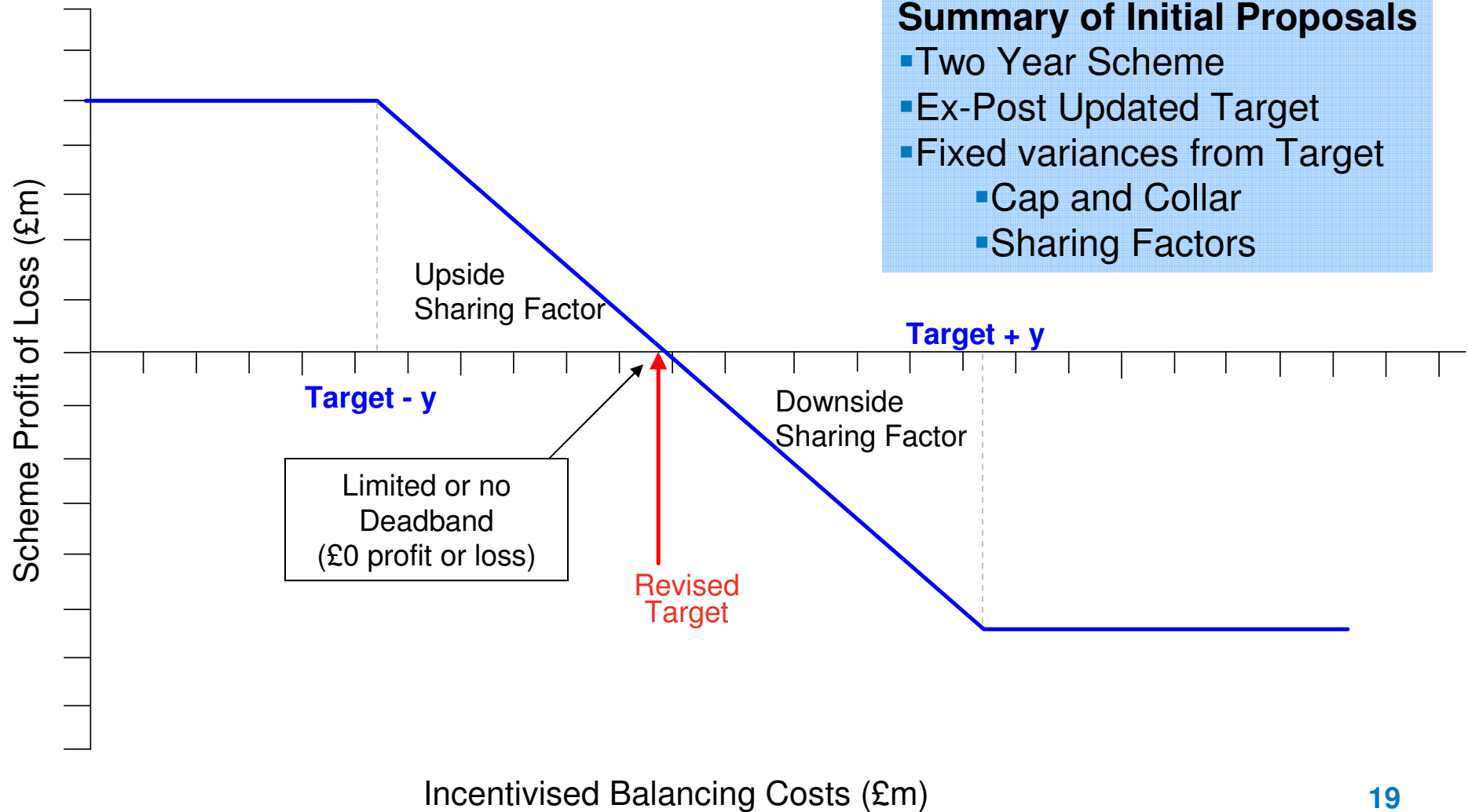
## ◆ Proposed changes to calculation of IBC

- ◆ Remove NIA and potential removal of RT

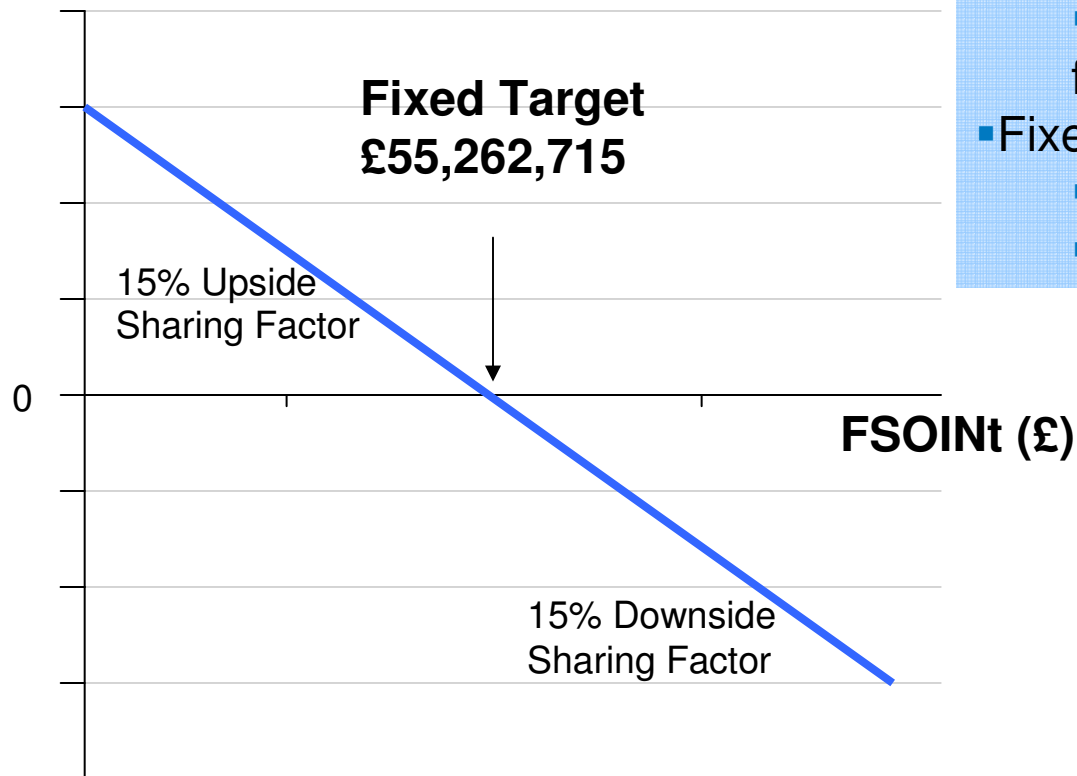
# BSIS – 2011/13 – Initial Proposals

## Summary of Initial Proposals

- Two Year Scheme
- Ex-Post Updated Target
- Fixed variances from Target
  - Cap and Collar
  - Sharing Factors



# BSUoS – Internal Incentive 2010/11



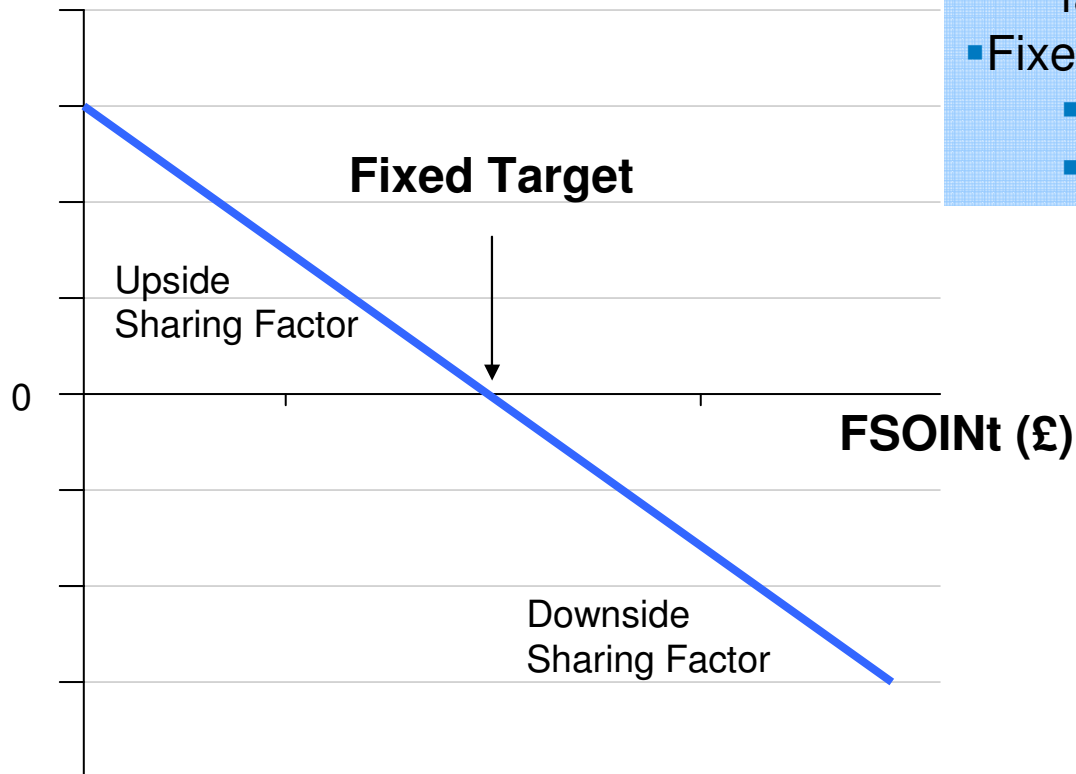
## Summary of Current Scheme

- Five year scheme
  - Annual adoption of BSIS sharing factors
- Fixed Target
  - No Cap or Collar
  - Sharing Factors

# BSUoS – Internal Incentive 2011/12 & 2012/13

## Summary of Scheme

- Remain as five year scheme
  - Annual adoption of BSIS sharing factors
- Fixed Target per year
  - No Cap or Collar
  - Sharing Factors



# BSUoS Charges – BSIS 2011/13

## Impact Summary

	Calculation of External Incentive	Calculation of Internal Incentive	Methodology of Charging and Apportioning	Billing BSUoS
Any Change?	✓	X	X	X
Change Detail	<ul style="list-style-type: none"> <li>◆ Two Year External Scheme</li> <li>◆ Variable Target with cap, collar and sharing factors</li> <li>◆ Removal of NIA</li> </ul>	<ul style="list-style-type: none"> <li>◆ Sharing Factor</li> <li>◆ Remains to be considered on an annual basis</li> </ul>	<ul style="list-style-type: none"> <li>◆ No Change to method</li> </ul>	<ul style="list-style-type: none"> <li>◆ No Change to method</li> </ul>

## BSUoS Charging – Contact

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- ◆ Any BSUoS Charging Questions please contact:

Colin Williams

[Colin.Williams@uk.ngrid.com](mailto:Colin.Williams@uk.ngrid.com)

Tel: 01926 65 5916

# BSUoS Forecast - Energy Components

Katharine Clench, BSIS Commercial Analyst

# Content

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- ◆ Headline Energy forecast
- ◆ Ex ante/ ex post inputs and assumptions
- ◆ Model sensitivity
- ◆ Black Start and Transmission Losses
- ◆ Waterfall diagrams



# Headline Energy Forecast

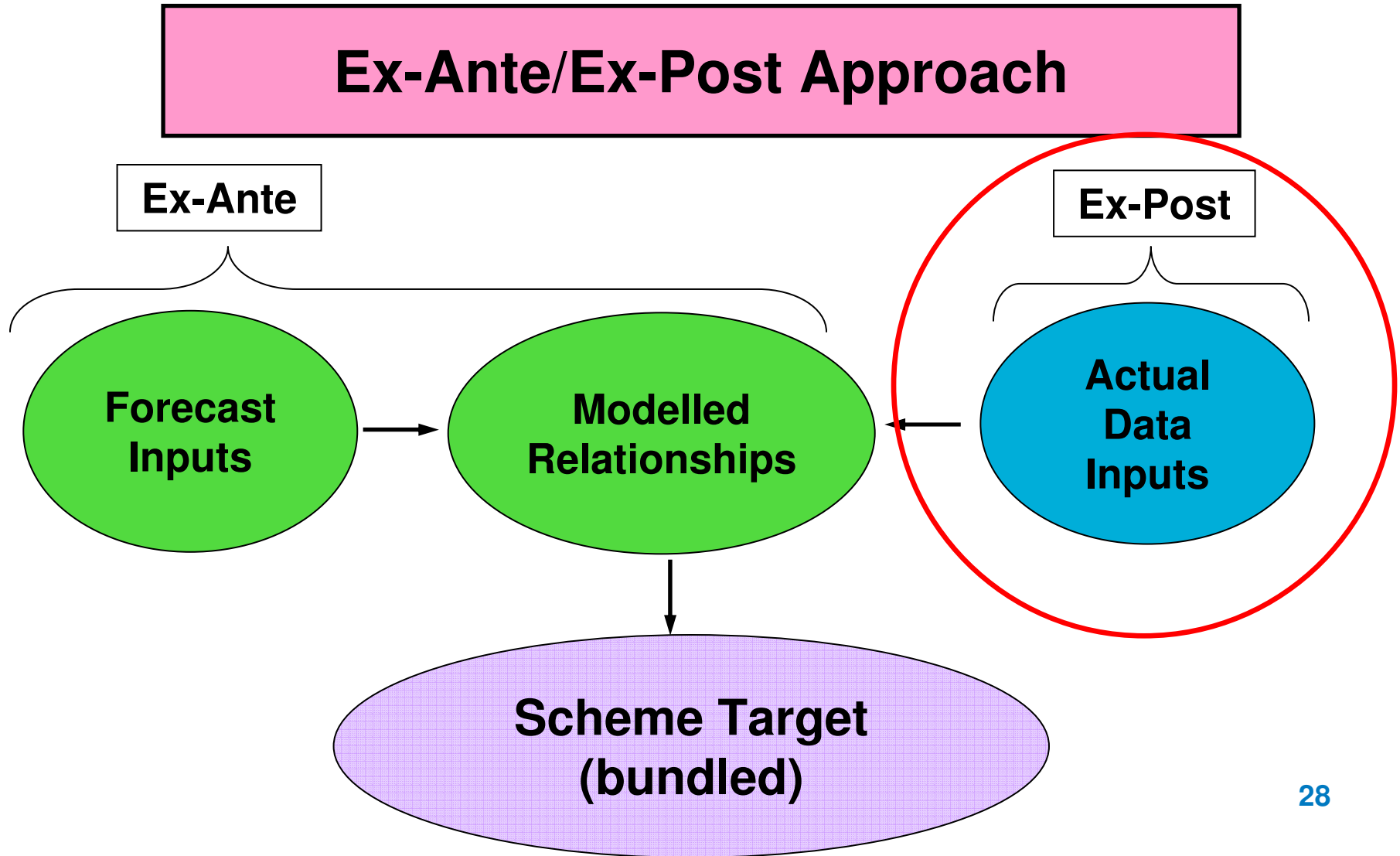
All Categories £m	2005/6 Year End	2006/7 Year End	2007/8 Year End	2008/9 Year End	2009/10 Year End	2010/11 Latest View	THIS MODEL (Apr/11 to Mar/12)	THIS MODEL (Apr/12 to Mar/13)
Energy Imbalance	6.1	-27.6	19.9	-71.5	11.6	-37.9	-28.0	-27.9
Margin	194.9	159.1	183.1	358.4	186.6	155.9	159.2	174.8
Op. Reserve	126.3	59.9	100.3	205.9	78.6	46.7	42.4	45.0
STOR	47.4	69.4	57.6	75.1	85.4	87.1	88.5	99.7
BM Start Up	7.4	11.9	14.8	28.9	10.8	8.1	9.7	10.1
CMM	13.8	17.9	10.4	48.5	11.8	14.1	18.6	19.9
Energy + Margin	201.1	131.6	203.0	287.0	198.3	118.0	131.2	146.8
Footroom	-5.5	9.2	5.2	5.7	30.2	13.9	28.3	31.0
Fast Reserve	51.0	58.4	58.3	60.8	63.3	69.4	75.3	77.8
AS Response	65.5	124.3	126.0	129.5	111.5	139.1	126.3	126.5
BM Response	71.2	36.3	31.8	71.3	50.4	27.9	54.1	48.3
Reactive	54.5	53.1	47.0	61.9	42.8	48.1	59.3	60.5
Blackstart	14.5	15.5	13.6	16.9	14.5	16.8	28.4	29.0
<b>Total (less Constraints and TLA)</b>	<b>471.0</b>	<b>442.9</b>	<b>497.3</b>	<b>655.4</b>	<b>532.0</b>	<b>448.6</b>	<b>521.2</b>	<b>539.1</b>

# Headline Energy Forecast

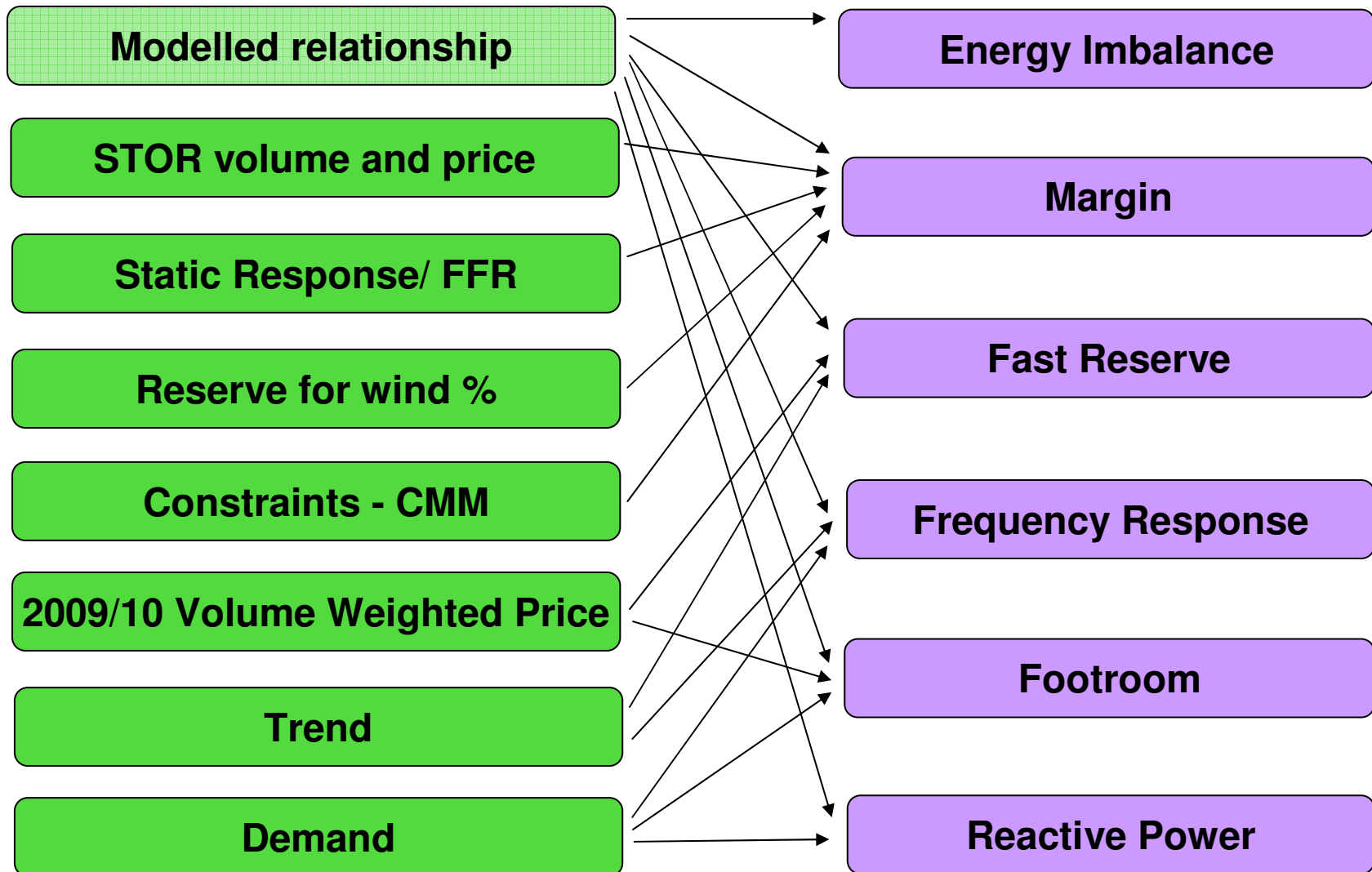
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Energy Imbalance		27.6	19.9	-71.5	11.6	-37.9	-28.0	-27.9
Margin			183.1	358.4	186.6	155.9	159.2	174.8
Op. Reserve	126.0		100.3	205.9	78.6	46.7	42.4	45.0
STOR	47.4			75.1	85.4	87.1	88.5	99.7
BM Start Up	7.4			28.9	10.8	8.1	7.0	10.1
CMM	13.8	17.9		5.5	11.8			19.9
Energy + Margin	201.1	131.6	203.8	513.8	198.7	198.7	198.7	206.8
Footroom	-5.5	9.2	5.2	5.2				
Fast Reserve	51.0	58.4	58.3	60.8				
AS Response	65.5	124.3	126.0	129.5				
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Blackstart	14.5	15.5	13.6	16.9				
Total (less Constraints and TLA)	<b>471.0</b>	<b>442.9</b>	<b>497.3</b>	<b>655.4</b>				

<b>2011/12</b>	<b>2012/13</b>
<b>£521.2m</b>	<b>£539.1m</b>

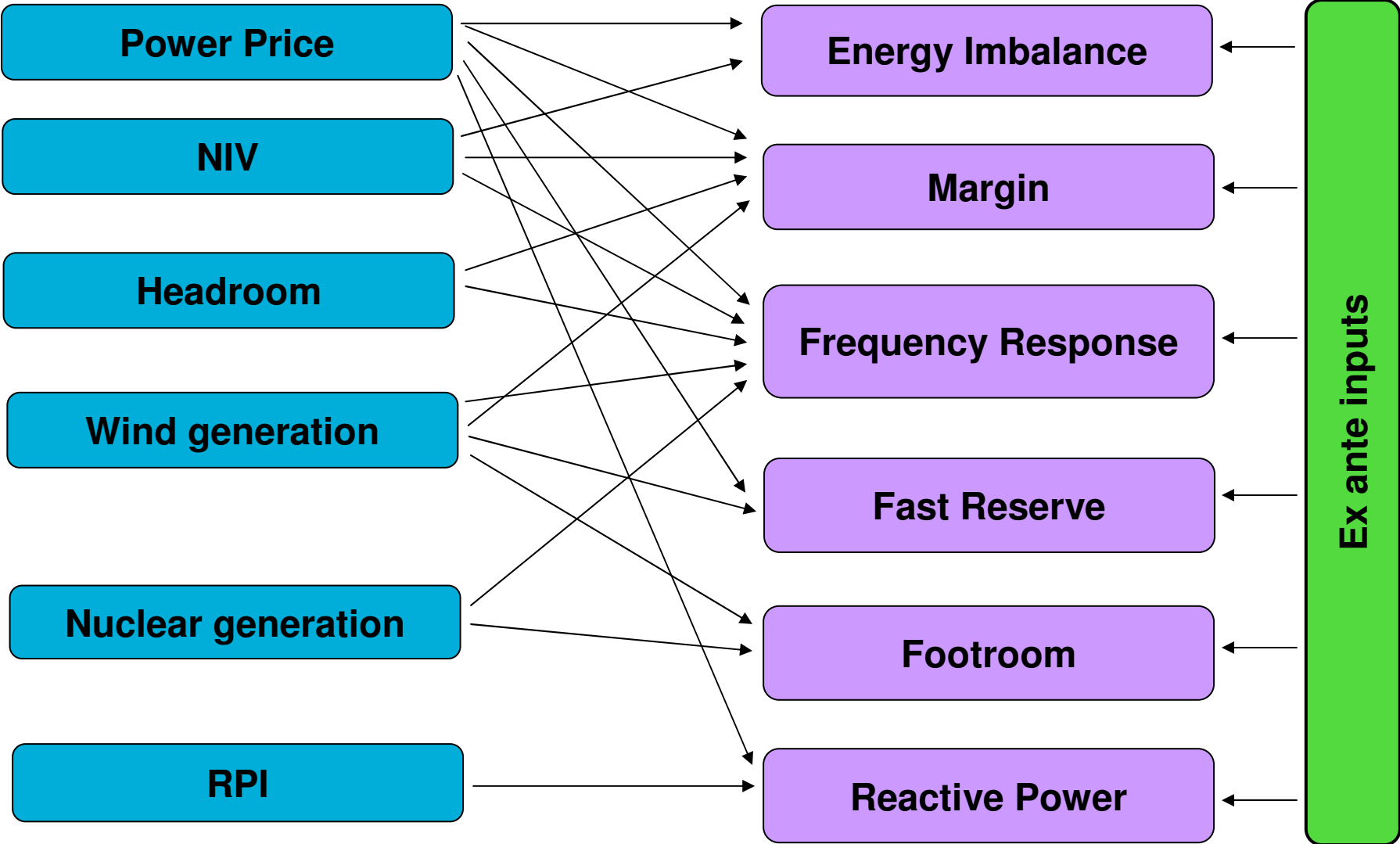
# New Modelling Approach



# Ex ante Inputs



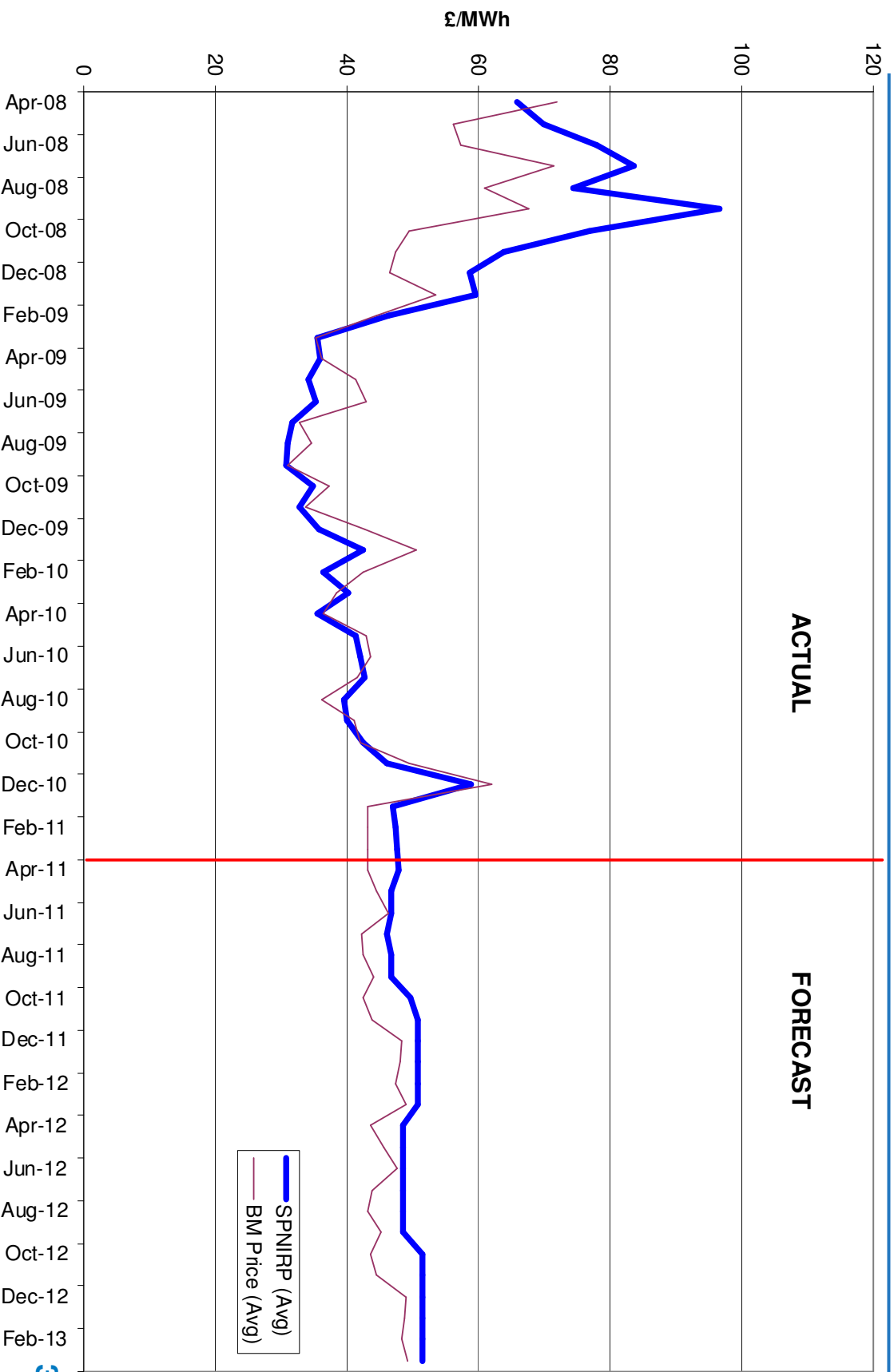
# Ex post Inputs



# Assumptions and Sensitivities



# Ex Post Input Assumptions Power Price



# Ex Post Input Assumptions Power Price Scenarios

Power price  by: 50%

All Categories £m	THIS MODEL (Apr/11 to Mar/12)	THIS MODEL (Apr/12 to Mar/13)
Energy Imbalance	-28.0	-27.9
Margin	159.2	174.8
Operating Reserve	42.4	45.0
STOR	88.5	99.7
BM Start Up	9.7	10.1
CMM	18.6	19.9
Energy Imbalance + Margin	131.2	146.8
Footroom	28.3	31.0
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AS Response	126.3	126.5
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Reactive	59.3	60.5
Blackstart	28.4	29.0
<b>Total (less Constraints and TLA)</b>	<b>521.2</b>	<b>539.1</b>

 +25%

 +~16%

 +36%



**~£79m  
increase  
to each  
year**

# Ex Post Input Assumptions Power Price Scenarios

Power price  by: 50%

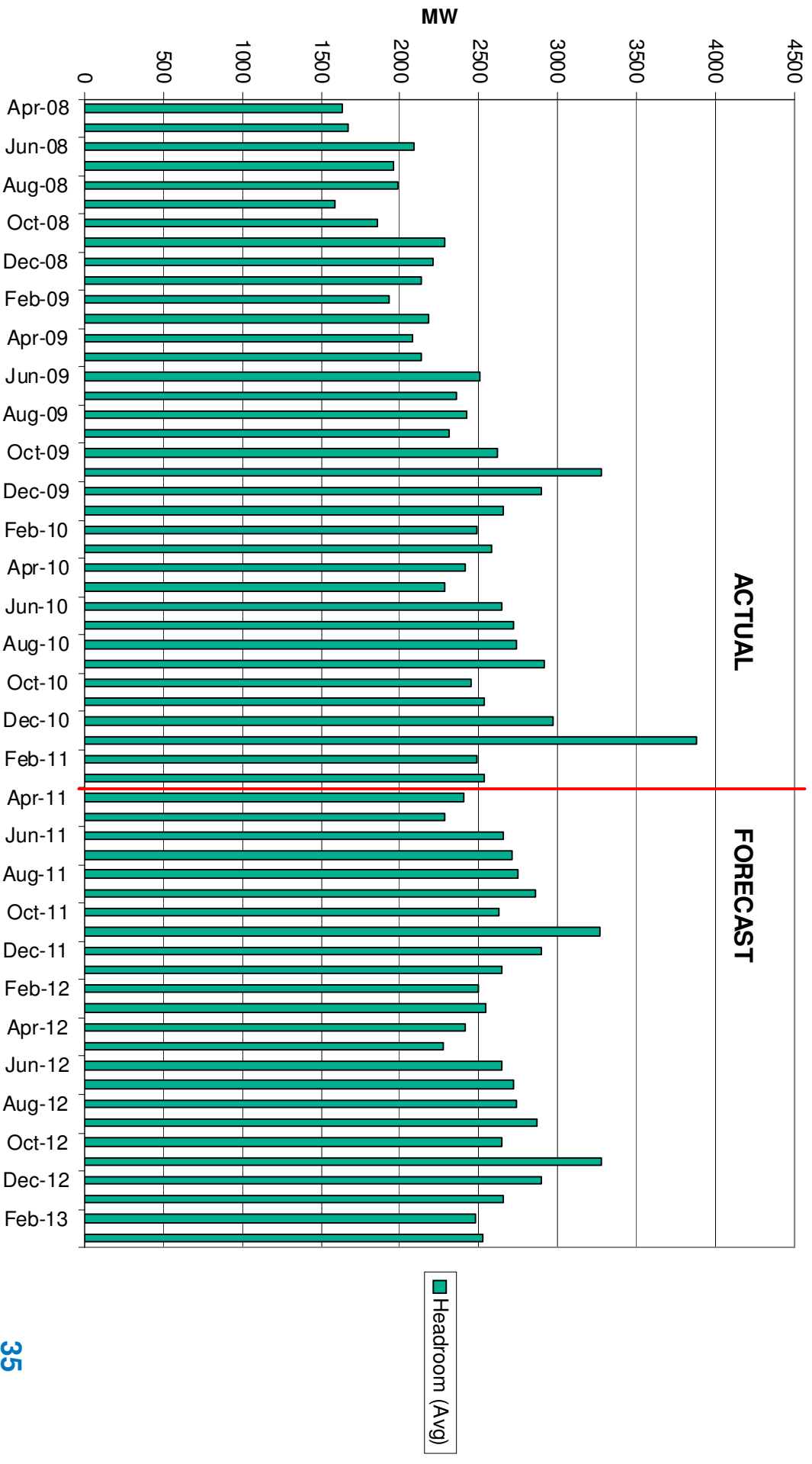
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Reactive	59.3	60.5
Blackstart	28.4	29.0
<b>Total (less Constraints and TLA)</b>	<b>521.2</b>	<b>539.1</b>

 -21%  
 -15%

 -27%  
 -36%

**~£60m decrease to each year**



# Ex Post Input Assumptions Headroom



# Ex Post Input Assumptions Headroom Scenarios

Headroom  and  by: 40%

All Categories £m	THIS MODEL (Apr/11 to Mar/12)	THIS MODEL (Apr/12 to Mar/13)
Energy Imbalance	-28.0	-27.9
Margin	159.2	174.8
Operating Reserve	42.4	45.0
STOR	88.5	99.7
BM Start Up	9.7	10.1
CMM	18.6	19.9
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Blackstart	28.4	29.0
<b>Total (less Constraints and TLA)</b>	<b>521.2</b>	<b>539.1</b>

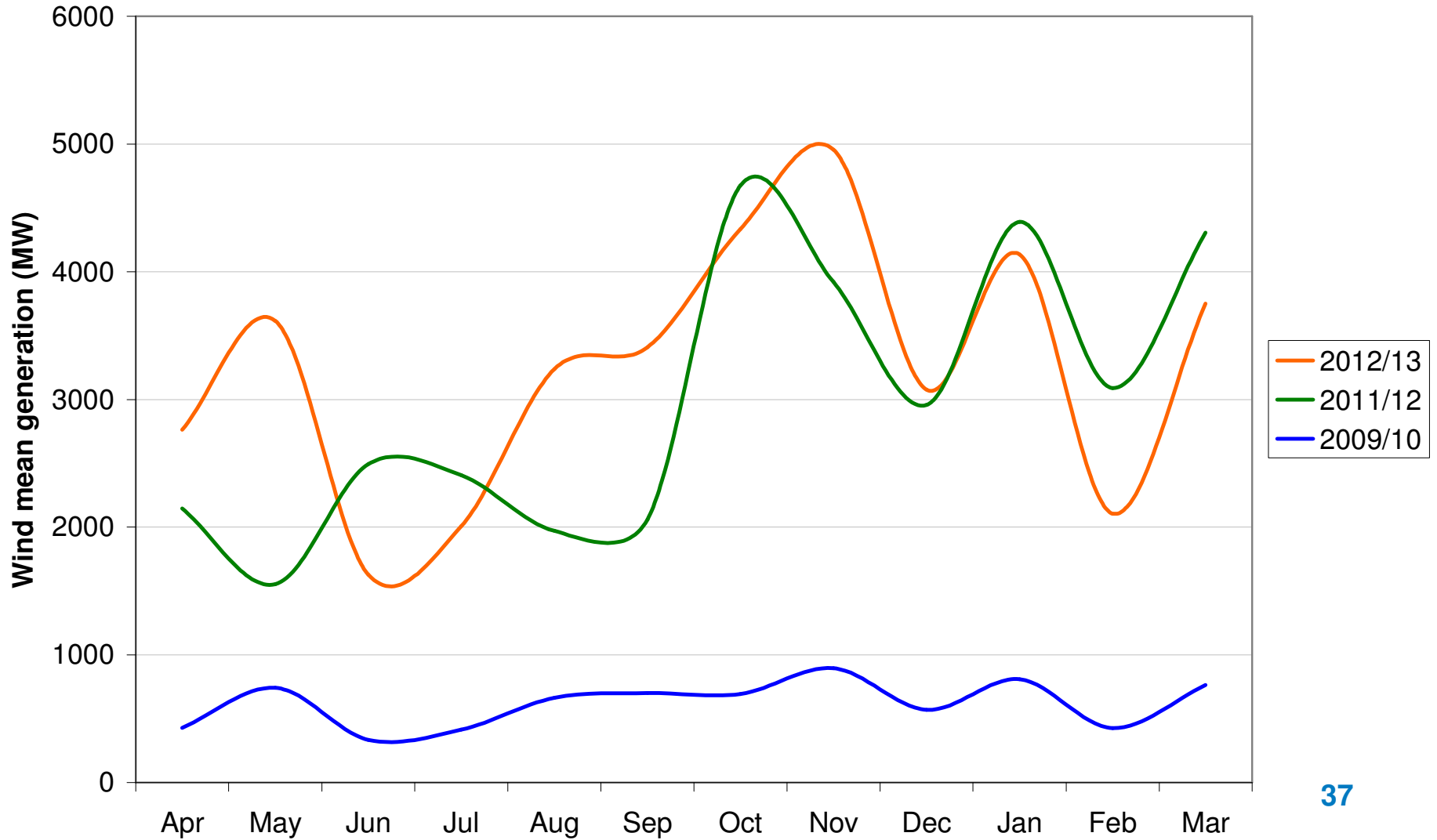
 ± 6%  
 ± 17%

 ± 24%

**± ~£26m to each year**

# Ex Post Input Assumptions

## Wind Generation



# Ex Post Input Assumptions

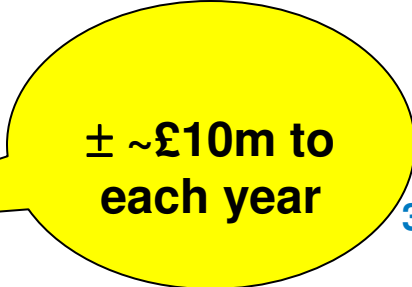
## Wind Scenarios

Wind output  and  by: **15%**

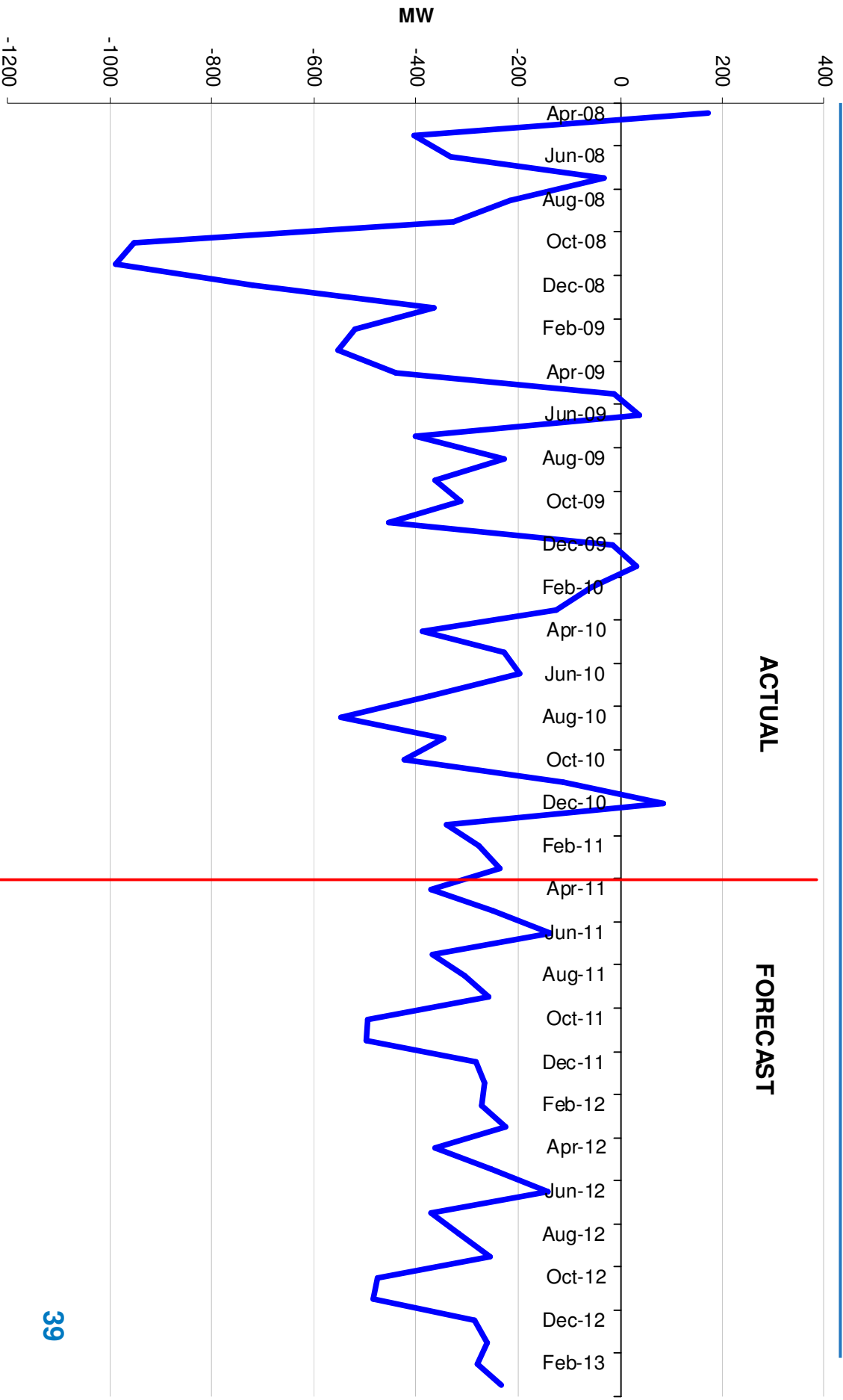
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<b>Total (less Constraints and TLA)</b>	<b>521.2</b>	<b>539.1</b>

 ± ~6%

 ± 8%

 ± ~£10m to each year

# Ex Post Input Assumptions Net Imbalance Volume (NIV)



# Ex Post Input Assumptions

## NIV Scenarios

NIV  and  by:

**100MW**

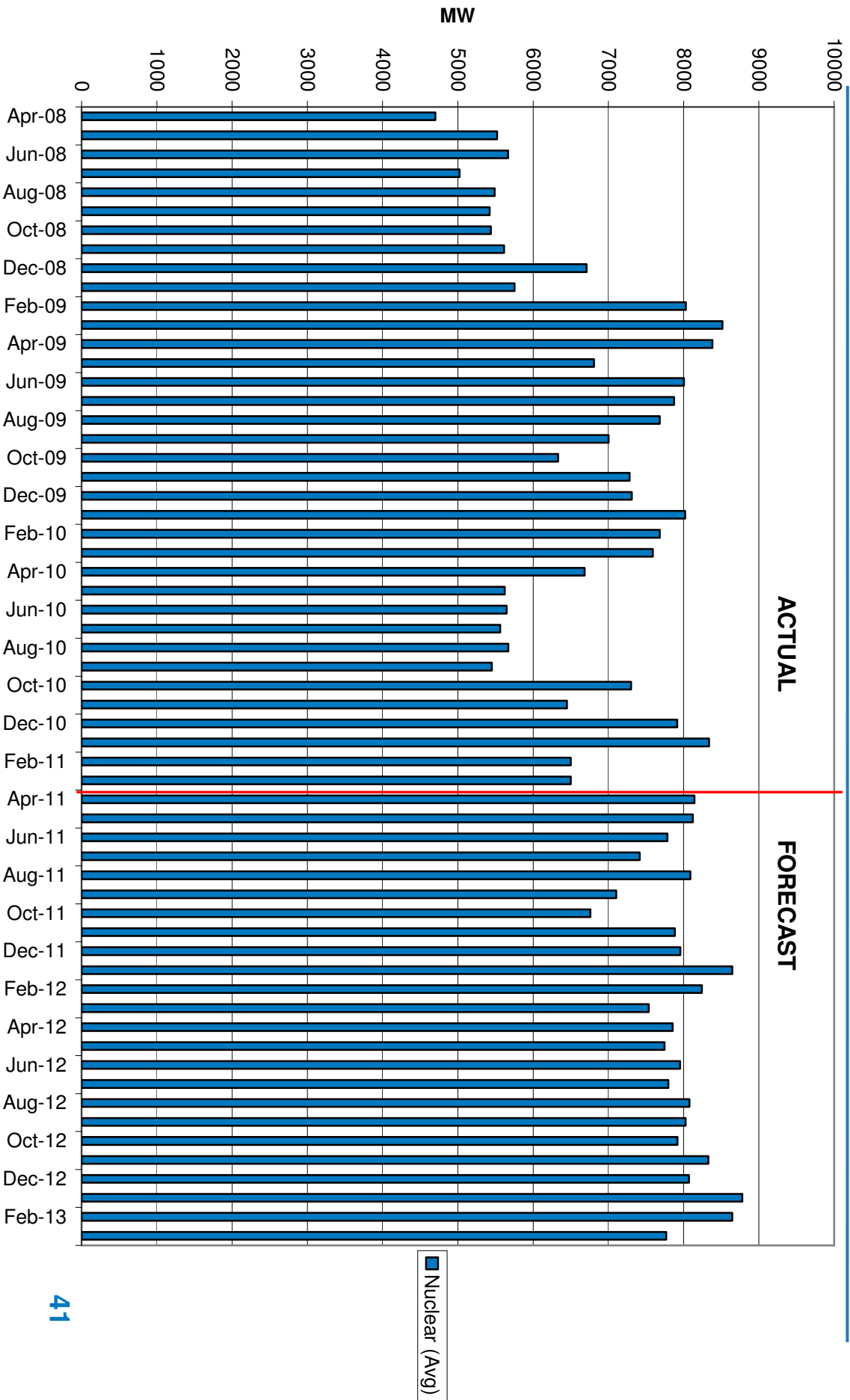
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Blackstart	28.4	29.0
<b>Total (less Constraints and TLA)</b>	<b>521.2</b>	<b>539.1</b>

 ± ~300%

 ± 4 %

± ~£90m to each year

# Ex Post Input Assumptions Nuclear Generation



# Ex Post Input Assumptions Nuclear Scenarios

Nuclear output ↓ to **4500MW** and ↑ to **8800MW**

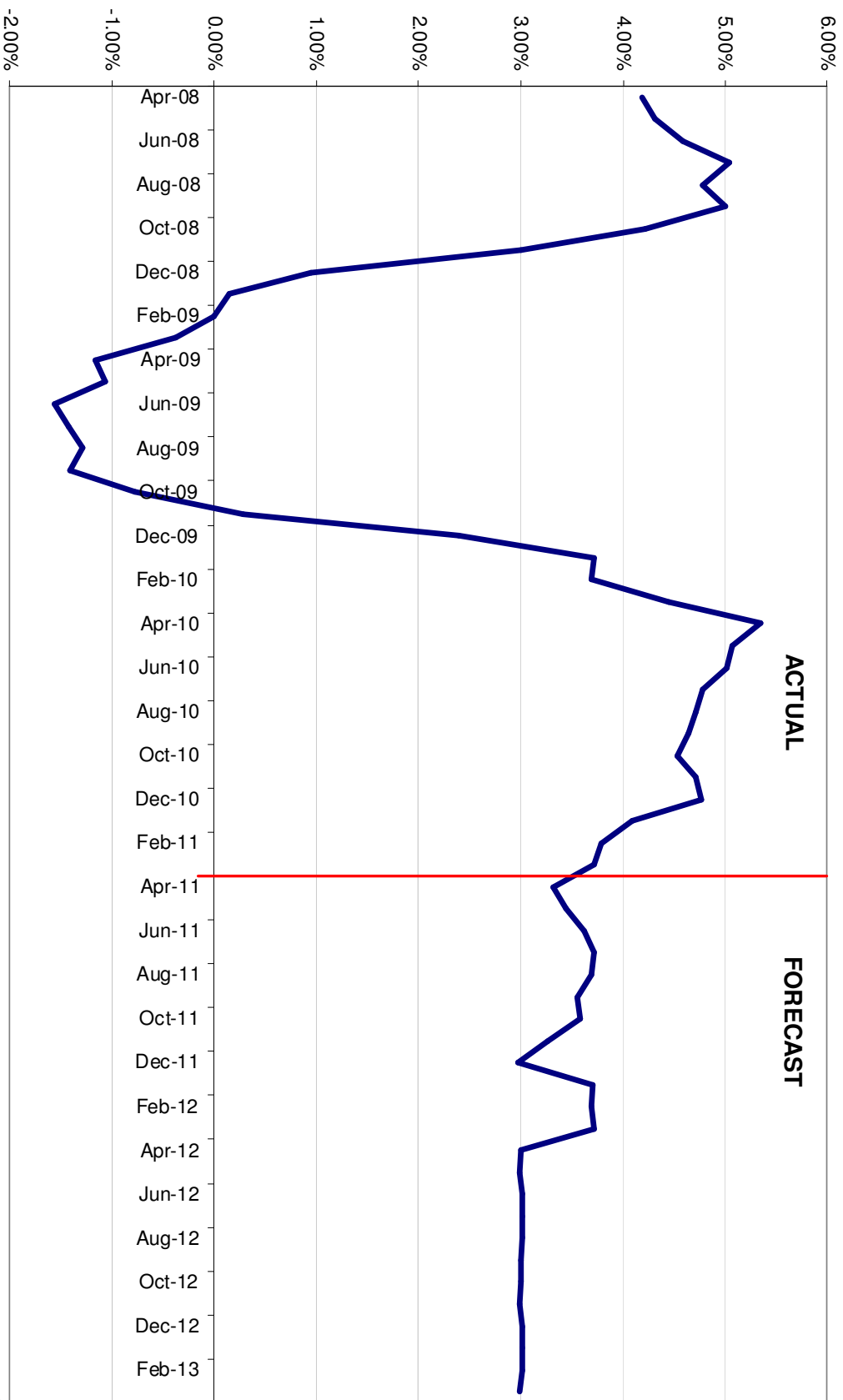
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Blackstart	28.4	29.0
<b>Total (less Constraints and TLA)</b>	<b>521.2</b>	<b>539.1</b>

← - 47% and +13%

← - 43% and +14%

**-£33m and  
+£10m to each  
year**

# Ex Post Input Assumptions RPI

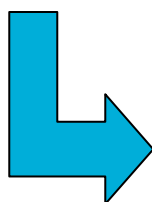


# Black Start and Transmission Losses

<b>Black Start</b>		
<b>2011/12</b>	<b>2012/13</b>	<b>Total</b>
<b>£28.4m</b>	<b>£29m</b>	<b>£57.4m</b>

- Availability fees
- Capital
- Testing

## Transmission Losses



5.5TWh ± 0.5TWh

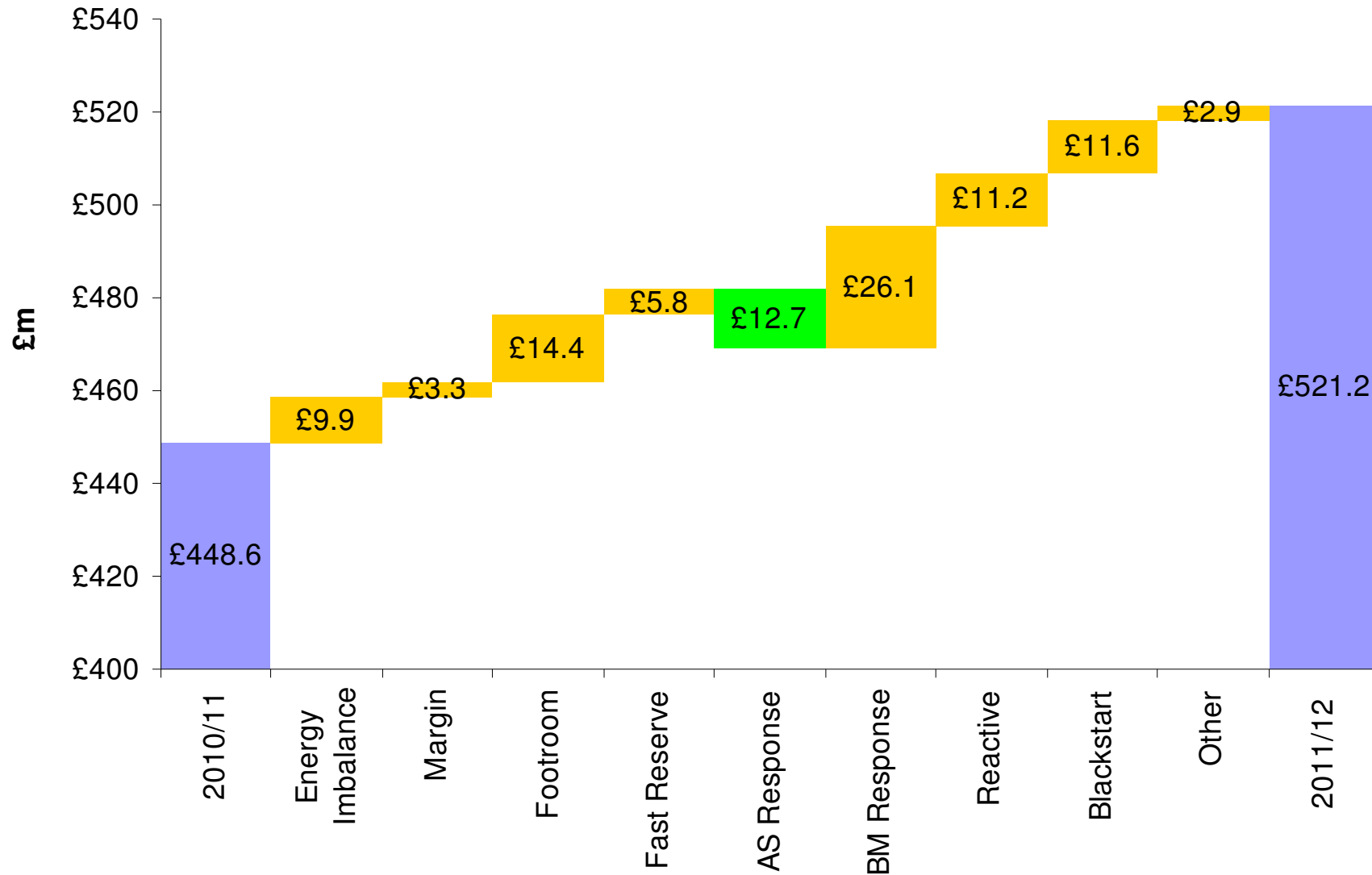


## Energy Forecast - Range

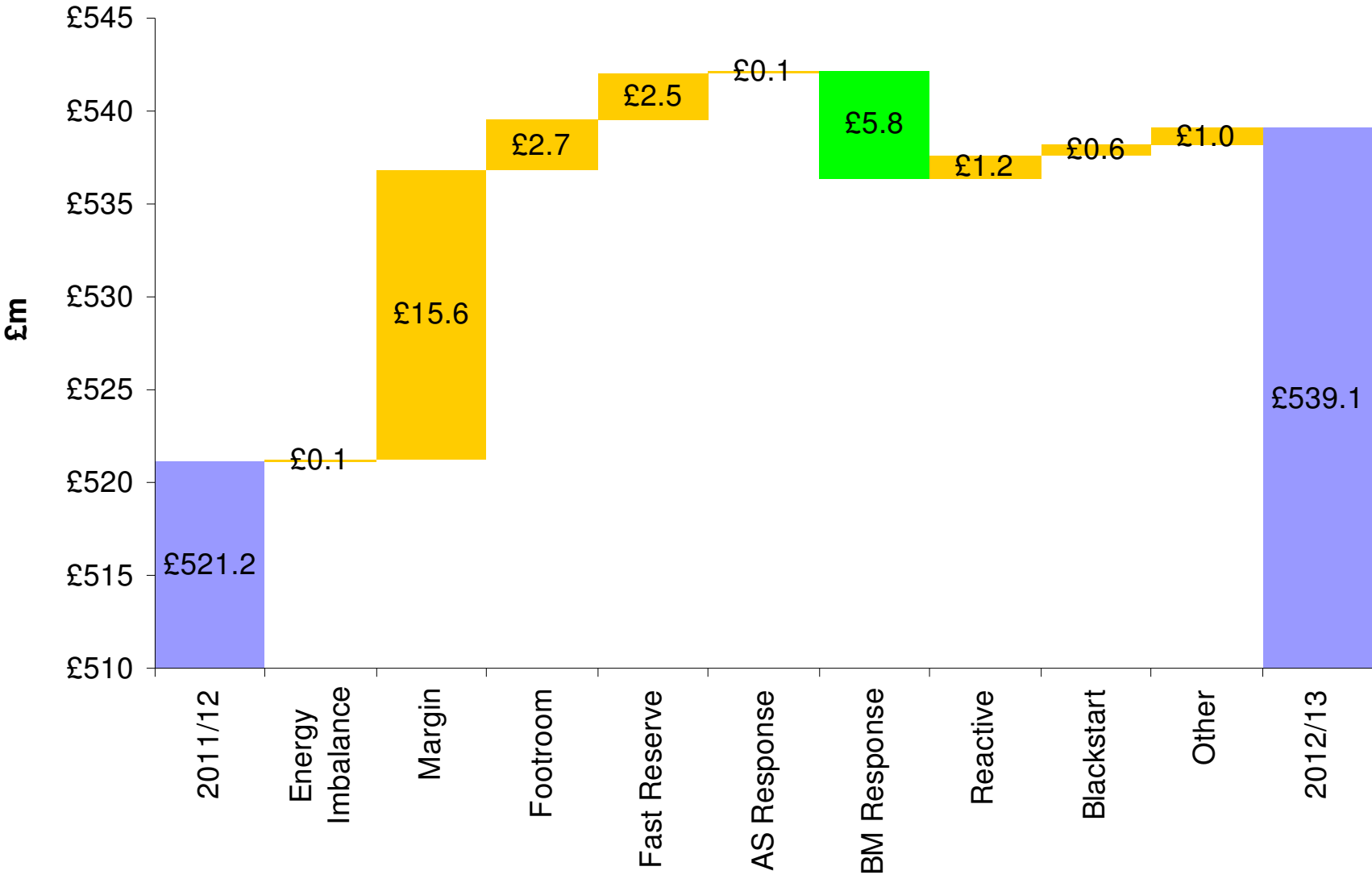
- ◆ Low = combined output of lower case scenarios
- ◆ High = combined output of upper case scenarios

	Low	Mid	High
2010/11		<b>£448.6m</b> (latest view)	
2011/12	<b>£361m</b>	<b>£521.2m</b>	<b>£767m</b>
2012/13	<b>£377m</b>	<b>£539.1m</b>	<b>£785m</b>

# Waterfall 2010/11 to 2011/12



# Waterfall 2011/12 to 2012/13



## Energy Summary

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- ☑ Energy forecast for 2011/12 and 2012/13
- ☑ Ex ante and ex post inputs
- ☑ Ex post assumptions
- ☑ Model sensitivities
- ☑ Waterfall diagrams

	Low	Mid	High
2011/12	<b>£361m</b>	<b>£521.2m</b>	<b>£767m</b>
2012/13	<b>£377m</b>	<b>£539.1m</b>	<b>£785m</b>

# Constraints Forecast

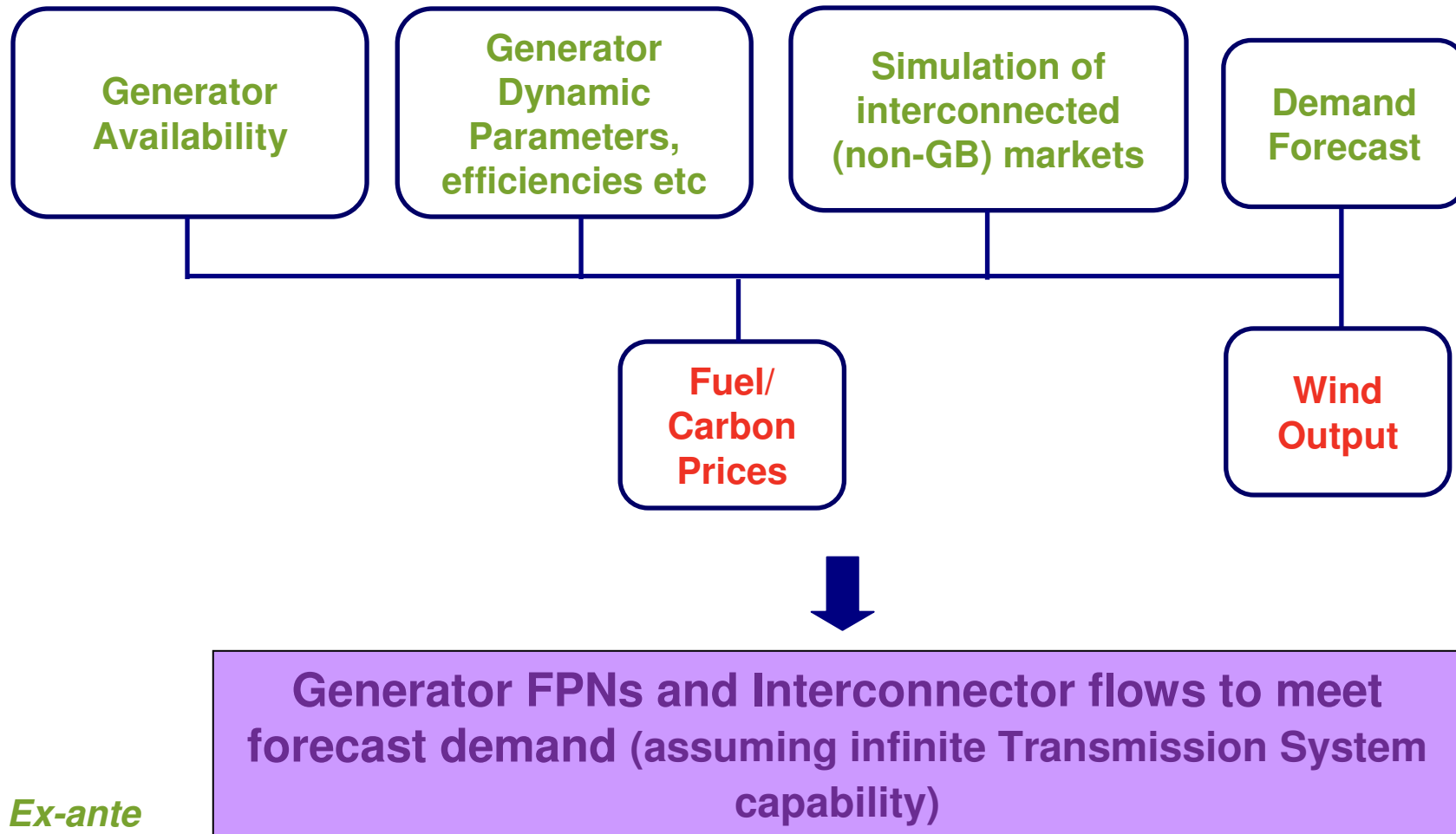
Gil Susteras, Future Requirements Manager

# Agenda

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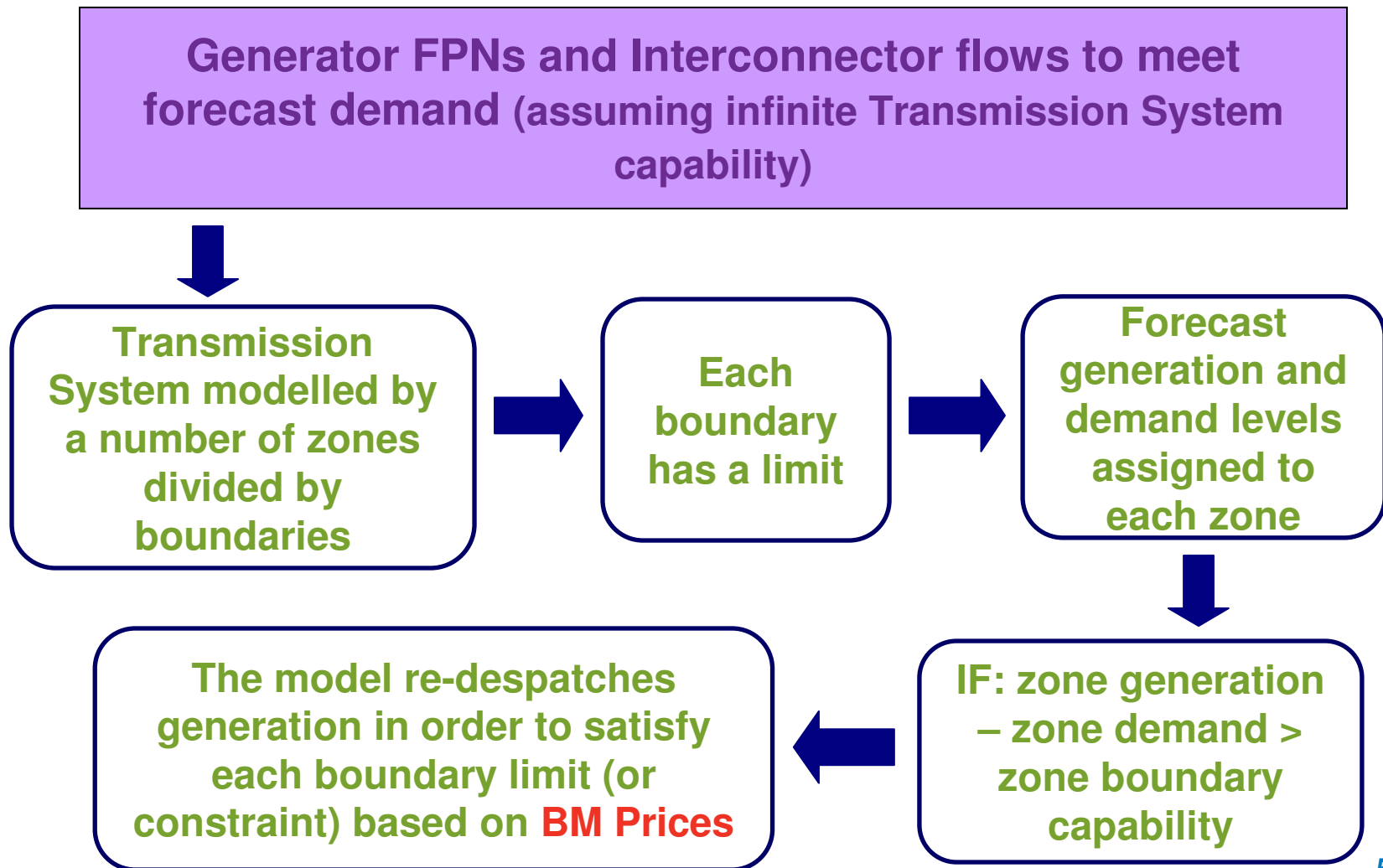
- ◆ Model overview
  - ◆ Unconstrained calibration
- ◆ Ex-ante assumptions
- ◆ Ex-post assumptions
- ◆ Forecast
- ◆ Scenarios and waterfalls

# 1. Unconstrained Run (simplified)



*Ex-ante*  
*Ex-post*  
*Model output*

## 2. Constrained Run (simplified)

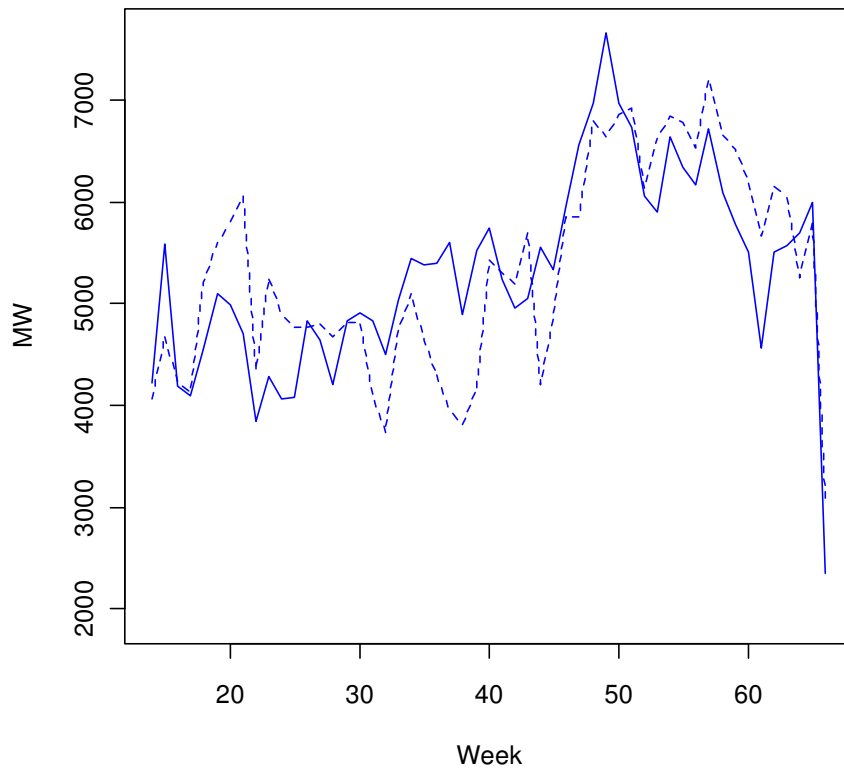


## Unconstrained calibration results

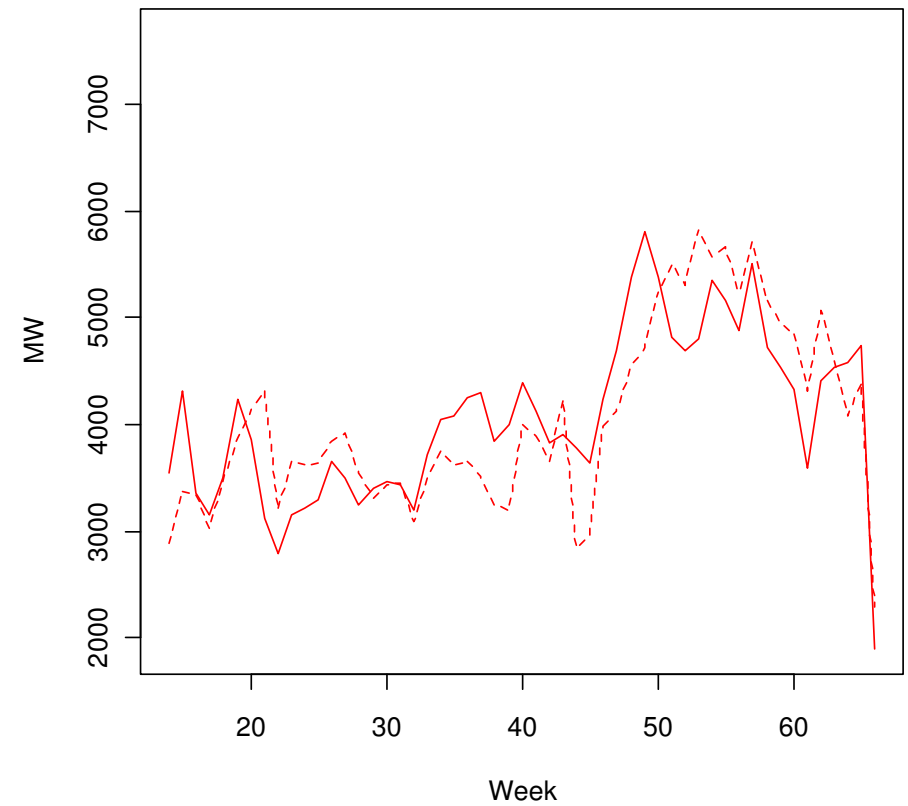
Sample results for key boundaries

# Scotland

**Scotland Peaks**  
solid=FPN 2009/10; dashed=Plexos 2009/10

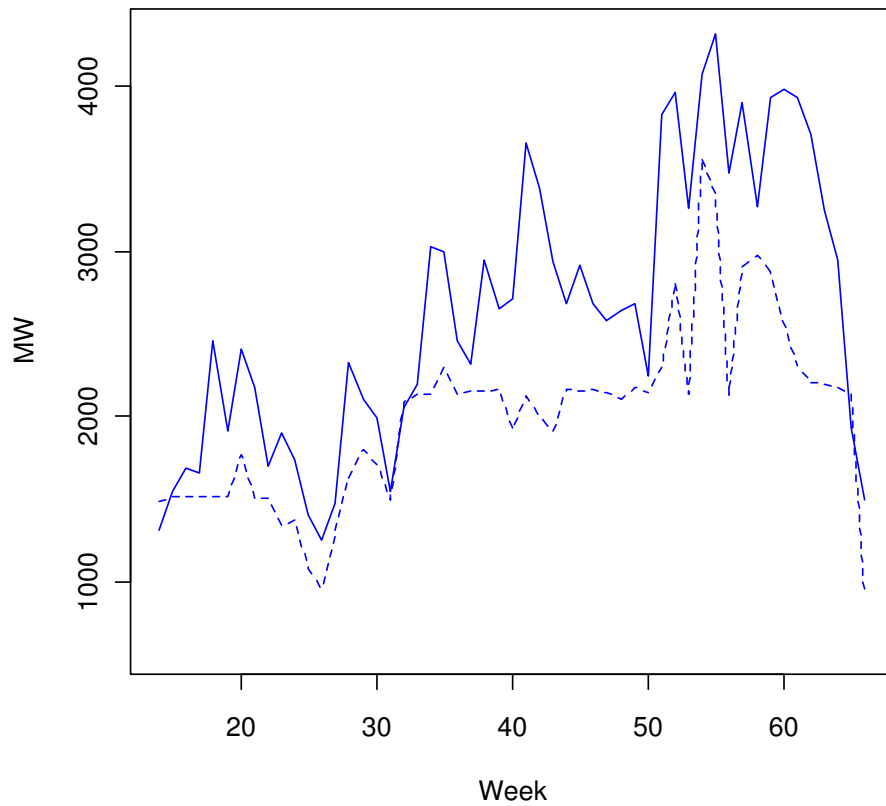


**Scotland Off-peaks**  
solid=FPN 2009/10; dashed=Plexos 2009/10

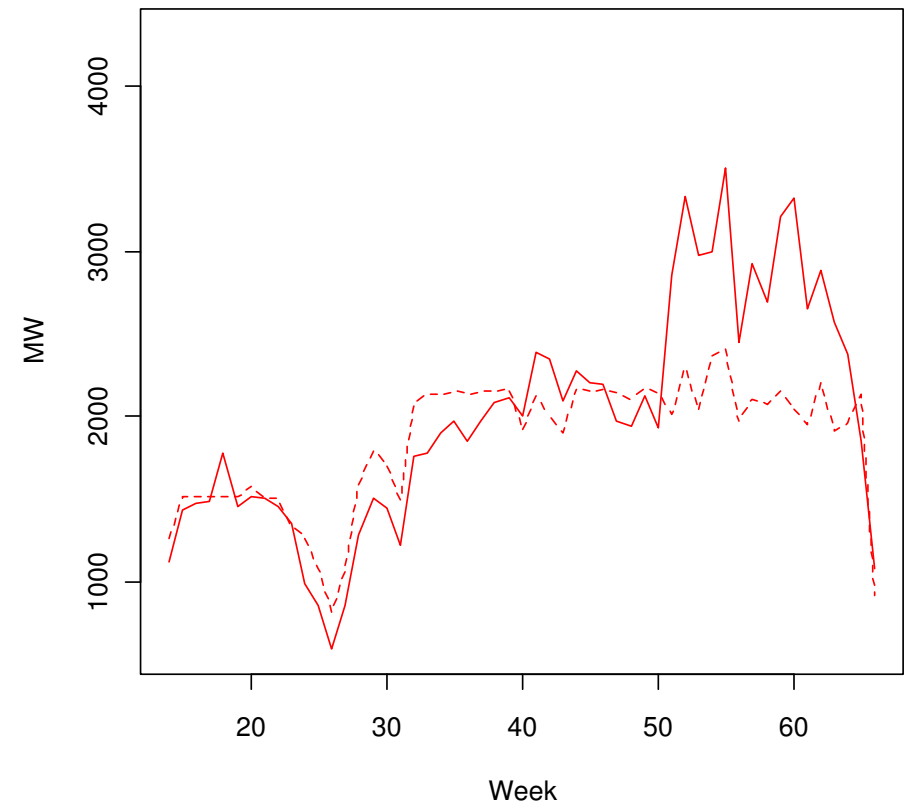


# Thames Estuary

**Thames Estuary Peaks**  
solid=FPN 2009/10; dashed=Plexos 2009/10

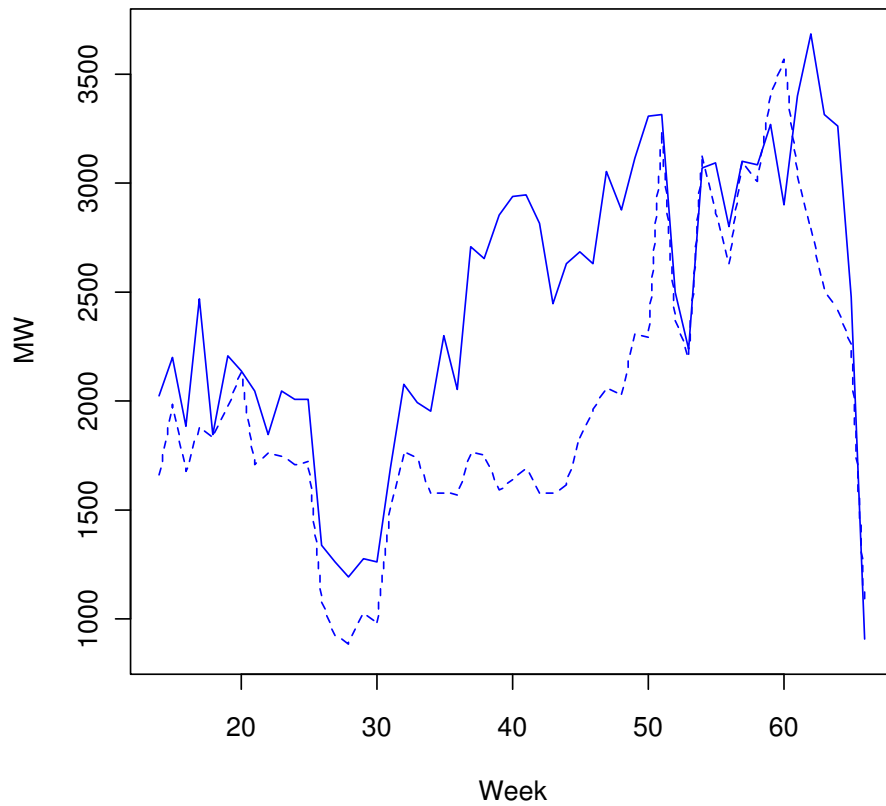


**Thames Estuary Off-peaks**  
solid=FPN 2009/10; dashed=Plexos 2009/10

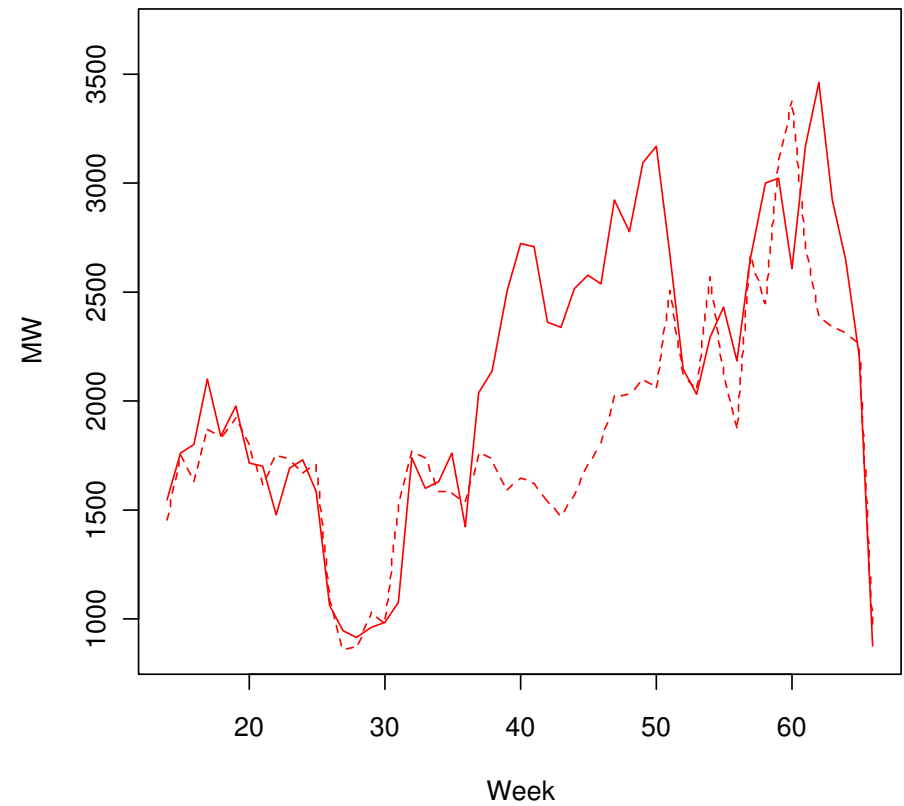


# South Wales

**South Wales Peaks**  
solid=FPN 2009/10; dashed=Plexos 2009/10

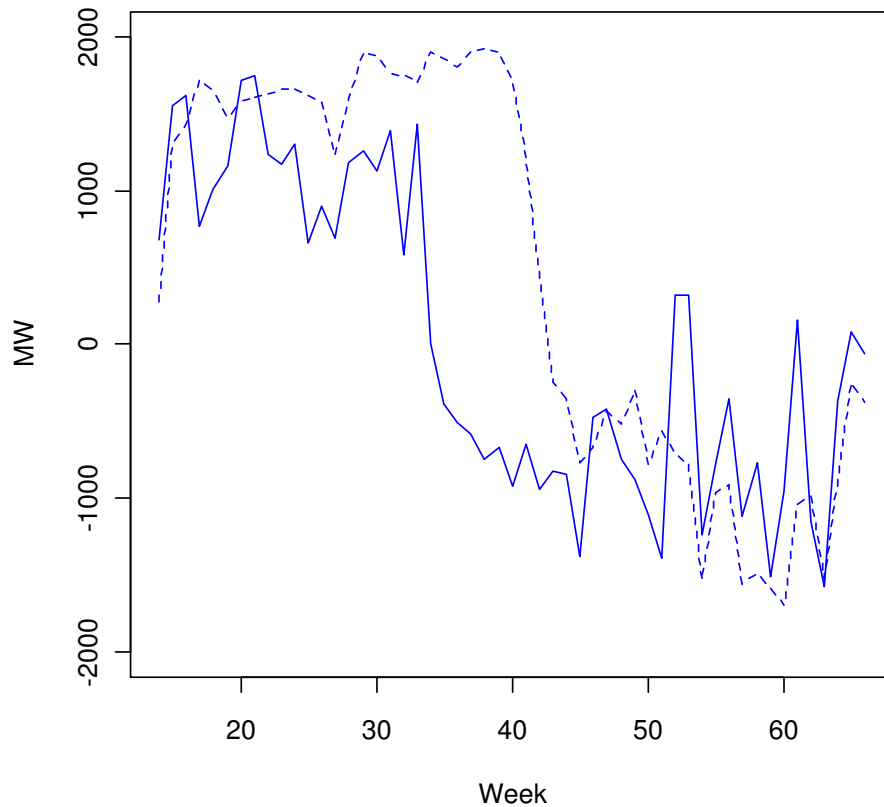


**South Wales Off-peaks**  
solid=FPN 2009/10; dashed=Plexos 2009/10

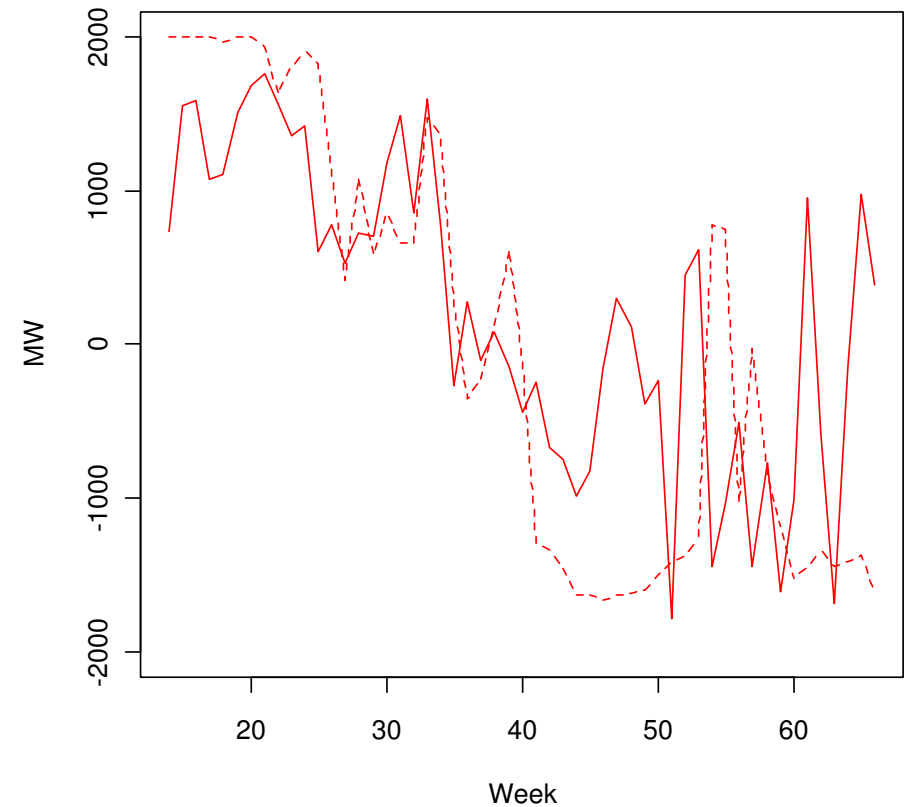


# French Interconnector

**France (IFA) peak [Positive=flow into GB]  
solid=FPN 2009/10; dashed=Plexos 2009/10**

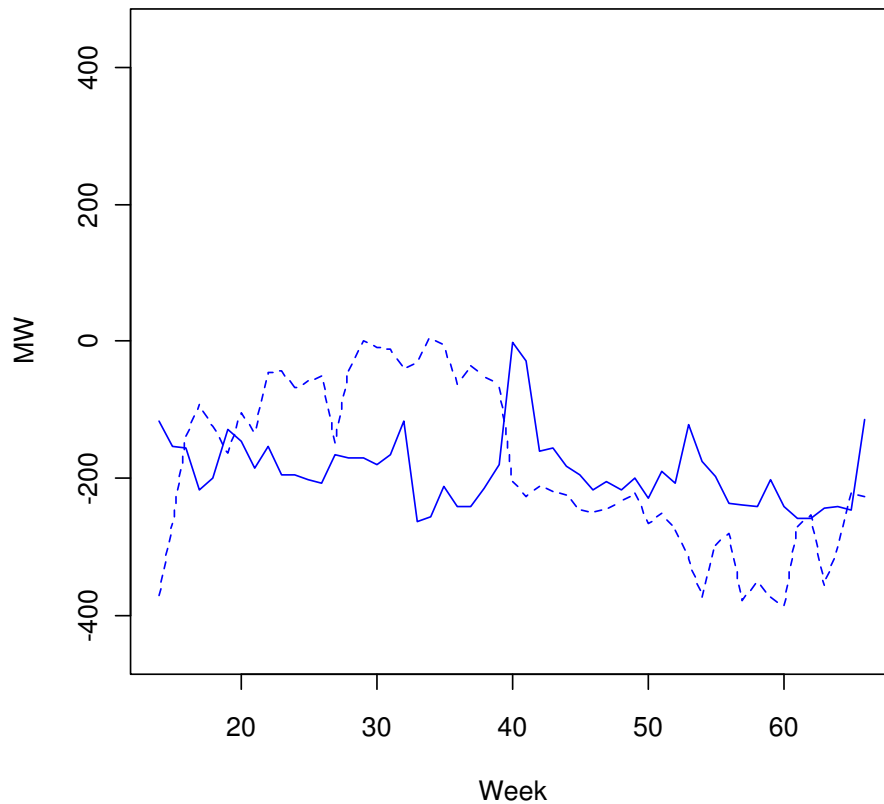


**France (IFA) off-peak [Positive=flow into GB]  
solid=FPN 2009/10; dashed=Plexos 2009/10**

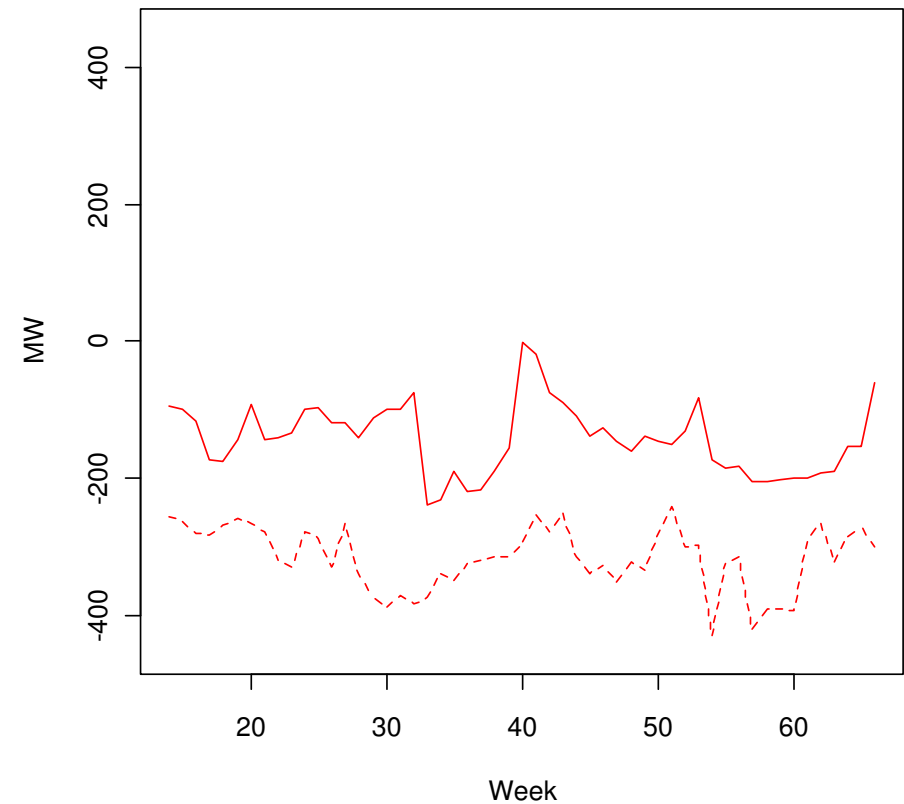


# Moyle Interconnector

**Ireland (Moyle) peak [Positive=flow into GB]  
solid=FPN 2009/10; dashed=Plexos 2009/10**



**Ireland (Moyle) off-peak [Positive=flow into GB]  
solid=FPN 2009/10; dashed=Plexos 2009/10**



# Assumptions



## **Ex-ante assumptions**

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**Generator Availability: OC2 + stochastic failure rate**

**Generator Dynamic Parameters, efficiencies etc: BM submissions + publicly available information**

**Simulation of interconnected (non-GB) markets: simplified stack (Redpoint's experience)**

**Demand Forecast: National Grid well established process**

**Transmission zones and boundaries: National Grid experience and expected outage plan**

**Generation/demand per zone: Diagrams + GSP historic levels**

**Boundary limits: Power System Studies and operational experience**

## Ex-post assumptions

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**Fuel/ Carbon Prices:** Argus forward curve and Bloomberg

**Wind Output:** 2009/10 metered output scaled for expected installed capacity (Gone Green scenario)

**BM Prices:** scaled from SRMC

# Forecast



## Like-for-like run (SRMC based)

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2009/10 = 120

2011/12 = 268

2012/13 = 229

## Pro-rata of values

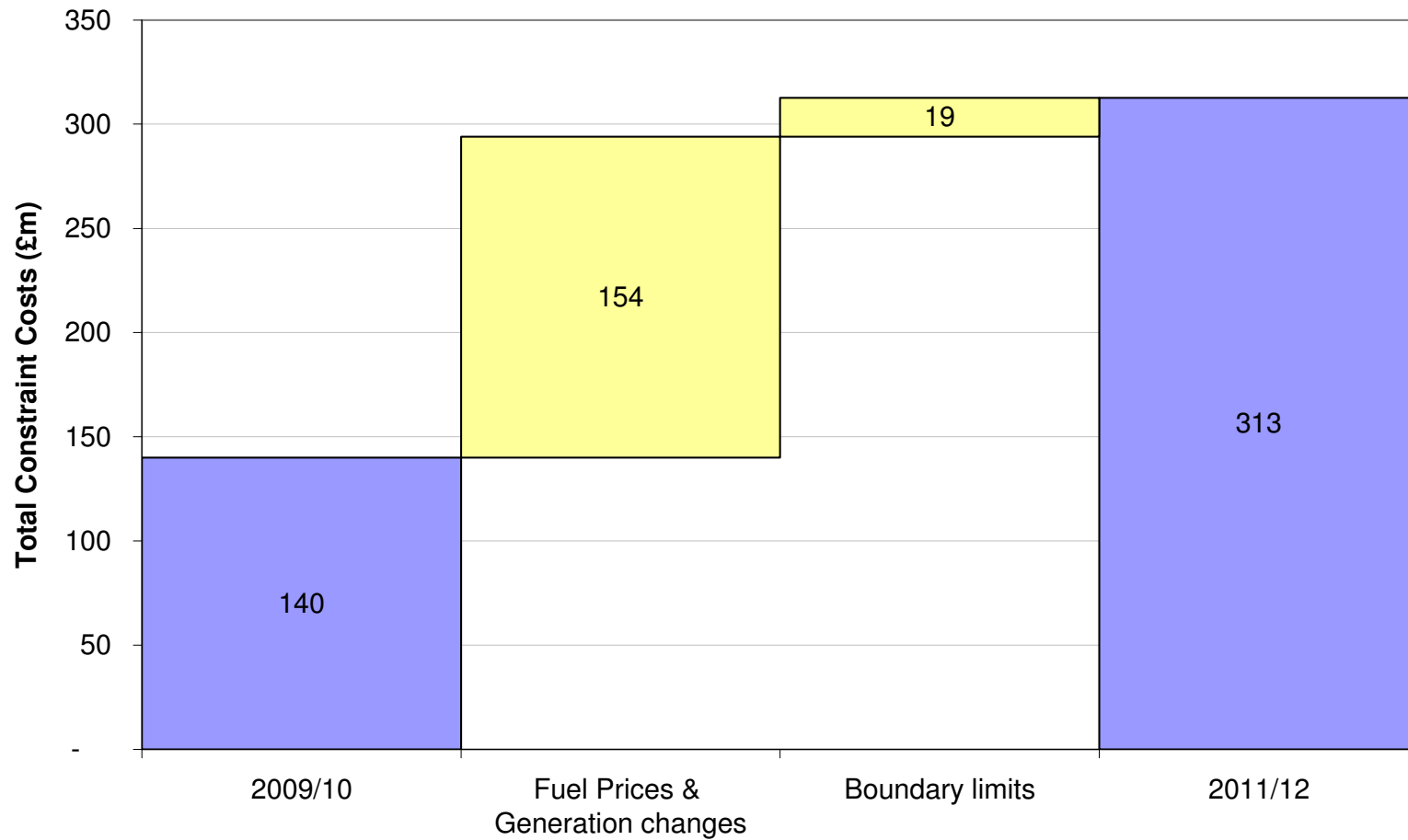
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2009/10 = 120 = £140m

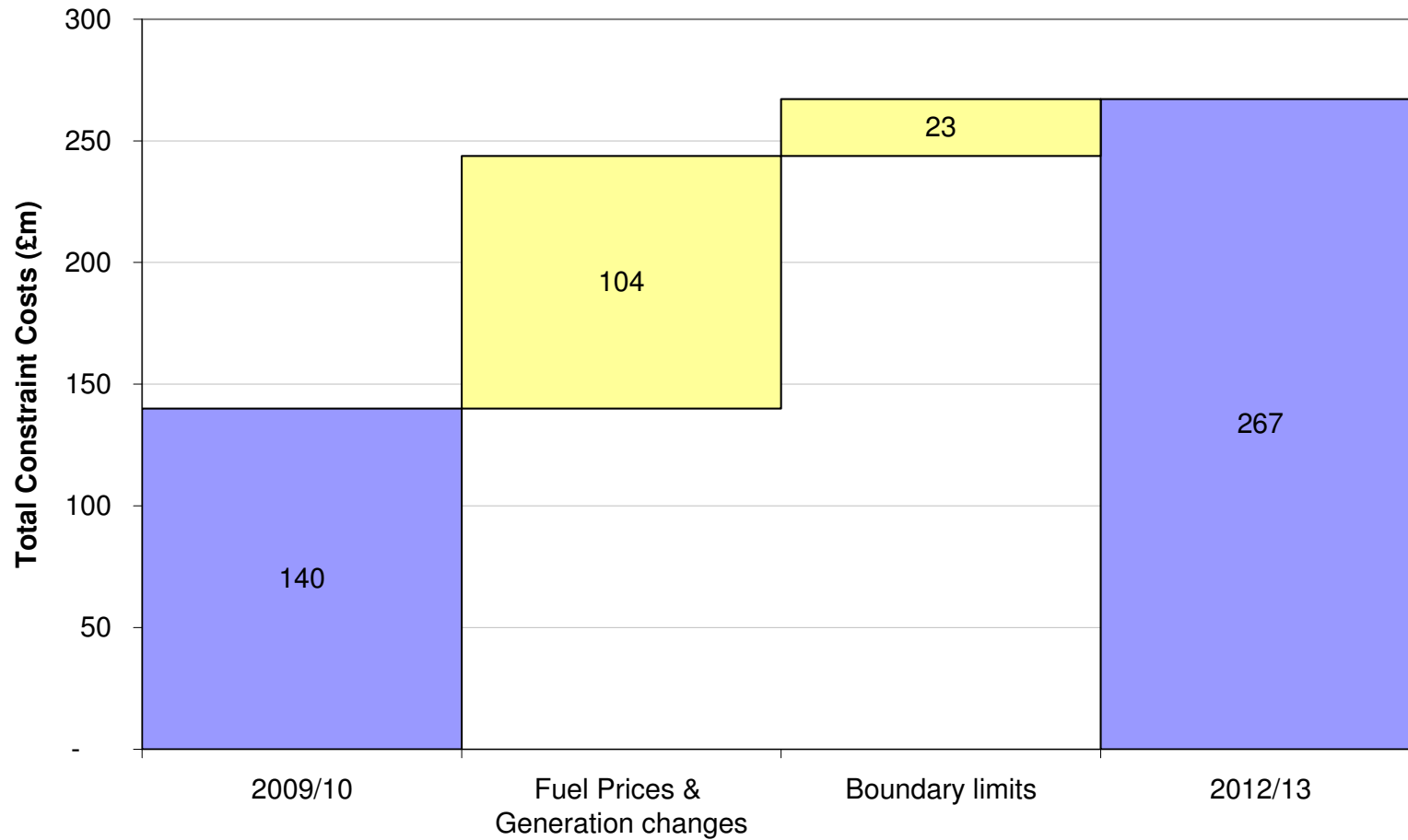
2011/12 = 268 = £313m

2012/13 = 229 = £267m

# Simplified waterfall (1)



## Simplified waterfall (2)

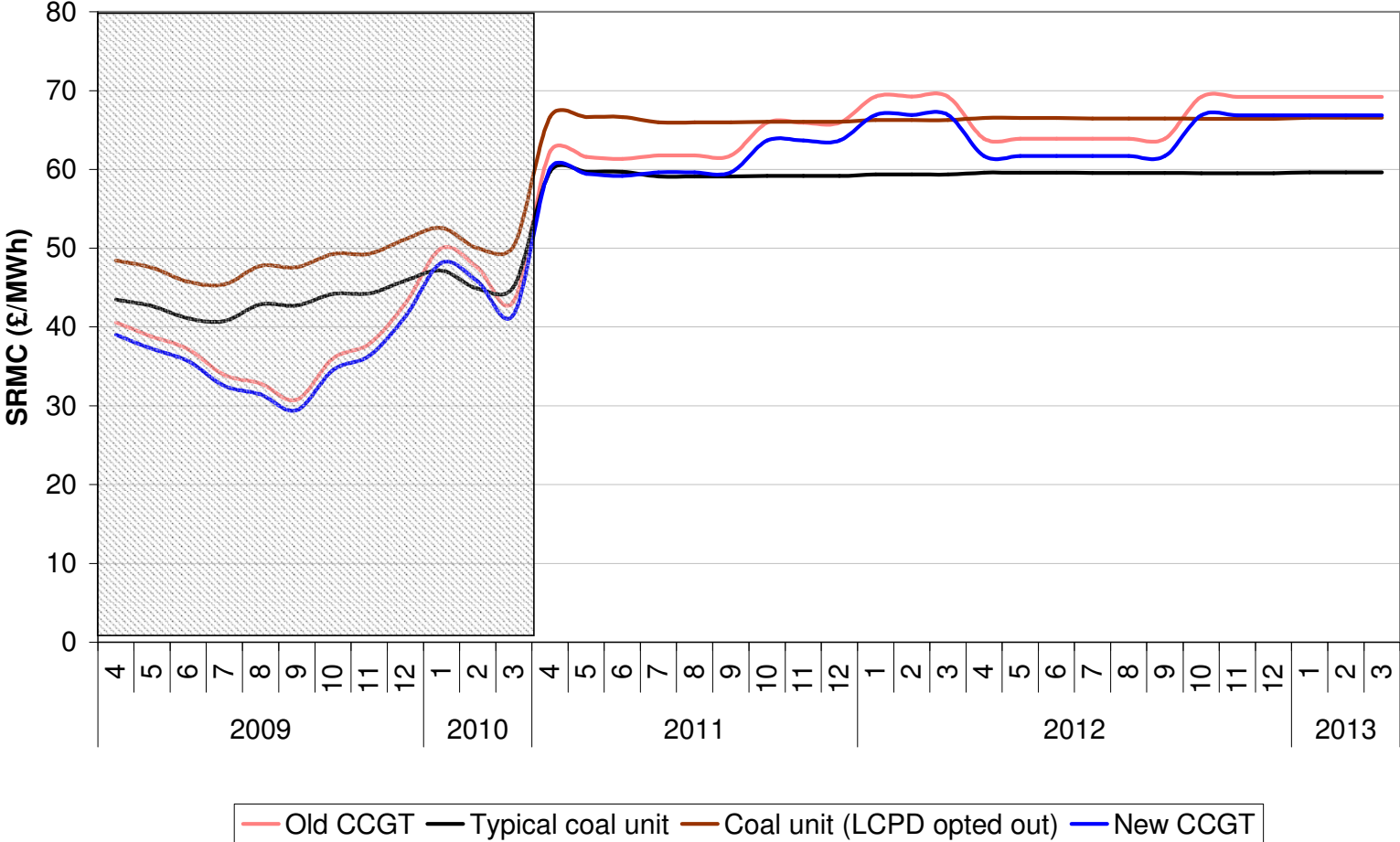


## Drivers for variations

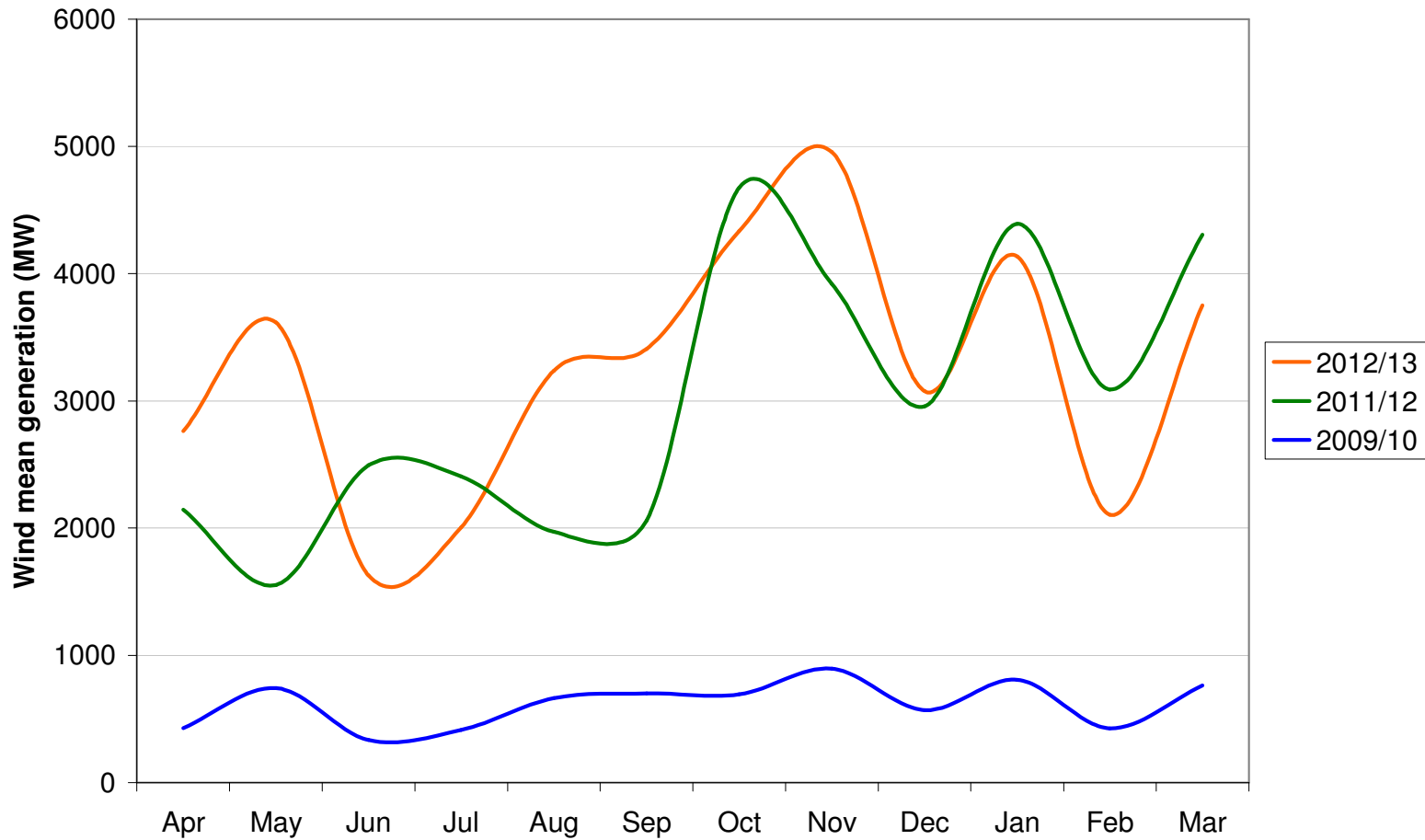
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- ◆ System boundaries
  - ◆ Evolving transmission system
- ◆ Fuel Prices
  - ◆ Snapshot based on forward curve; in reality, ex-post input
- ◆ Wind generation
  - ◆ Snapshot based on best view of connections; in reality, ex-post input

# Commodity prices effect



# Wind generation

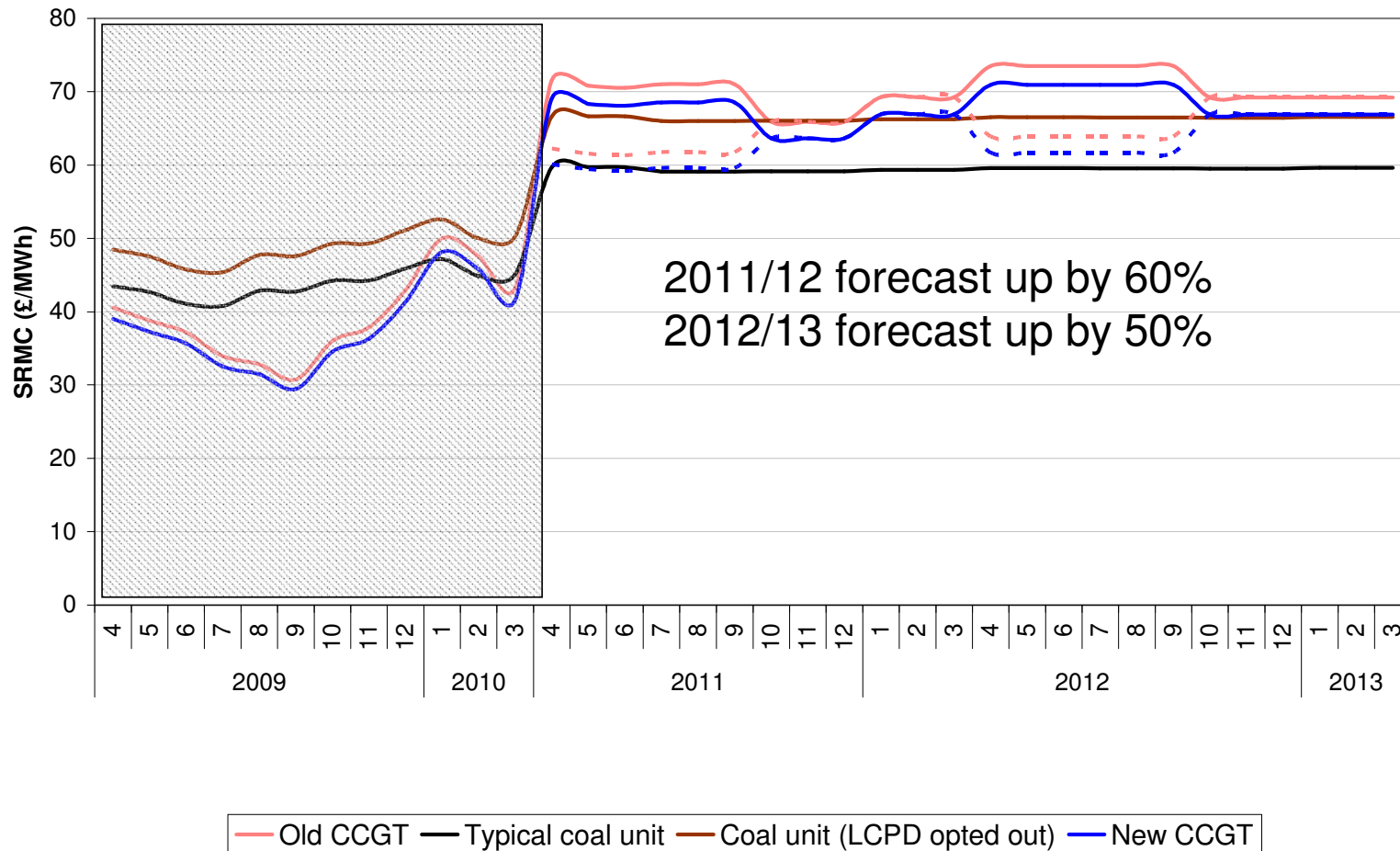


## Sensitivity analysis

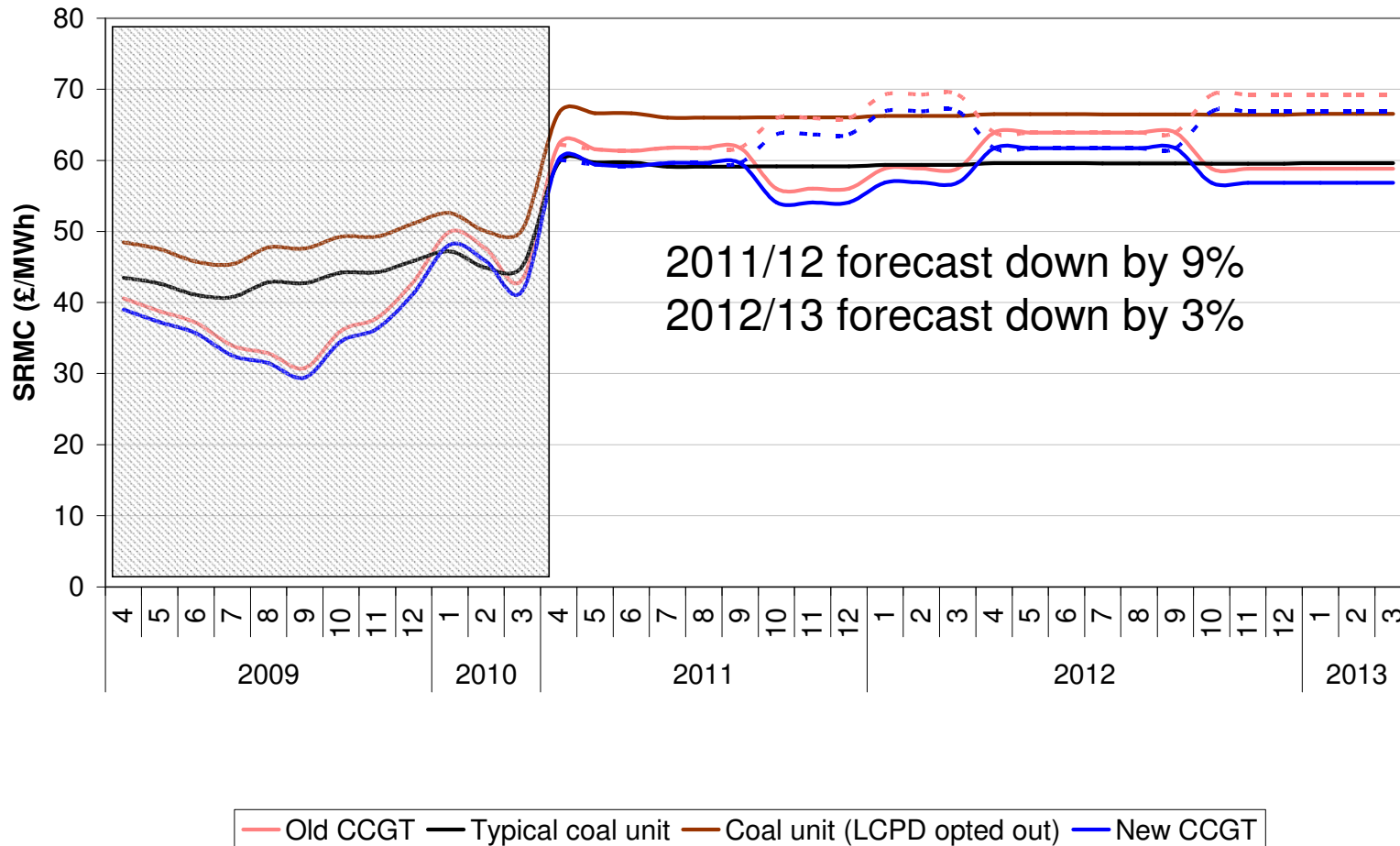
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- ◆ Commodity prices
- ◆ Wind

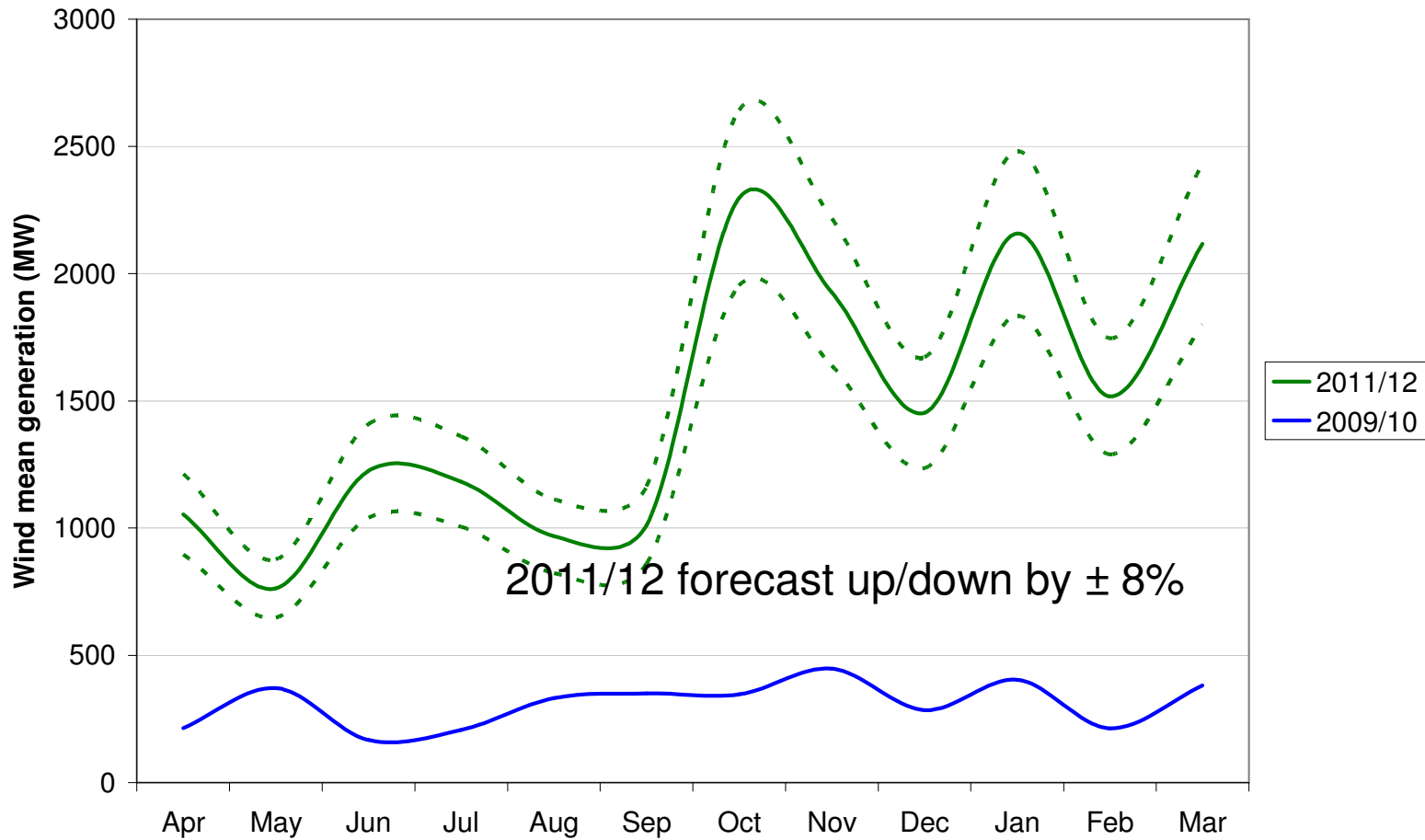
# Effect of Movements in Gas Prices (up by 15% in summer)



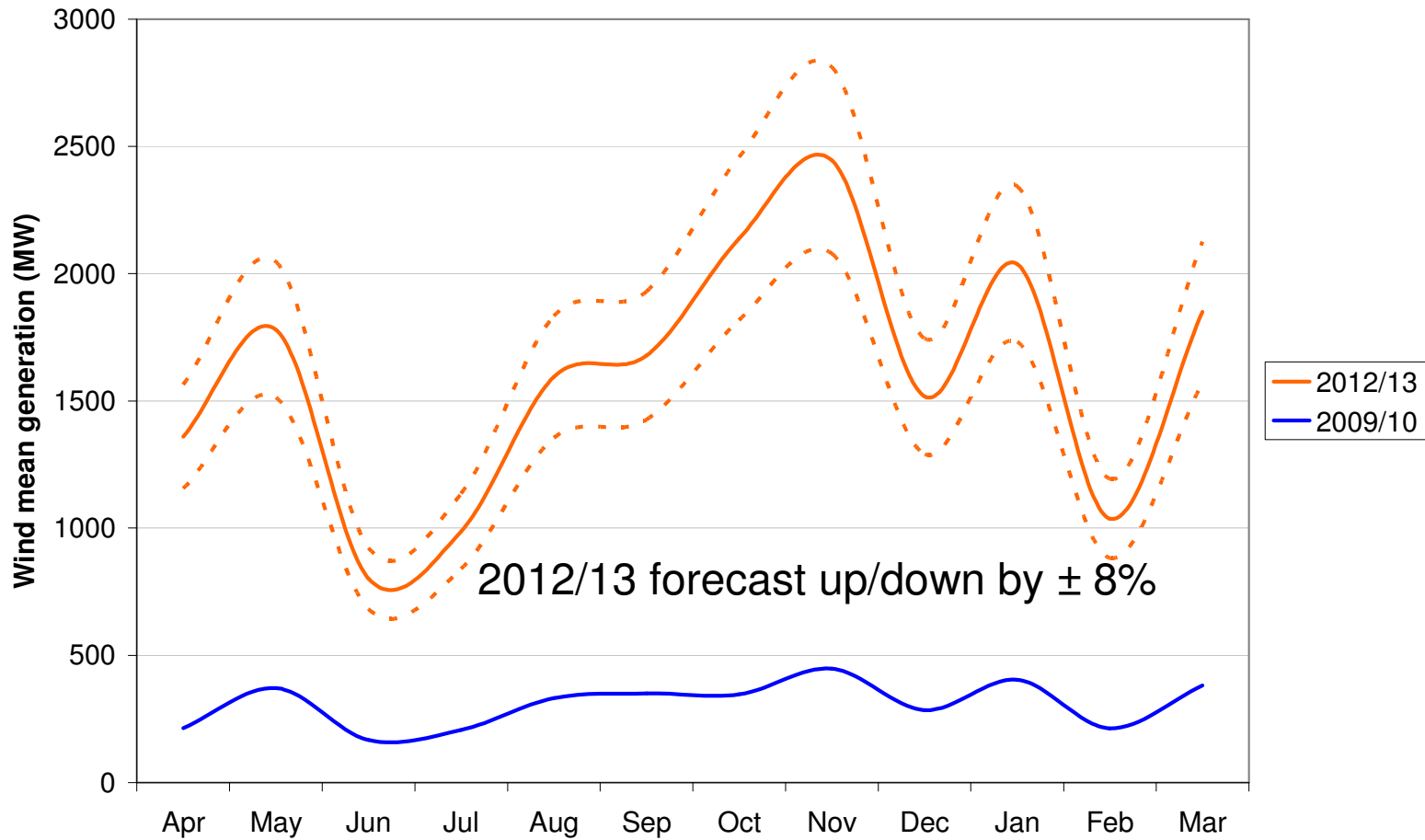
# Effect of Movements in Gas Prices (down by 15% in winter)



# Wind sensitivity 2011/12 ( $\pm 15\%$ )



# Wind sensitivity 2012/13 ( $\pm 15\%$ )



## Constraints Forecast - Range

- ◆ Low = combination of all low scenarios
- ◆ High = combination of all high scenarios

	Low	Mid	High
2010/11		<b>£161m</b> (latest view)	
2011/12	<b>£260m</b>	<b>£313m</b>	<b>£526m</b>
2012/13	<b>£238m</b>	<b>£267m</b>	<b>£422m</b>

## Summary

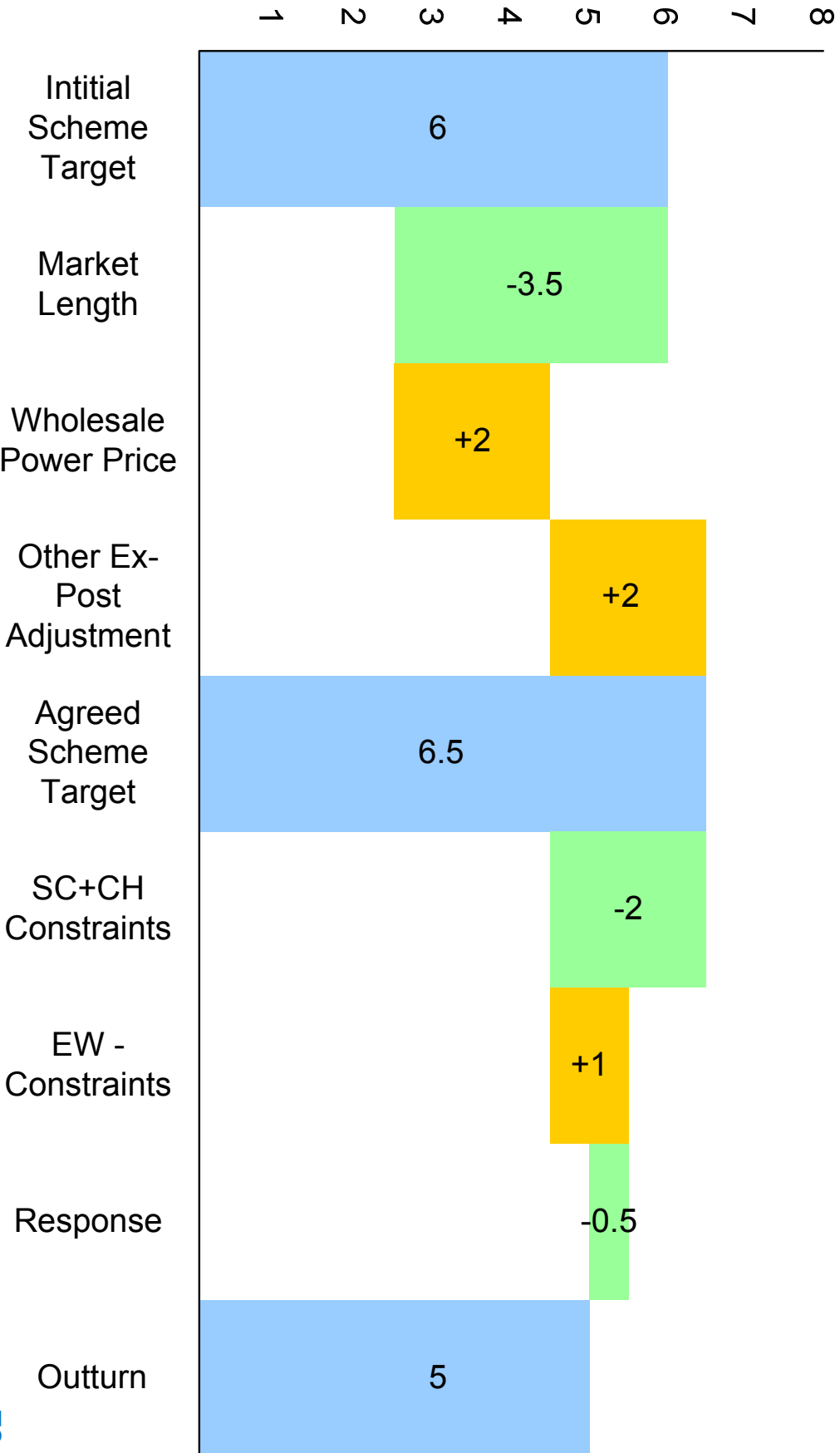
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- ◆ Transmission system evolving in response to new connections
- ◆ Constraint management is a key aspect of the value added by National Grid as System Operator
- ◆ Sharper incentives + Higher requirements = potential increase in CMS contracts
- ◆ Forecast presented is a snapshot based on current best view of controllable and un-controllable drivers

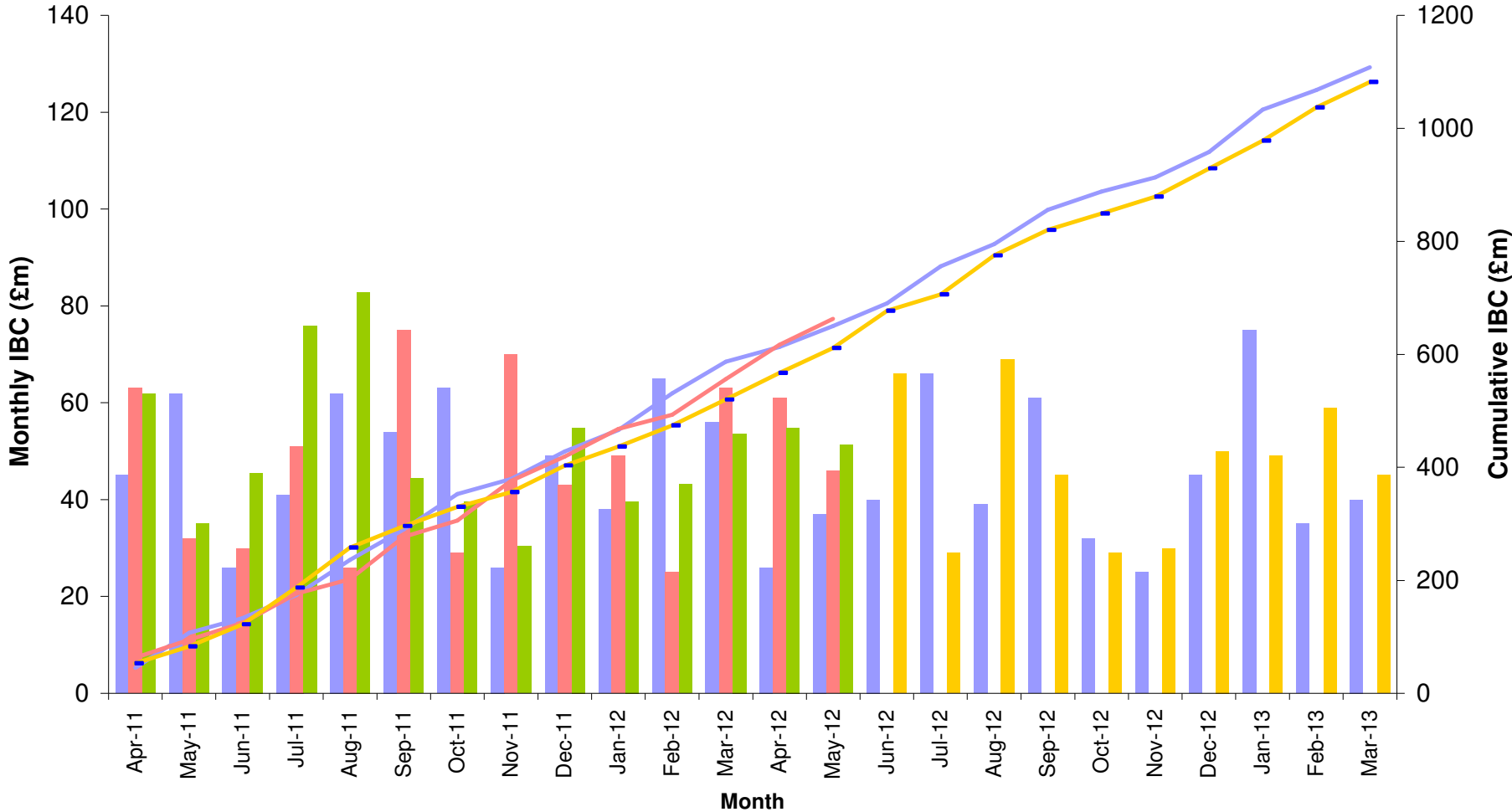
# BSUoS Reporting

Jo Faulkner, Balancing Services Manager

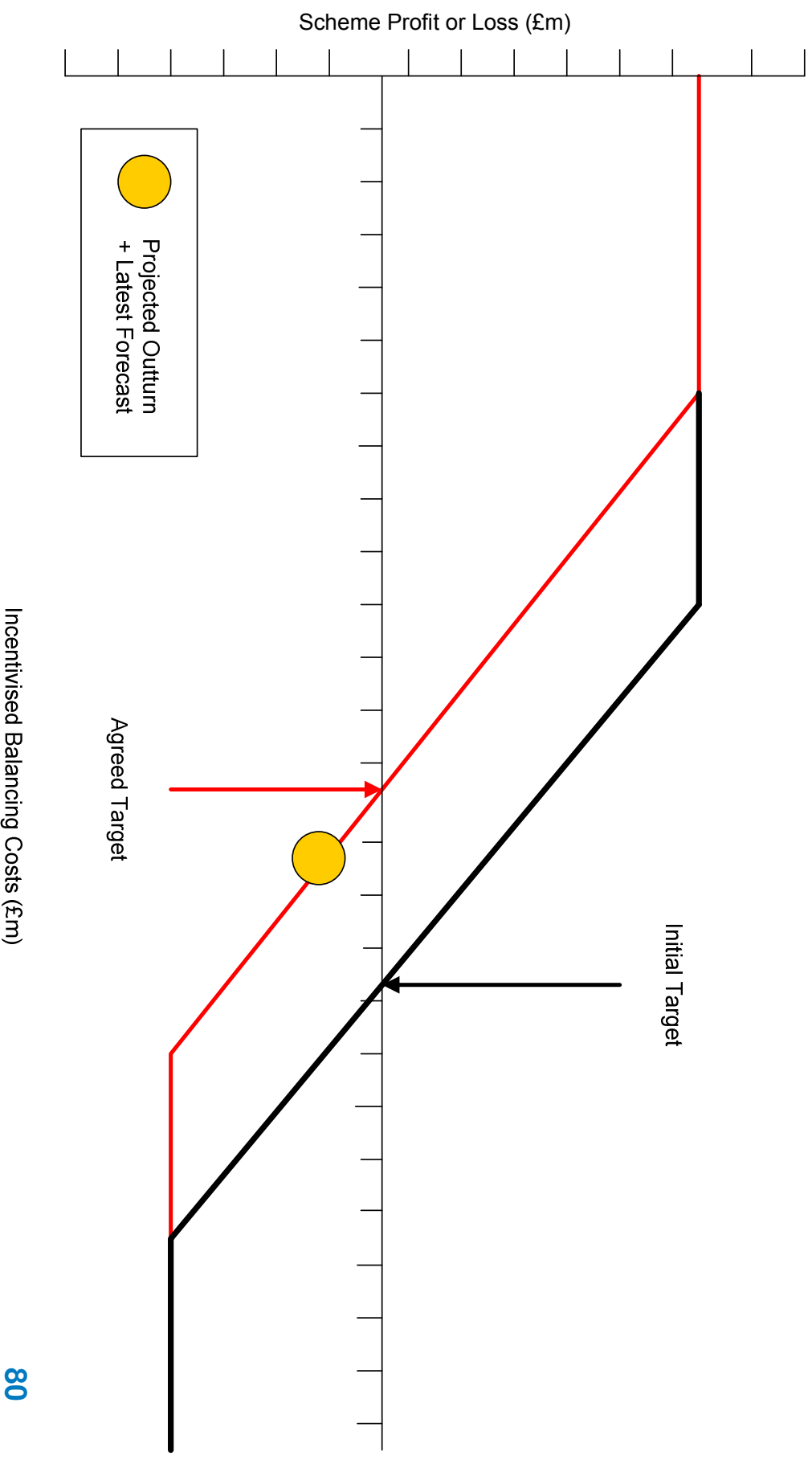
# Waterfall Example



# Monthly Forecast & Outturn Example



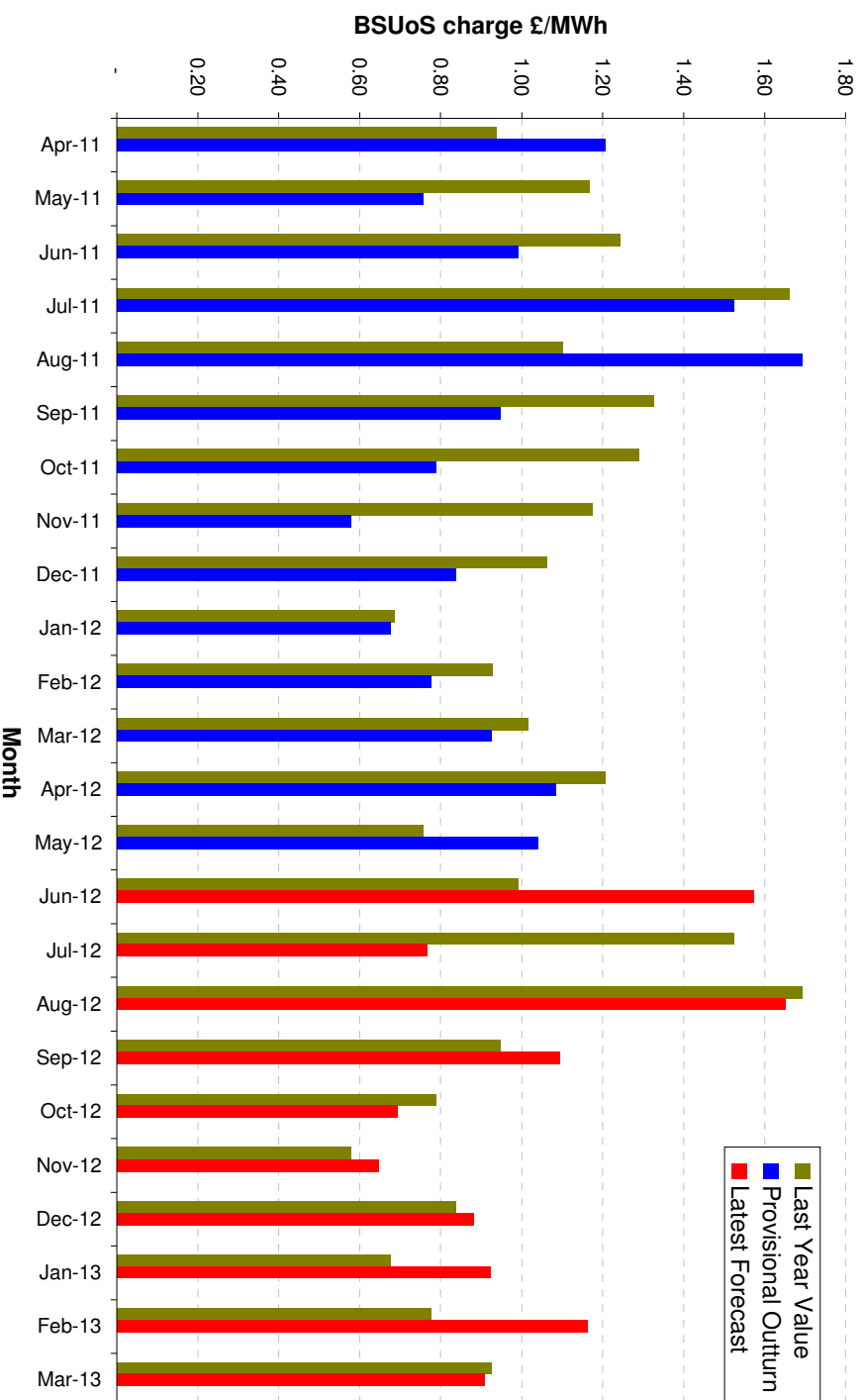
# Scheme Chart Example



# Monthly BSUoS Example

2011/12: £0.95/MWh

2012/13: £1.02/MWh



## Closing remarks

Alan Smart, Energy Operations Manager

## Next Steps

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- ◆ Models to be ‘refreshed’ with most recent data prior to scheme start
- ◆ CUSC Modification to update Charging Methodology by removing the NIA concept from the BSUoS calculation
- ◆ Licence methodology statements to be developed
- ◆ Ofgem to publish Final Proposals in March 2011

## Contact us

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### On the web:

Our dedicated web pages for electricity SO incentives are available at the following addresses:

<http://www.nationalgrid.com/uk/Electricity/soincentives/>

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