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Electricity System Operator Incentives
BSUoS Seminar



Tuesday 15th February 2011

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Welcome and Introduction

Alan Smart, Energy Operations Manager

Agenda

- 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

- Health and Safety
- Feedback forms

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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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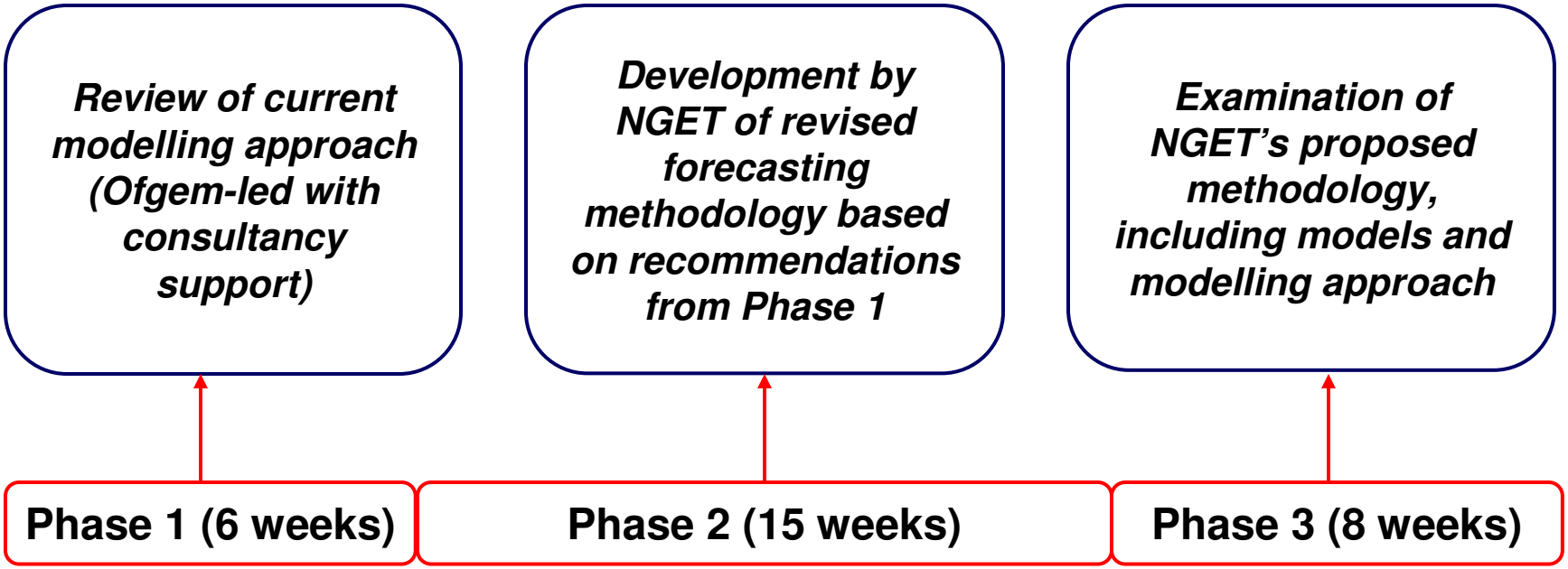
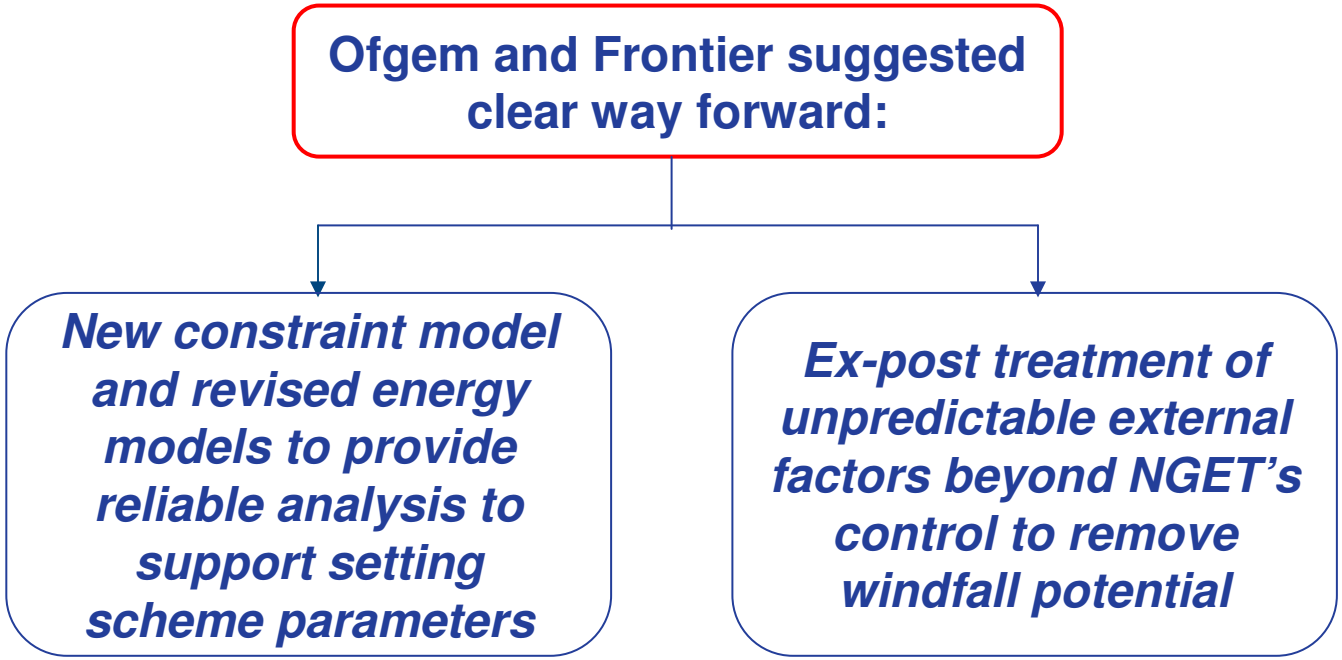


Summary of Phase 1 key findings

Aim: **Multi-year scheme**:

- Promote system operation efficiency
- Reduce regulatory and industry burden



Evolution of the proposed incentivisation approach

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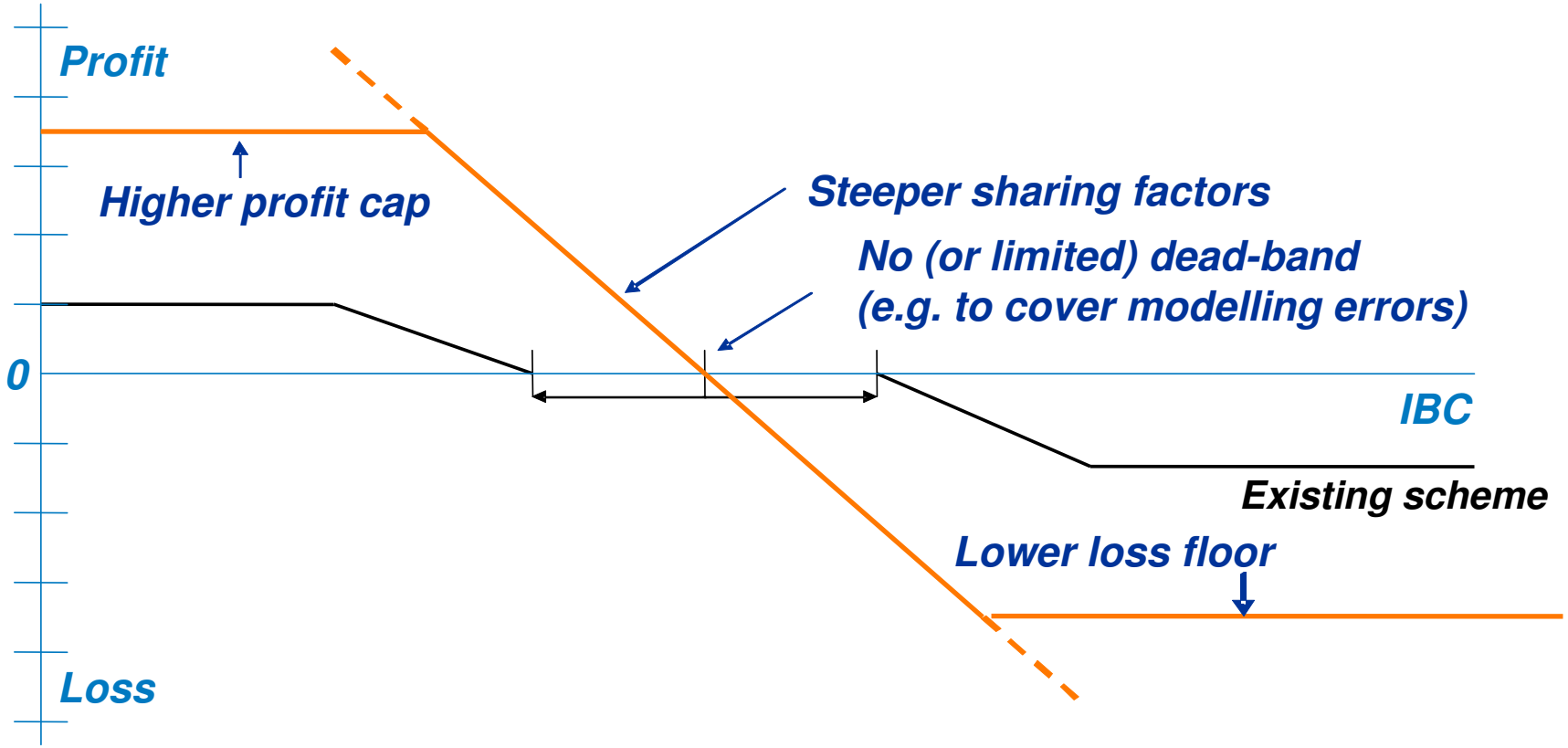
	Current	*Proposed*
Target IBC	*Ex-ante*	*Ex-ante forecast updated ex-post*
Adjustments to Target IBC	*Two ex-post adjusters*	*Multiple ex-post adjustments*
Adjustments to out-turn costs	*Ex-post NIA*	*None*
BSUoS Charges	*Ex-ante forecast*	*Ex-ante forecast*

New scheme structure

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



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BSUoS Charging Methodology – Impact of BSIS Initial Proposals

Colin Williams - Charging and Revenue

Agenda

- 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

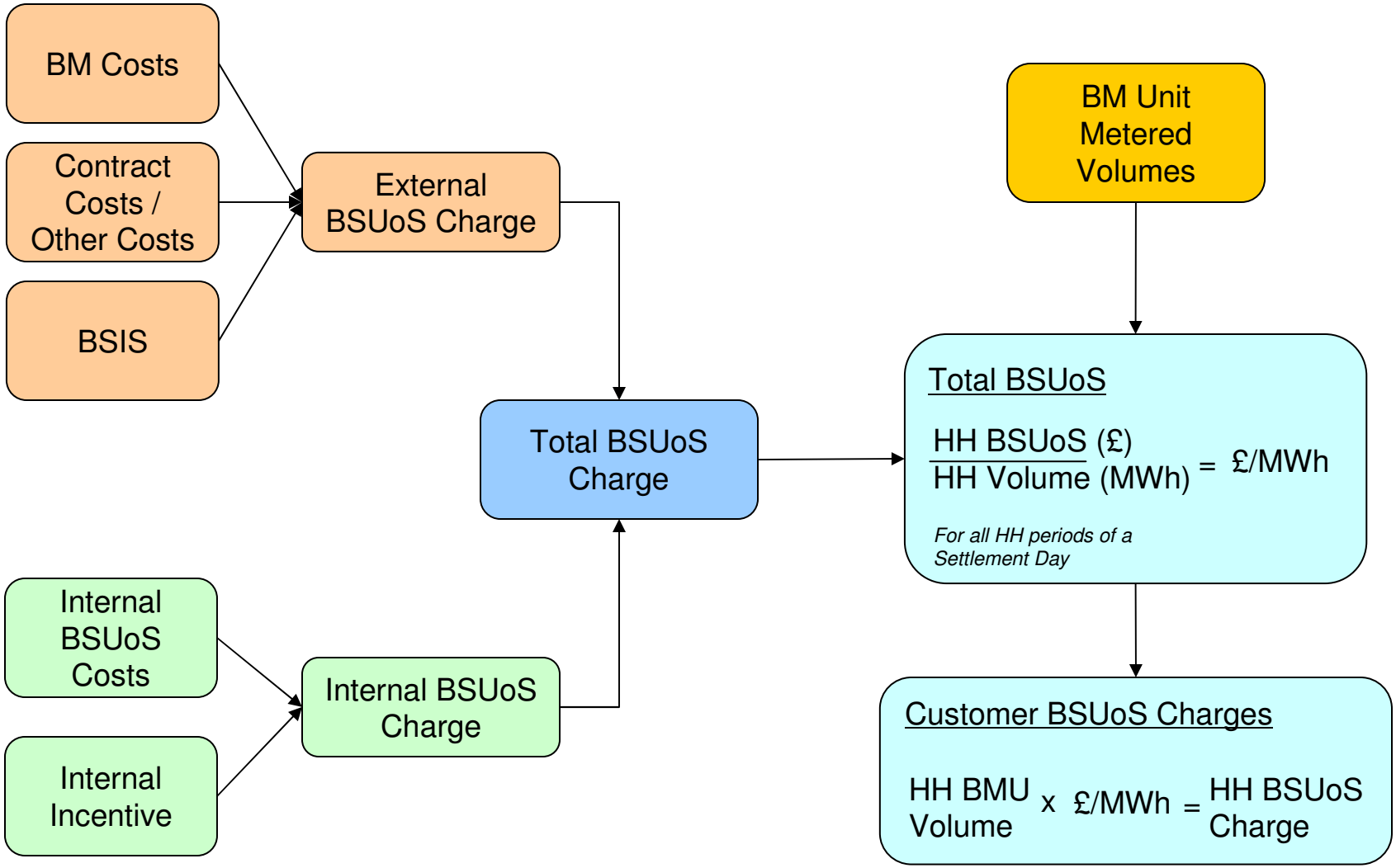
This will remain unchanged

BSUoS Charges - Calculation

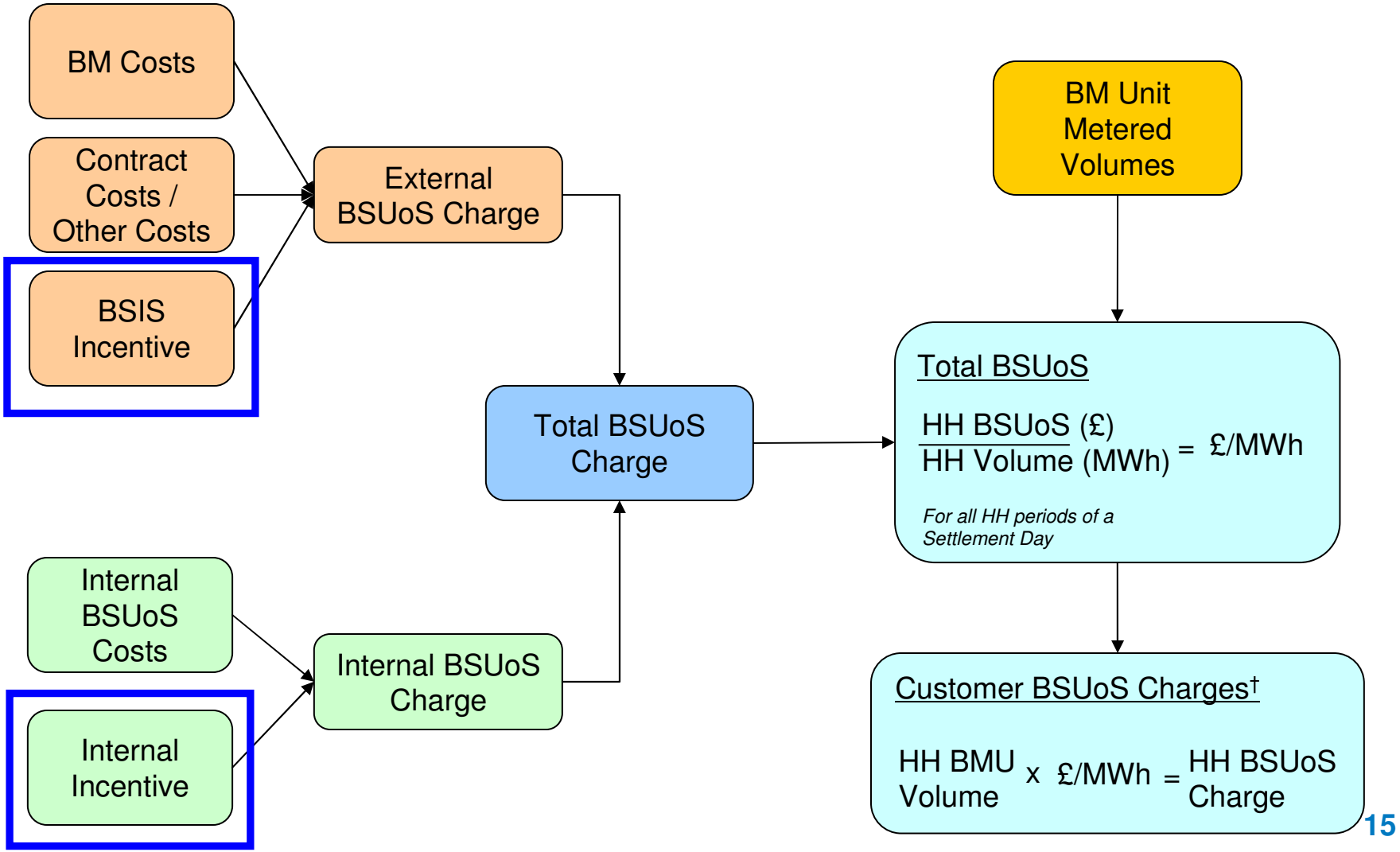
- Two main components of BSUoS
  - Internal - internal SO costs e.g. staff, buildings, IS
  - External - costs of the services used to balance the system
    - Electricity related products
      - Balancing Services Contract Costs
      - Balancing Mechanism Bids and Offers

- Both Internal and External Costs have an Incentive Scheme Adjustment

BSUoS Calculation – Simplified

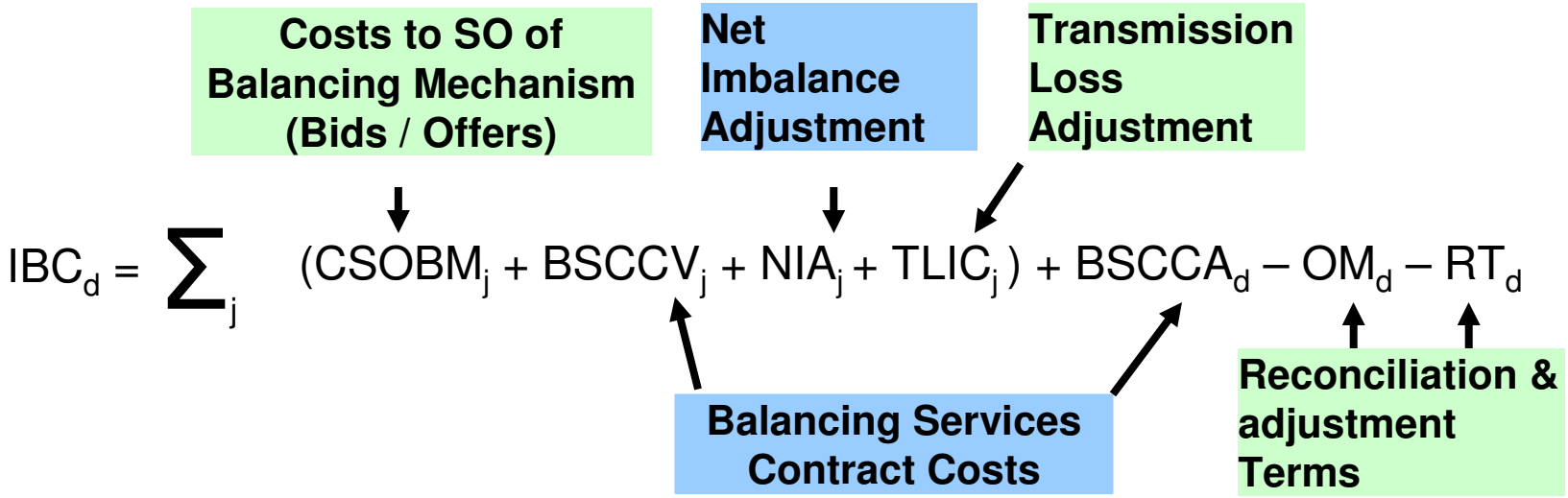


BSUoS Calculation – Simplified



Incentivised Balancing Costs – Current Methodology

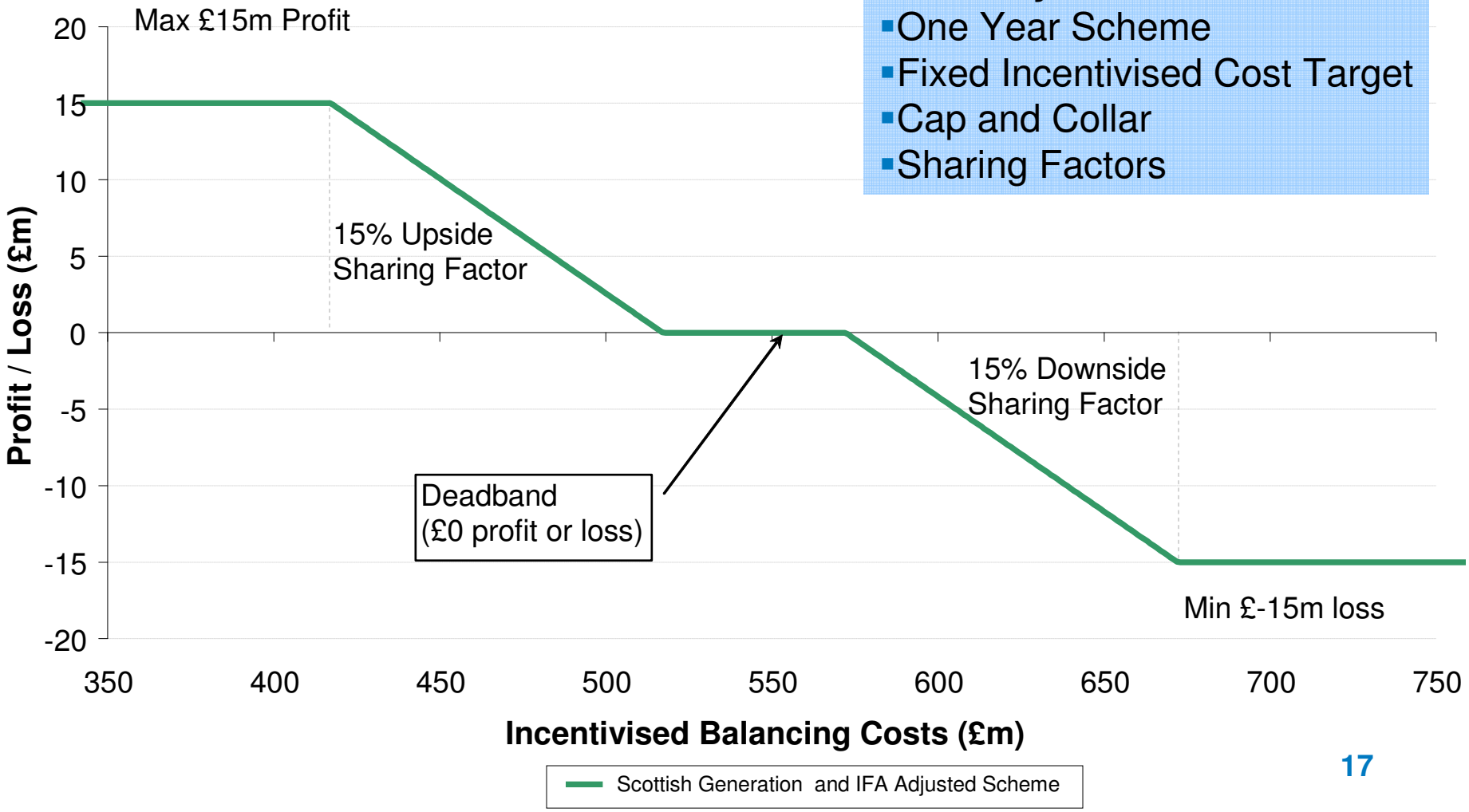
- 2010/11 IBC Calculation



- 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



Impact on Incentivised Balancing Costs from Initial Proposals

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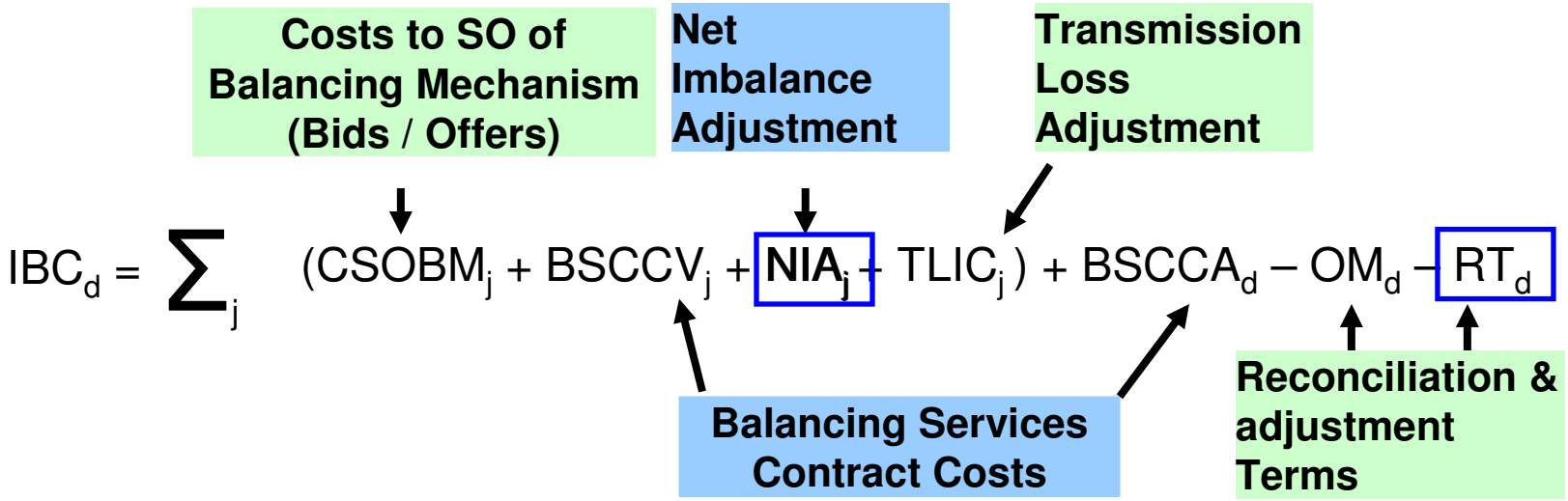
- 2011/13 IBC Calculation

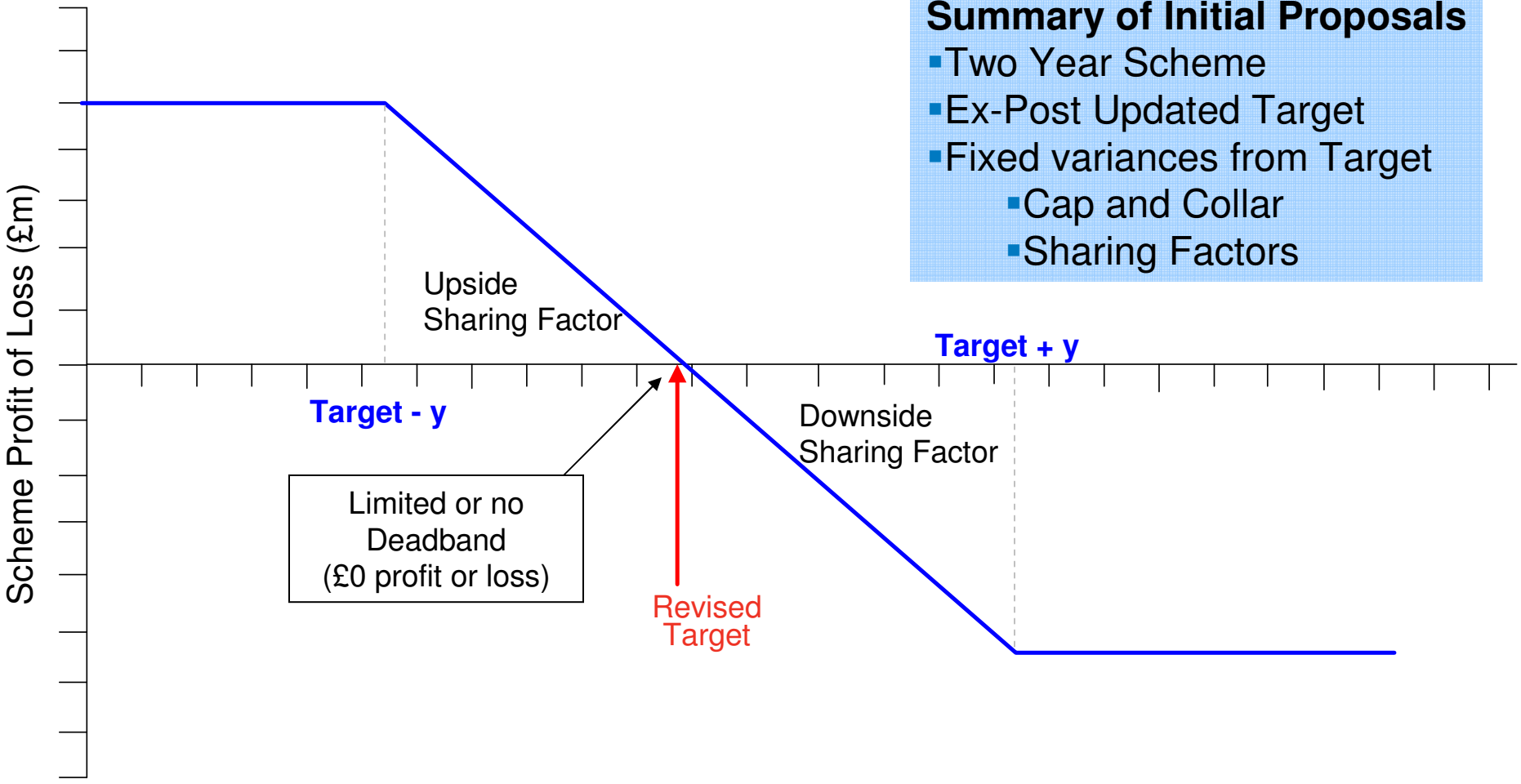


- Proposed changes to calculation of IBC
  - Remove NIA and potential removal of RT

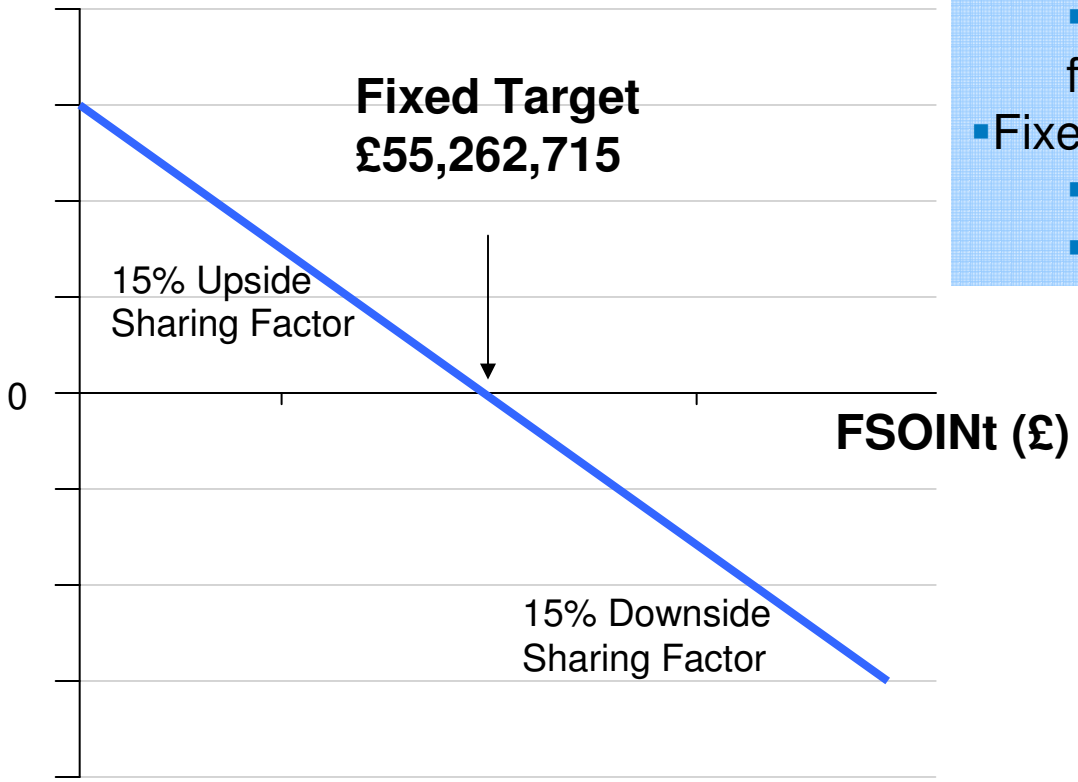
BSIS – 2011/13 – Initial Proposals

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

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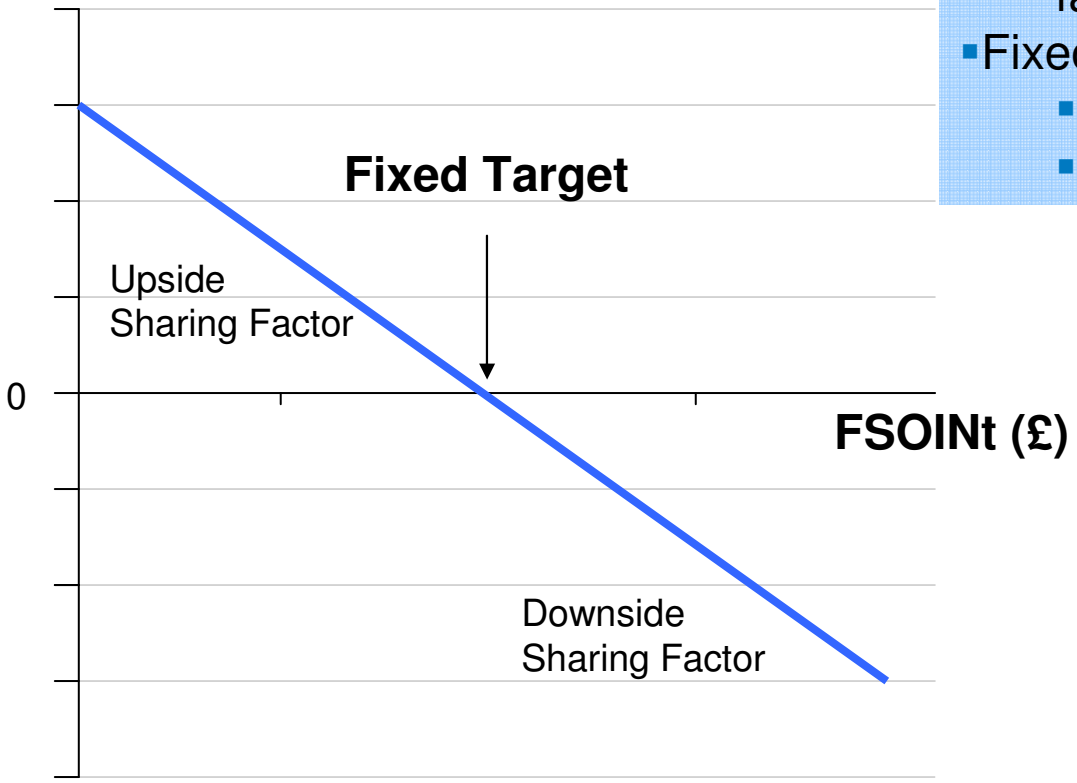

Summary of Scheme

- 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

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	Calculation of External Incentive	Calculation of Internal Incentive	Methodology of Charging and Apportioning	Billing BSUoS
Any Change?	✓	X	X	X
Change Detail	◆ Two Year External Scheme ◆ Variable Target with cap, collar and sharing factors ◆ Removal of NIA	◆ Sharing Factor ◆ Remains to be considered on an annual basis	◆ No Change to method	◆ No Change to method

BSUoS Charging – Contact

- Any BSUoS Charging Questions please contact:

Colin Williams

Colin.Williams@uk.ngrid.com

Tel: 01926 65 5916

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BSUoS Forecast - Energy Components

Katharine Clench, BSIS Commercial Analyst

Content

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

Headline Energy Forecast

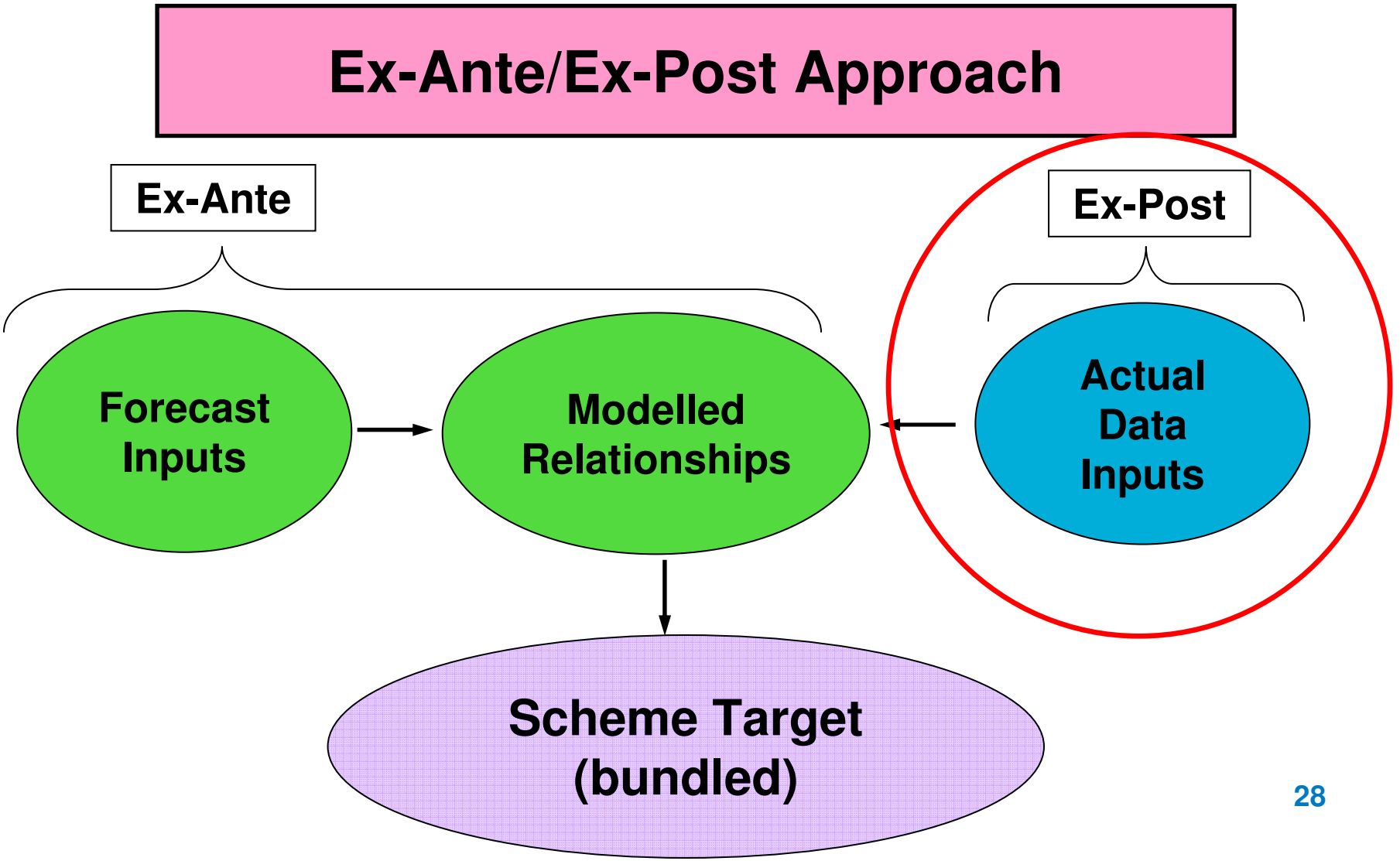
All Categories £m	2005/6 Year End	2006/7 Year End	2007/8 Year End	2008/9 Year End	2009/10 Year End	2010/11 Latest View	THIS MODEL (Apr/11 to Mar/12)	THIS MODEL (Apr/12 to Mar/13)
Energy Imbalance	6.1	-27.6	19.9	-71.5	11.6	-37.9	-28.0	-27.9
Margin	194.9	159.1	183.1	358.4	186.6	155.9	159.2	174.8
Op. Reserve	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
Total (less Constraints and TLA)	**471.0**	**442.9**	**497.3**	**655.4**	**532.0**	**448.6**	**521.2**	**539.1**

Headline Energy Forecast

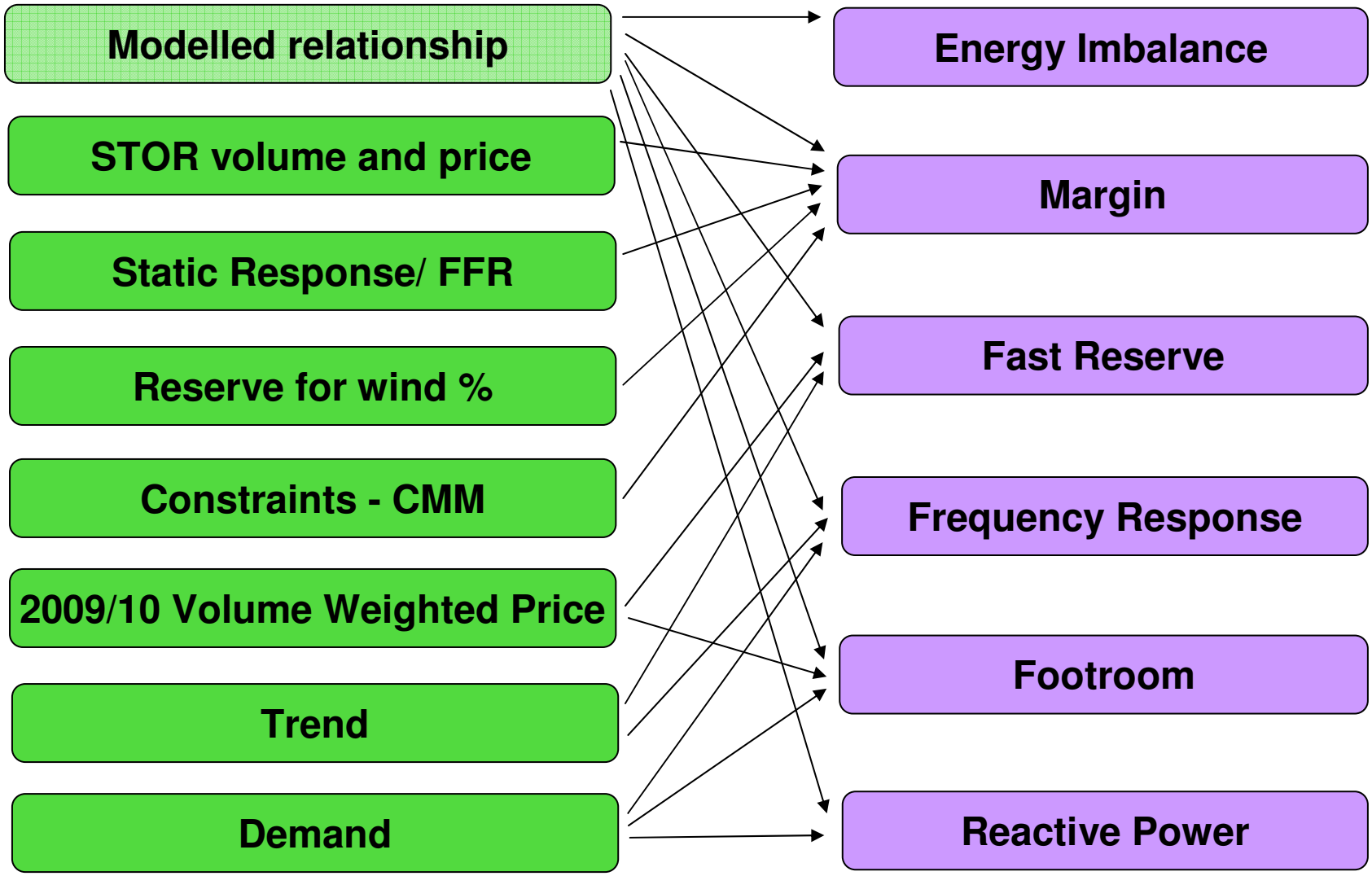
All Categories £m	2005/6 Year End	2006/7 Year End	2007/8 Year End	2008/9 Year End	2009/10 Year End	2010/11 Latest View	THIS MODEL (Apr/11 to Mar/12)	THIS MODEL (Apr/12 to Mar/13)
Energy Imbalance		27.6	19.9	-71.5	11.6	-37.9	-28.0	-27.9
Margin			183.1	358.4	186.6	155.9	159.2	174.8
Op. Reserve	12		00.3	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	9.7	10.1
CMM	13.8	17.9		5	11.8			19.9
Energy + Margin	201.1	131.6	203.		198.			6.8
Footroom	-5.5	9.2	5.2					
Fast Reserve	51.0	58.4	58.3	60.8				
AS Response	65.5	124.3	126.0	129.5				
BM Response	71.2	36.3	31.8	71.3				
Reactive	54.5	53.1	47.0	61.9				
Blackstart	14.5	15.5	13.6	16.9				
Total (less Constraints and TLA)	**471.0**	**442.9**	**497.3**	**655.4**				

2011/12	2012/13
£521.2m	£539.1m

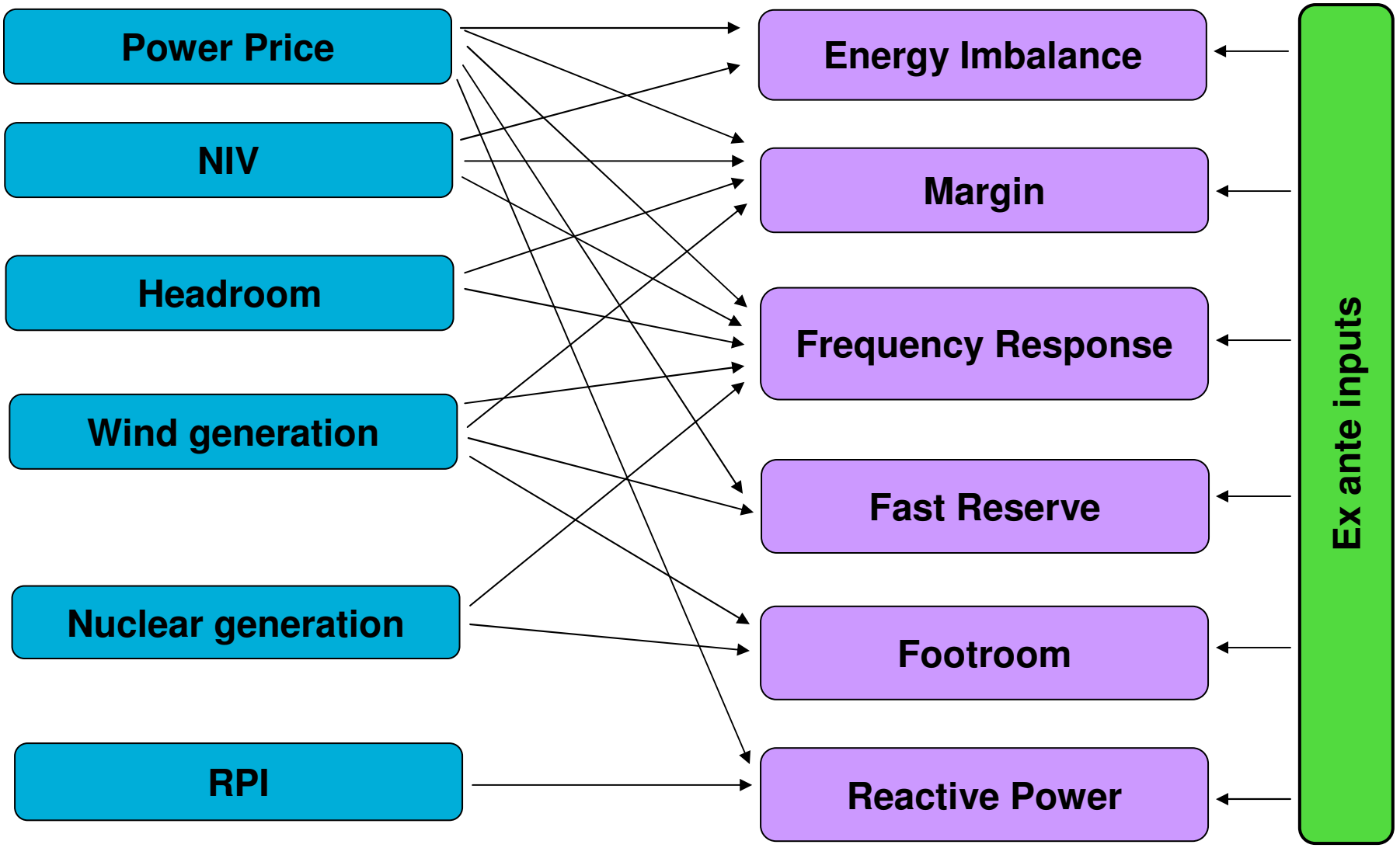
New Modelling Approach



Ex ante Inputs



Ex post Inputs



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Assumptions and Sensitivities

Ex Post Input Assumptions
Power Price

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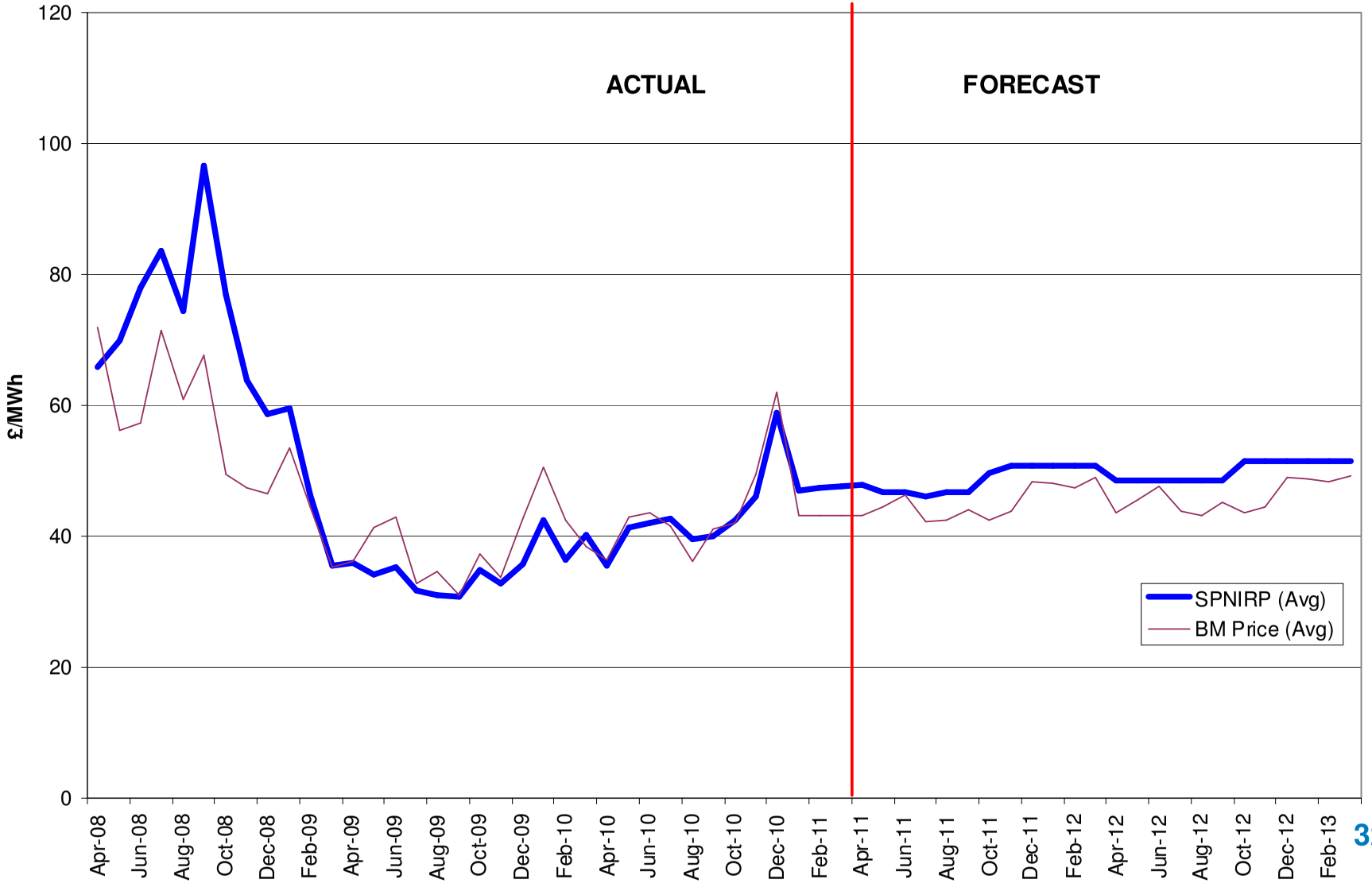

Ex Post Input Assumptions
Power Price Scenarios

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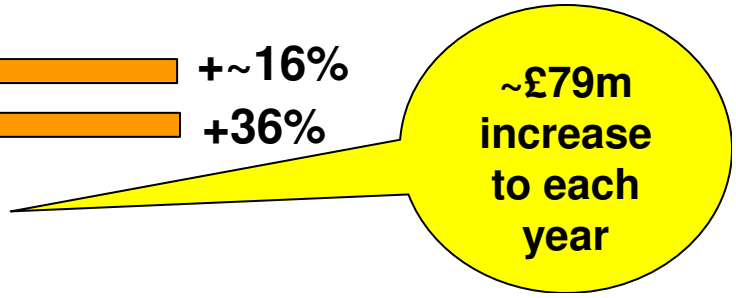
Power price ↑ **by:** **50%**

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
Fast Reserve	75.3	77.8
AS Response	126.3	126.5
BM Response	54.1	48.3
Reactive	59.3	60.5
Blackstart	28.4	29.0
Total (less Constraints and TLA)	**521.2**	**539.1**



Ex Post Input Assumptions
Power Price Scenarios

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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	-21%
Margin	159.2	174.8	-15%
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	
Fast Reserve	75.3	77.8	
AS Response	126.3	126.5	
BM Response	54.1	48.3	-27%
Reactive	59.3	60.5	-36%
Blackstart	28.4	29.0	
Total (less Constraints and TLA)	**521.2**	**539.1**	

~£60m decrease to each year

Ex Post Input Assumptions Headroom

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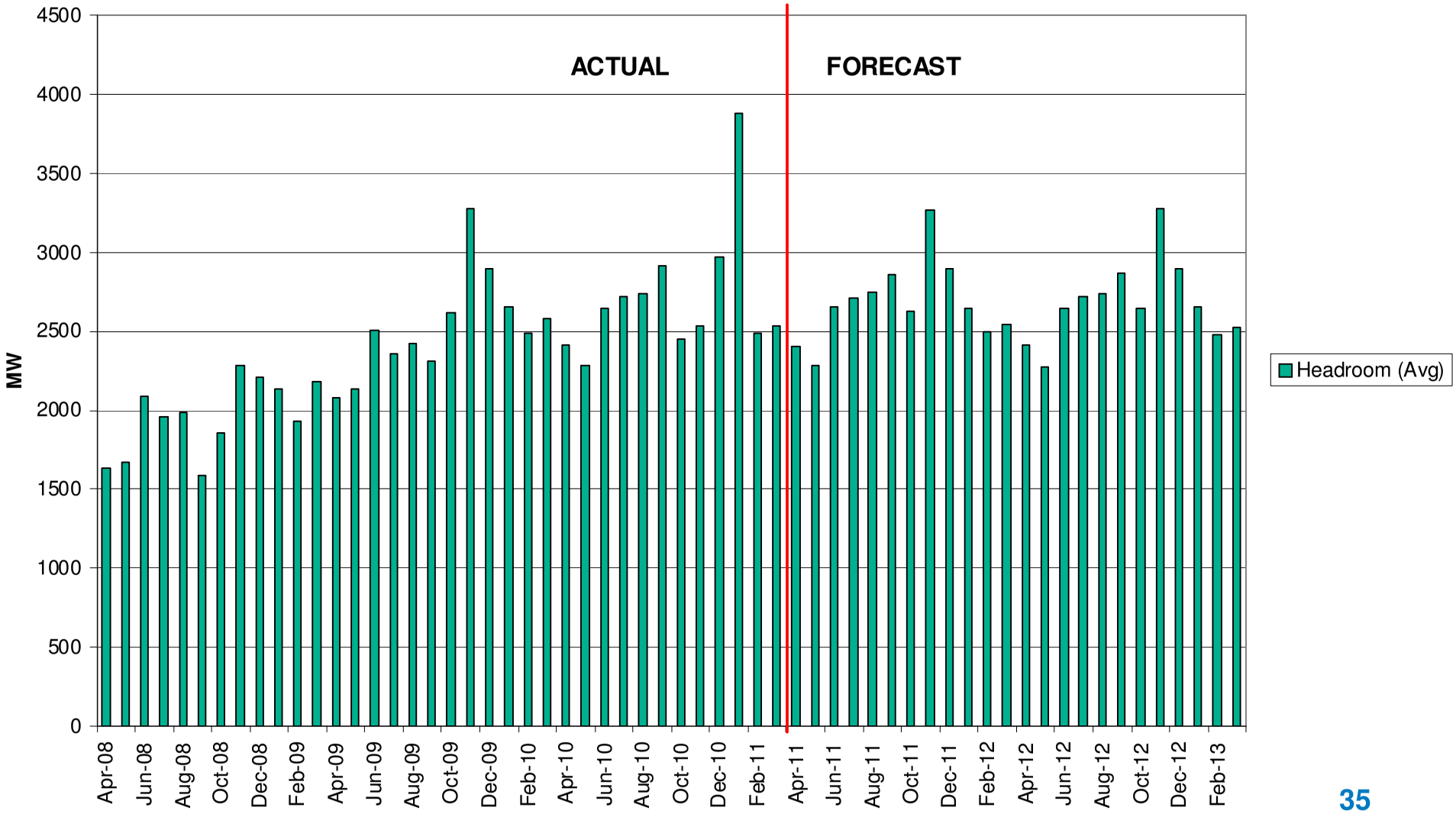

Ex Post Input Assumptions
Headroom Scenarios

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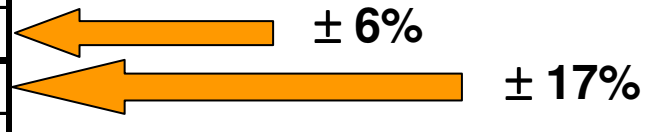
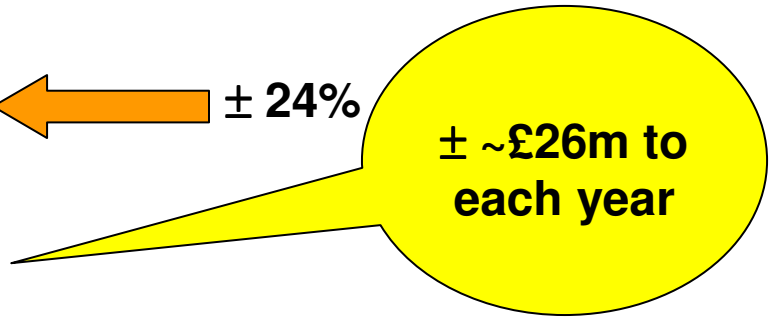
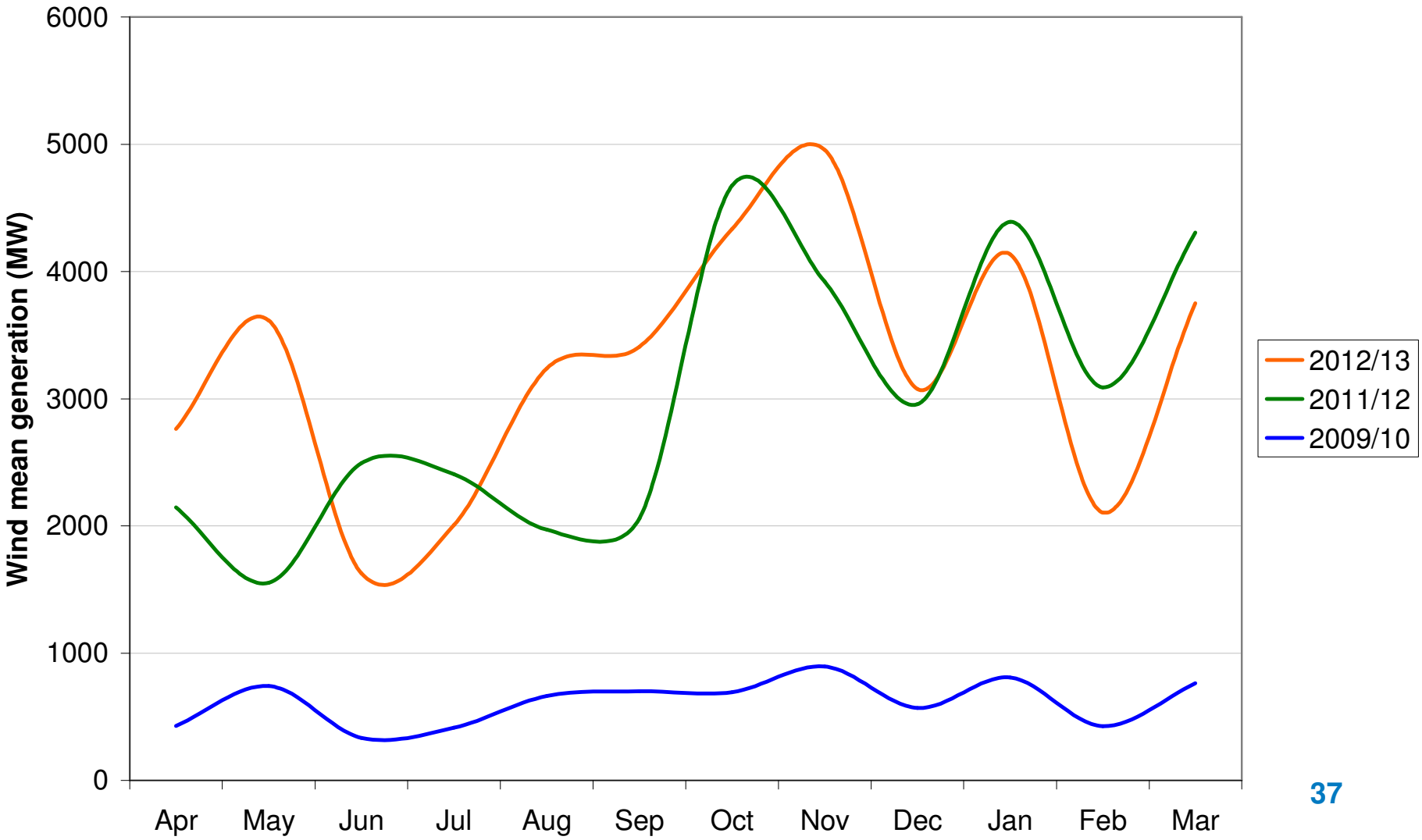
Headroom ↓ and ↑ by: 40%

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
Energy Imbalance + Margin	131.2	146.8
Footroom	28.3	31.0
Fast Reserve	75.3	77.8
AS Response	126.3	126.5
BM Response	54.1	48.3
Reactive	59.3	60.5
Blackstart	28.4	29.0
Total (less Constraints and TLA)	**521.2**	**539.1**





Ex Post Input Assumptions
Wind Generation



Ex Post Input Assumptions
Wind Scenarios

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Wind output ↓ and ↑ by: 15%

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
Fast Reserve	75.3	77.8
AS Response	126.3	126.5
BM Response	54.1	48.3
Reactive	59.3	60.5
Blackstart	28.4	29.0
Total (less Constraints and TLA)	**521.2**	**539.1**

± ~6%

± 8%

± ~£10m to each year

Ex Post Input Assumptions
Net Imbalance Volume (NIV)

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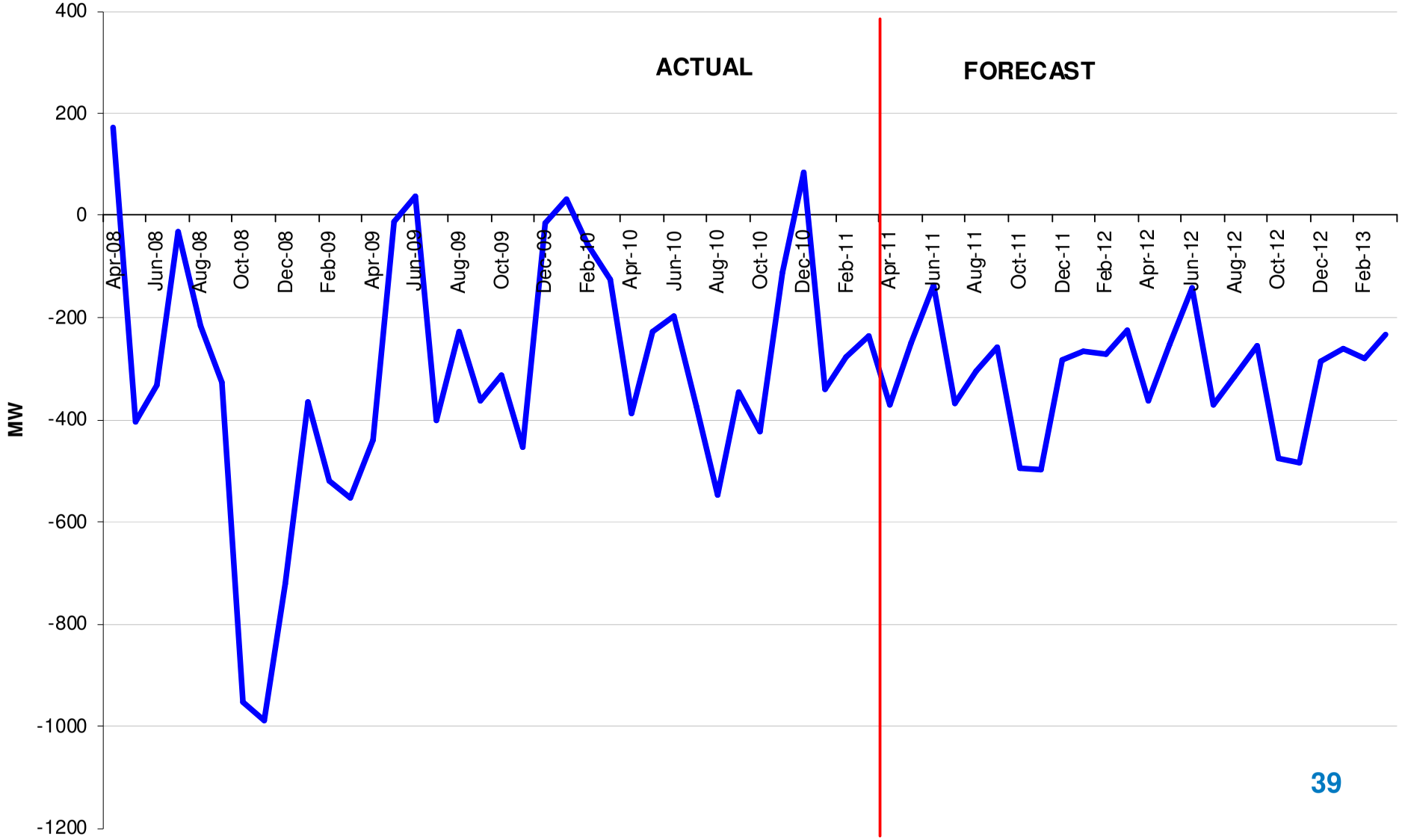

Ex Post Input Assumptions
NIV Scenarios

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NIV ↓ and ↑ by: **100MW**

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
Fast Reserve	75.3	77.8
AS Response	126.3	126.5
BM Response	54.1	48.3
Reactive	59.3	60.5
Blackstart	28.4	29.0
Total (less Constraints and TLA)	**521.2**	**539.1**

← ± ~300%

← ± 4 %

± ~£90m to each year

Ex Post Input Assumptions
Nuclear Generation

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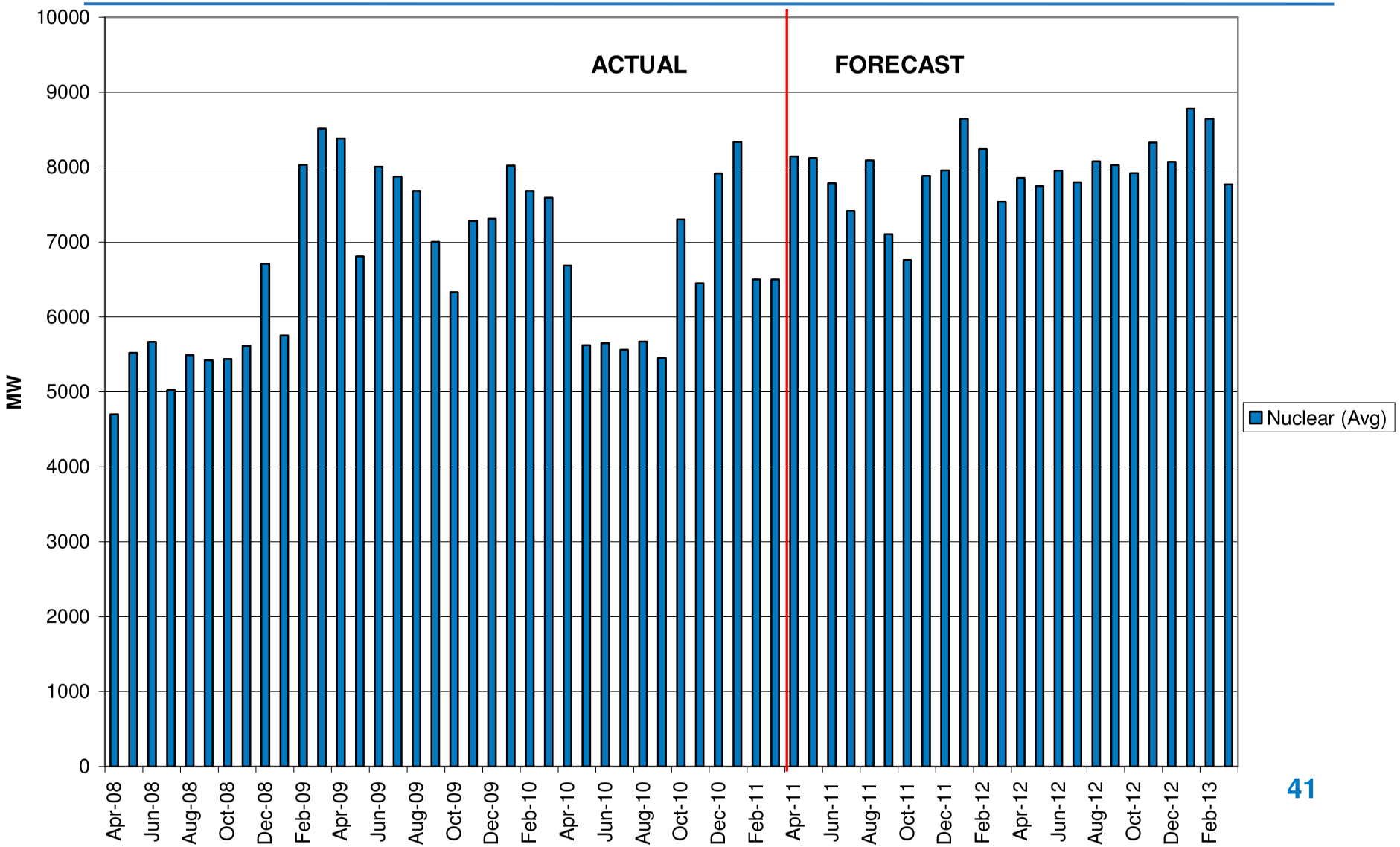

Ex Post Input Assumptions
Nuclear Scenarios

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Nuclear output ↓ to 4500MW and ↑ to 8800MW

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
Fast Reserve	75.3	77.8
AS Response	126.3	126.5
BM Response	54.1	48.3
Reactive	59.3	60.5
Blackstart	28.4	29.0
Total (less Constraints and TLA)	**521.2**	**539.1**

- 47% and +13%

- 43% and +14%

-£33m and +£10m to each year

Ex Post Input Assumptions
RPI

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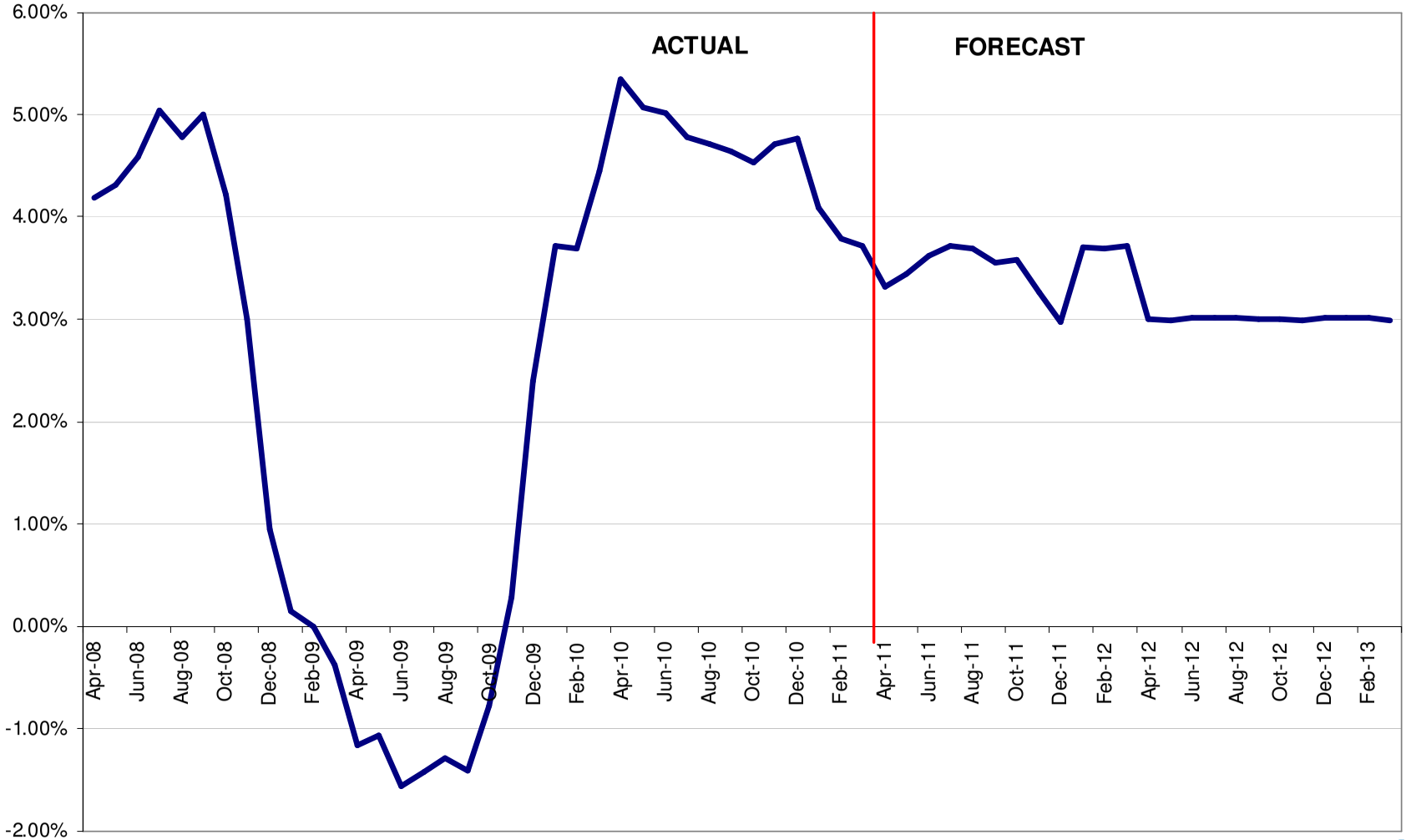

Black Start and Transmission Losses

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

- Availability fees
- Capital
- Testing

Transmission Losses

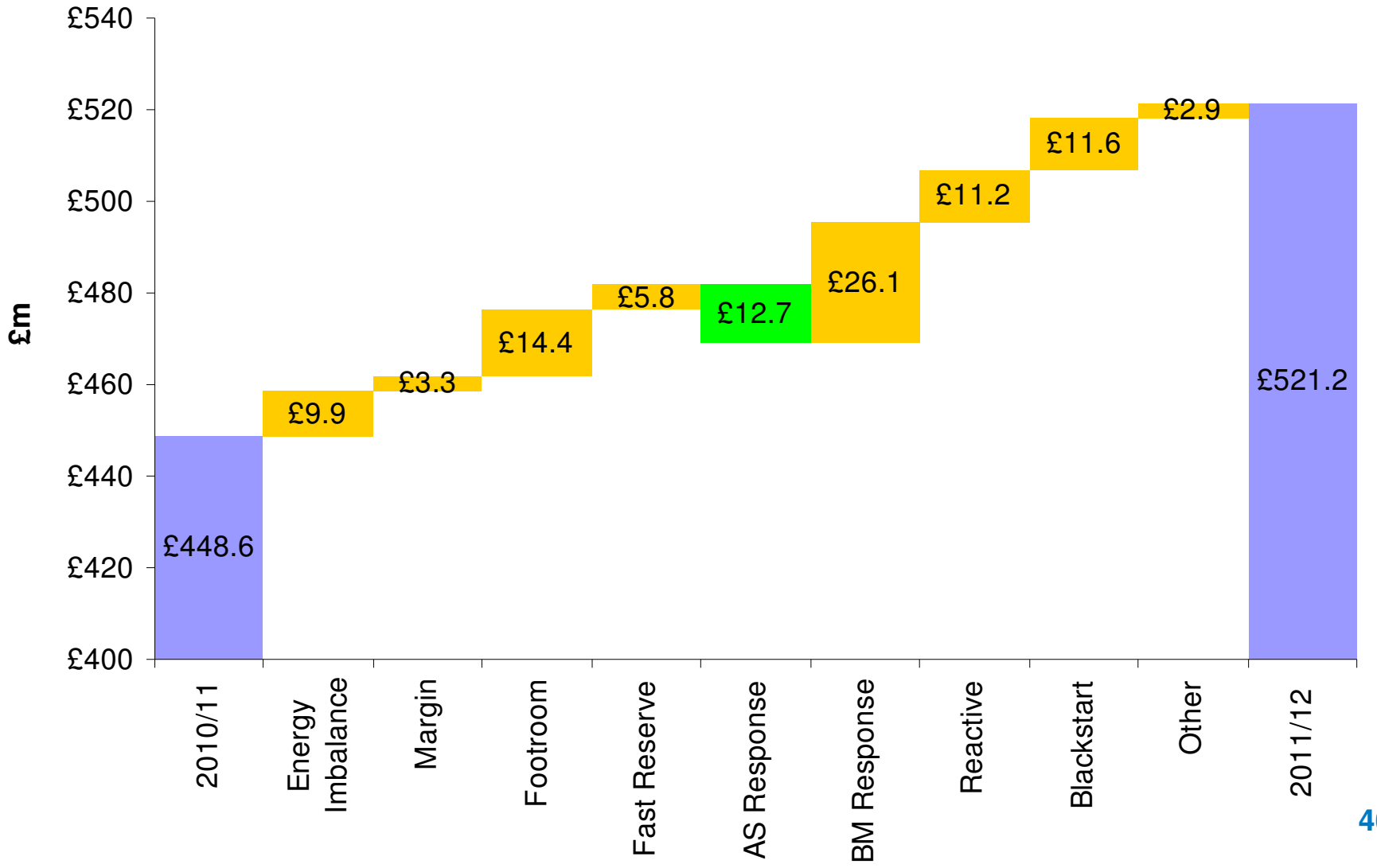
5.5TWh ± 0.5TWh

Energy Forecast - Range

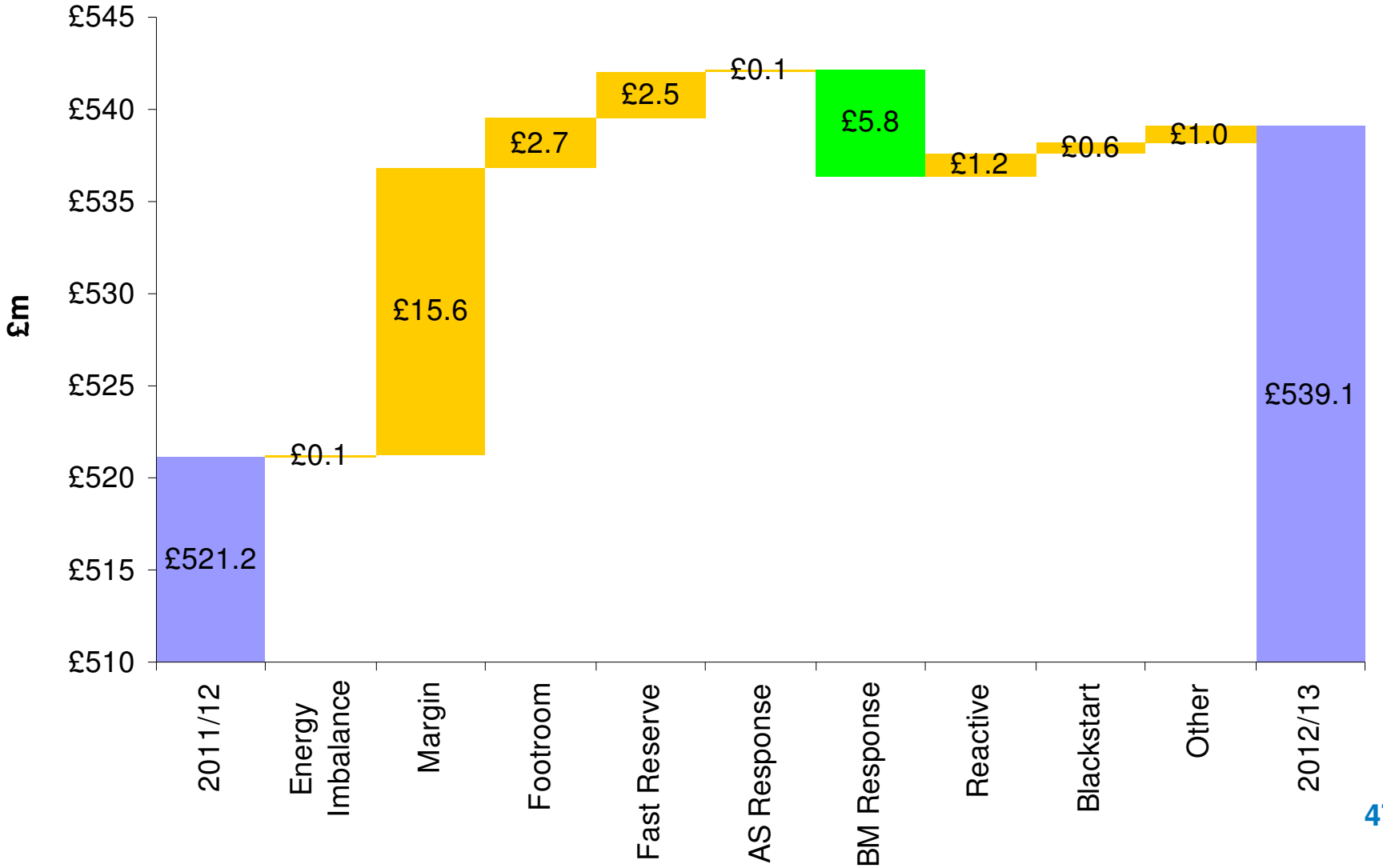
- Low = combined output of lower case scenarios
- High = combined output of upper case scenarios

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

Waterfall 2010/11 to 2011/12



Waterfall 2011/12 to 2012/13



Energy Summary

- ☑ 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	**£361m**	**£521.2m**	**£767m**
2012/13	**£377m**	**£539.1m**	**£785m**

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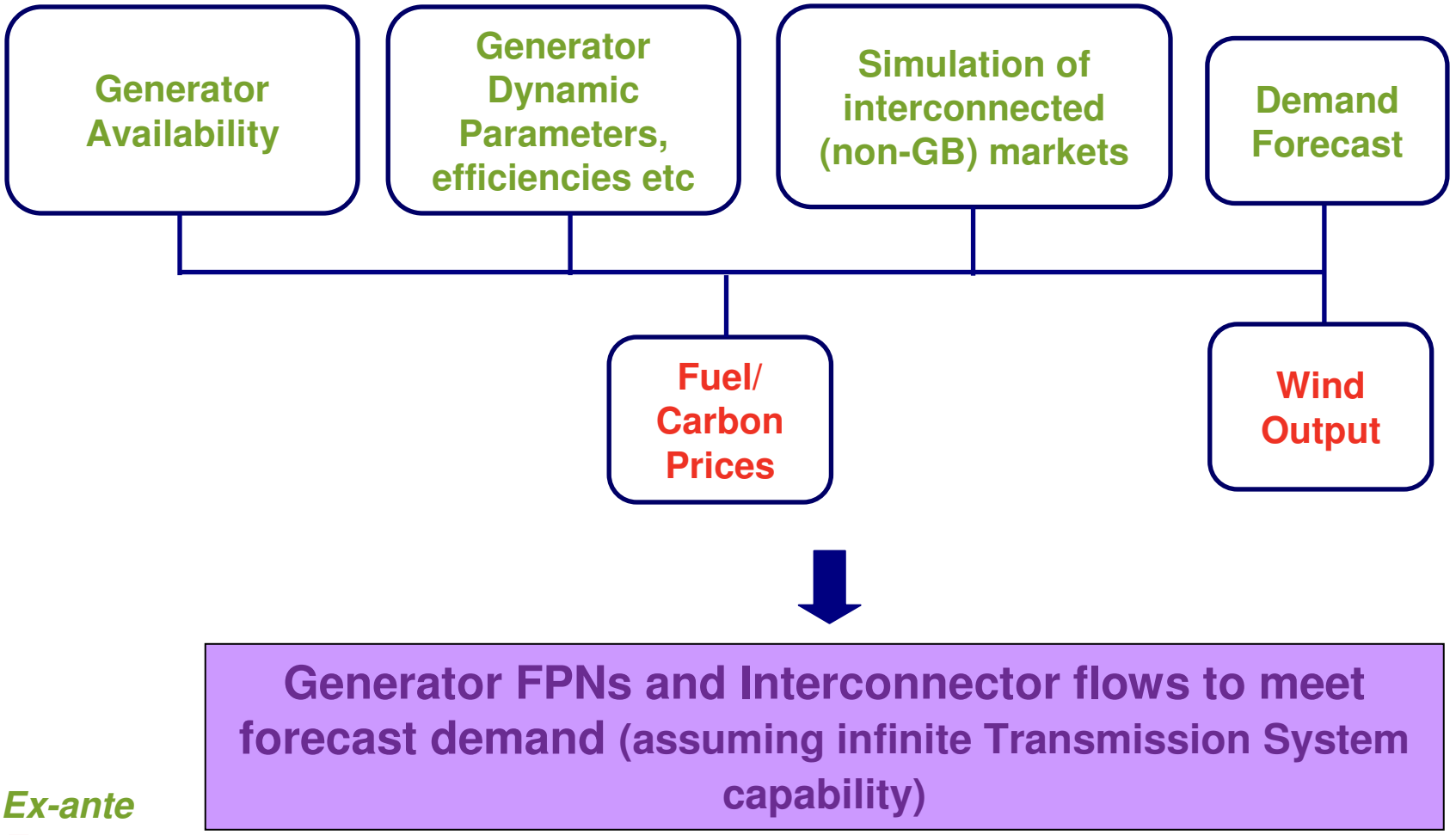
Constraints Forecast

Gil Susteras, Future Requirements Manager

Agenda

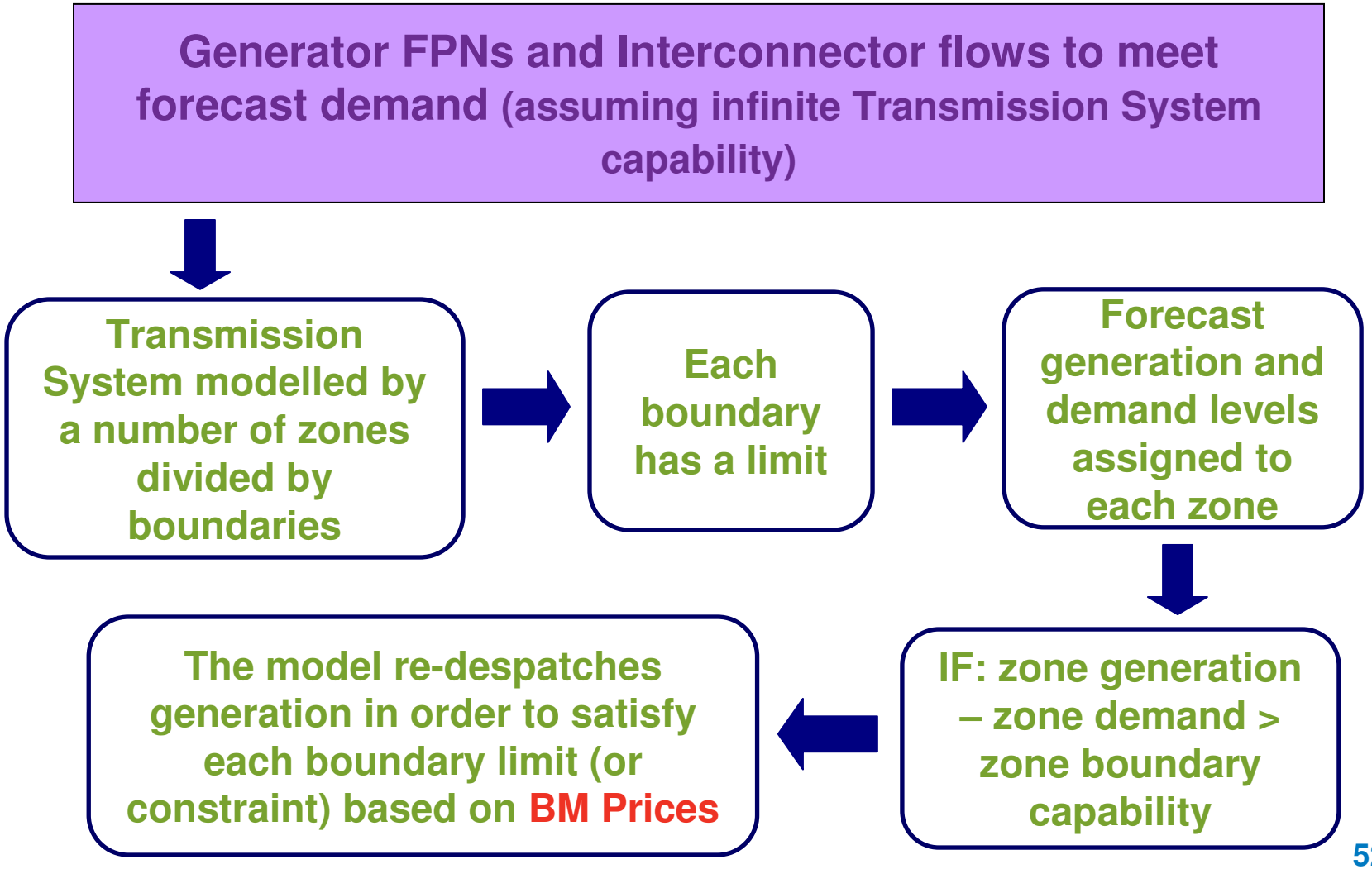
- Model overview
  - Unconstrained calibration
- Ex-ante assumptions
- Ex-post assumptions
- Forecast
- Scenarios and waterfalls

1. Unconstrained Run (simplified)



Ex-ante
Ex-post
Model output

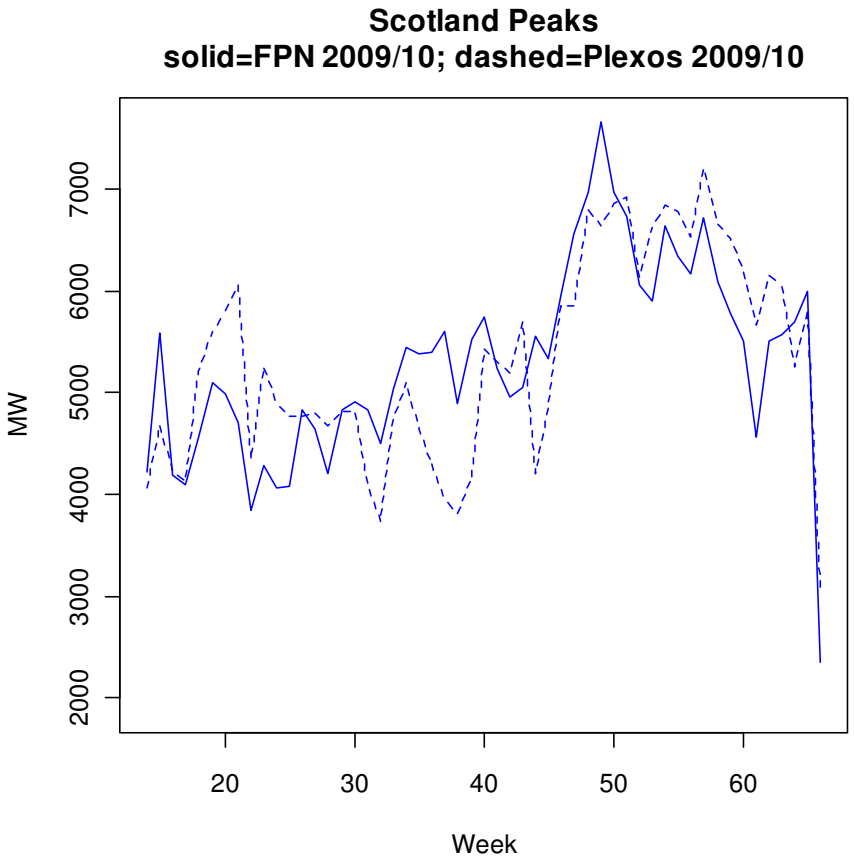
2. Constrained Run (simplified)



Unconstrained calibration results

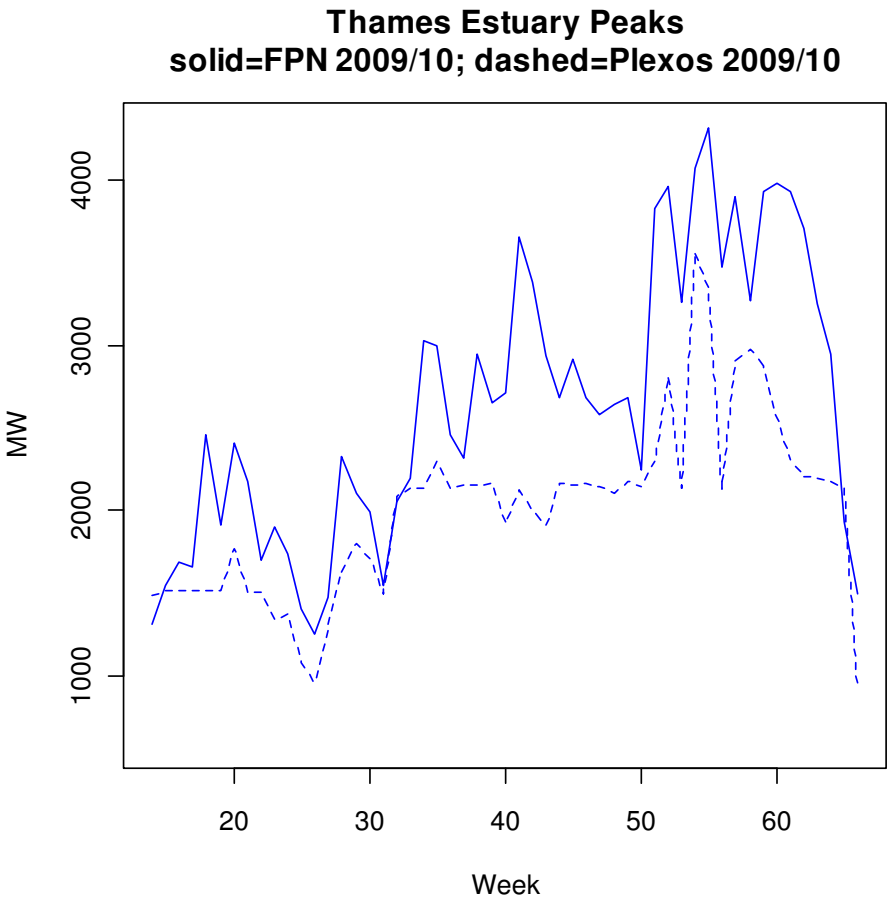
Sample results for key boundaries

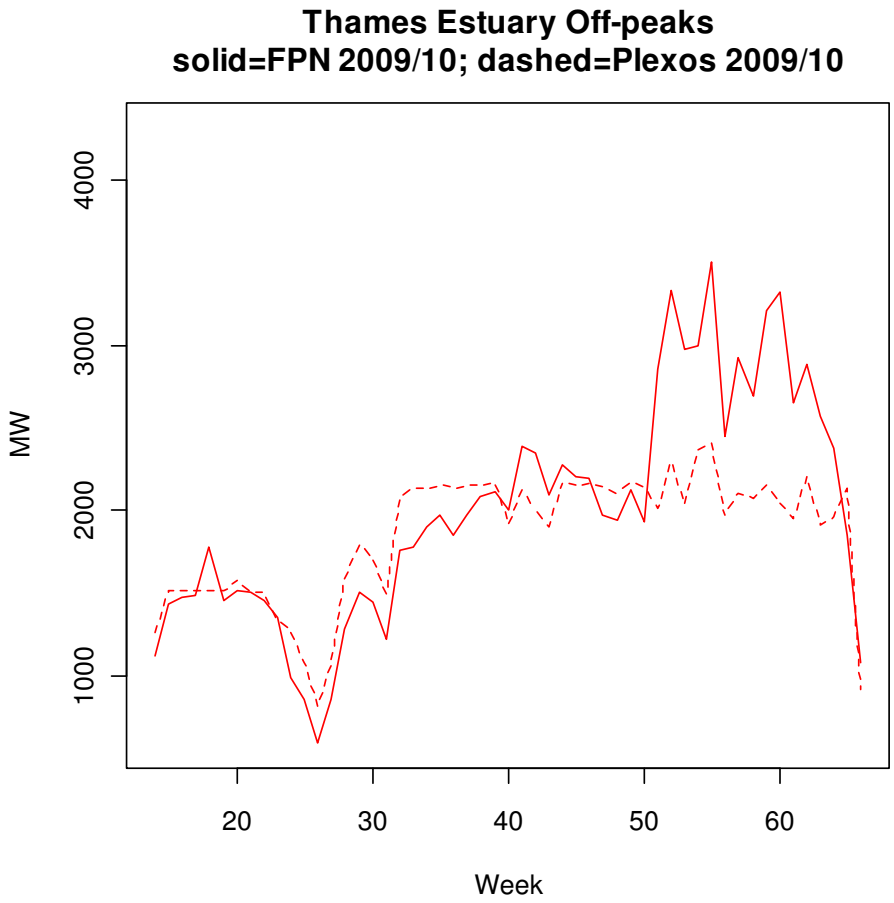
Scotland


Scotland Peaks
solid=FPN 2009/10; dashed=Plexos 2009/10
MW
2000
3000
4000
5000
6000
7000
20
30
40
50
60
Week

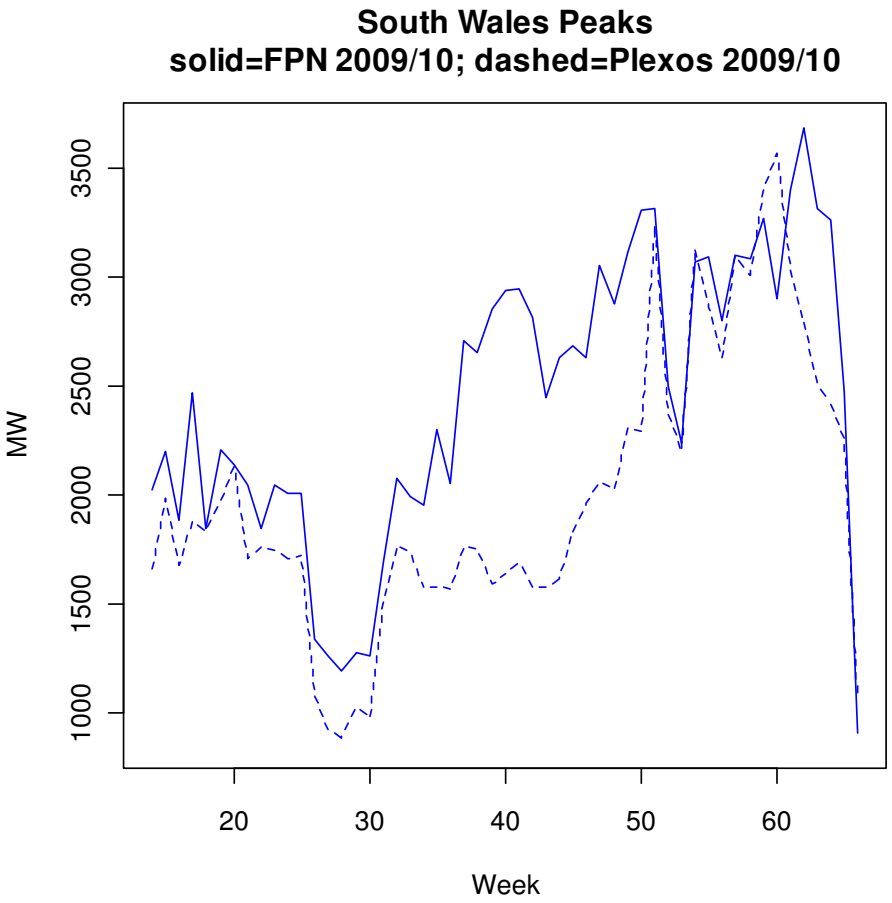

Scotland Off-peaks
solid=FPN 2009/10; dashed=Plexos 2009/10
MW
2000
3000
4000
5000
6000
7000
20
30
40
50
60
Week

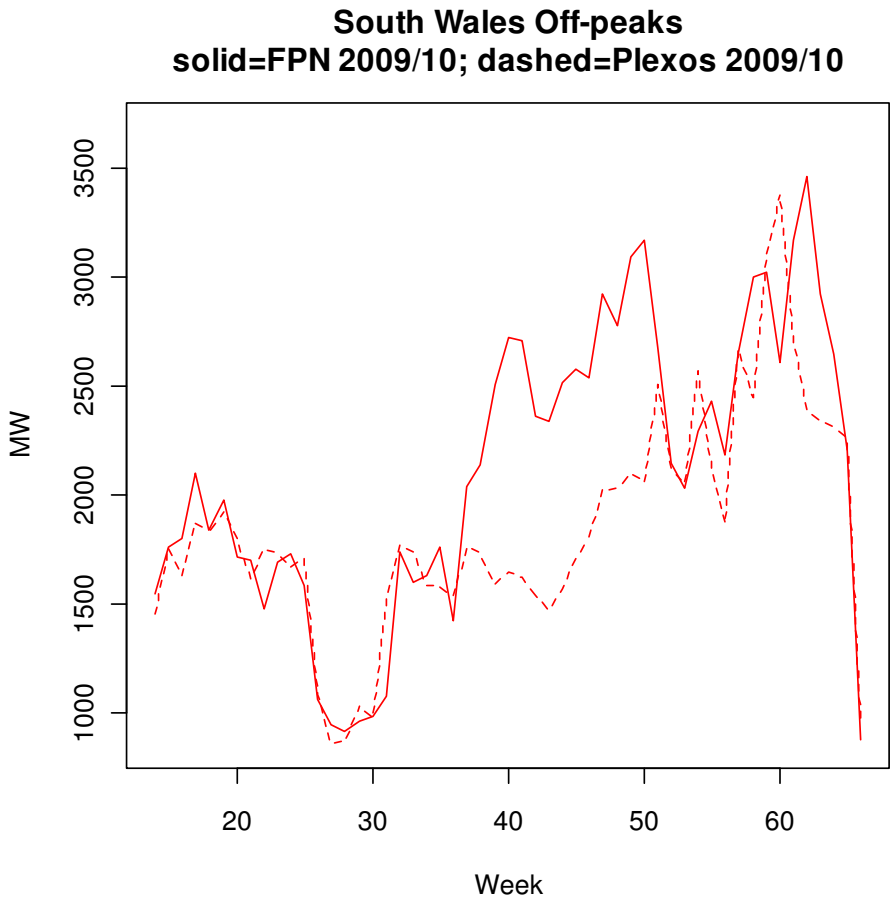
Thames Estuary



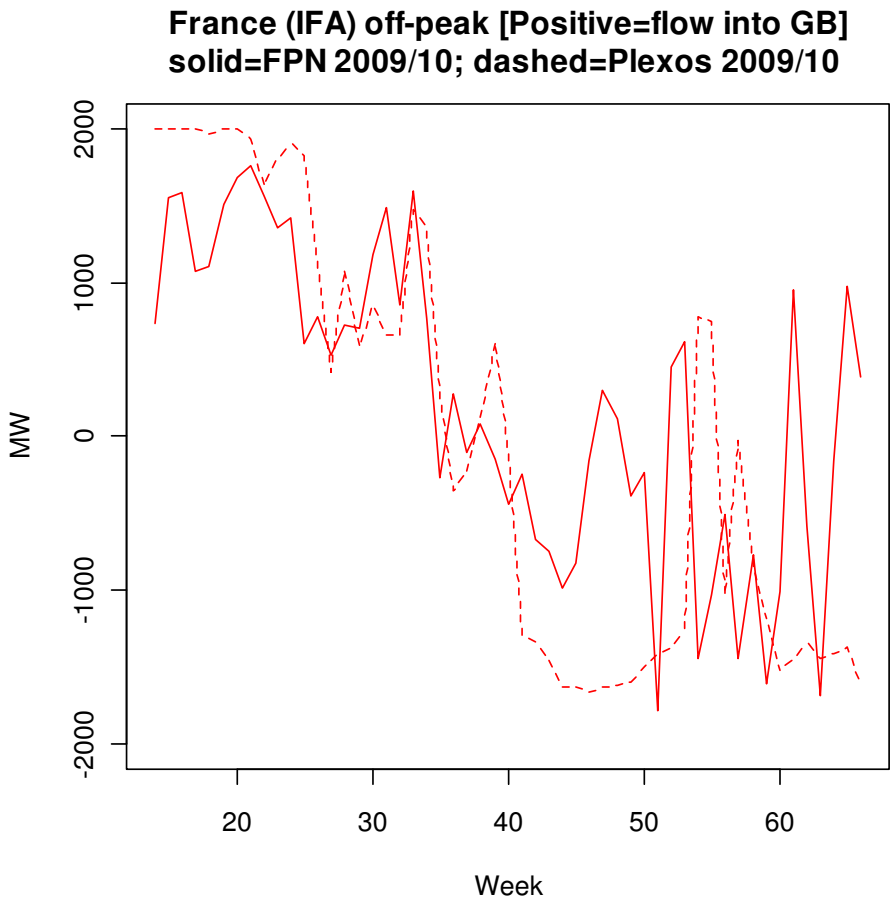


South Wales

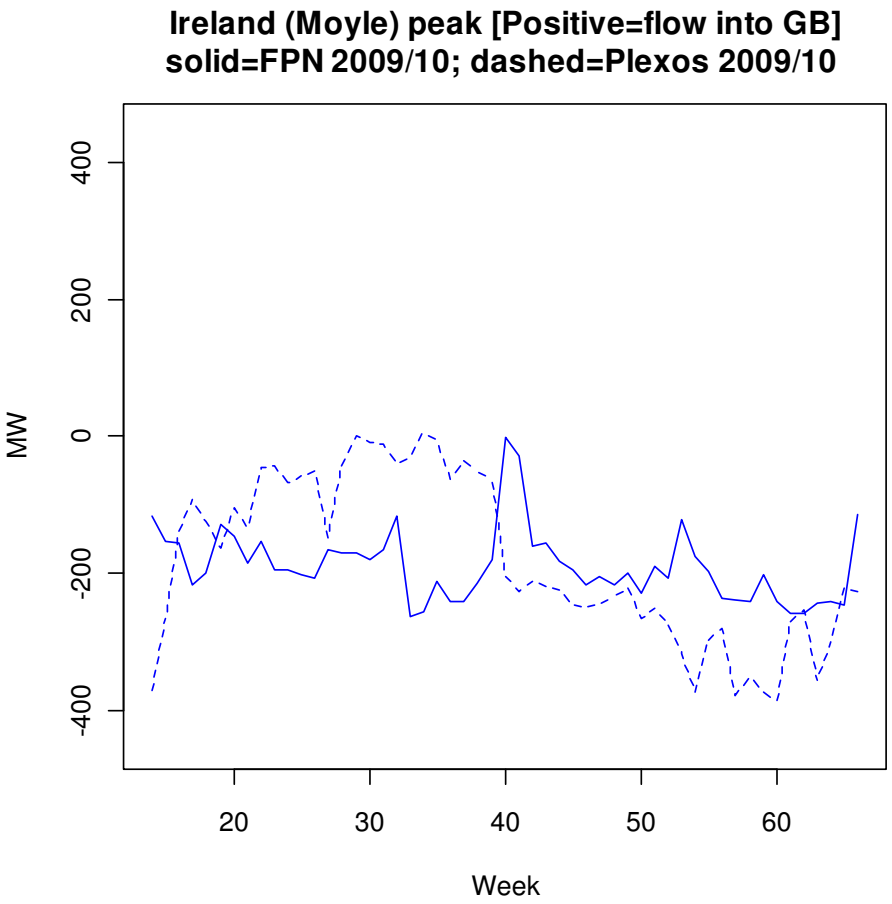

South Wales Peaks
solid=FPN 2009/10; dashed=Plexos 2009/10
MW
1000
1500
2000
2500
3000
3500
20
30
40
50
60
Week

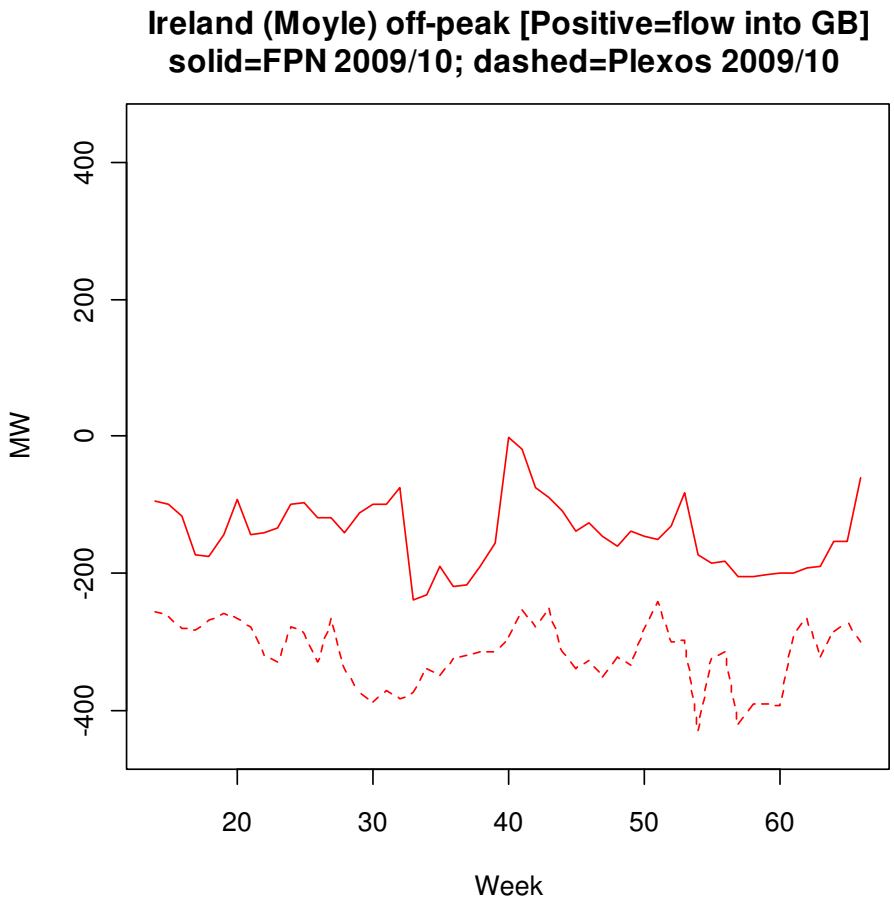

South Wales Off-peaks
solid=FPN 2009/10; dashed=Plexos 2009/10
MW
1000
1500
2000
2500
3000
3500
20
30
40
50
60
Week

French Interconnector



Moyle Interconnector





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Assumptions

Ex-ante assumptions

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

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

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Forecast

Like-for-like run (SRMC based)

2009/10 = 120

2011/12 = 268

2012/13 = 229

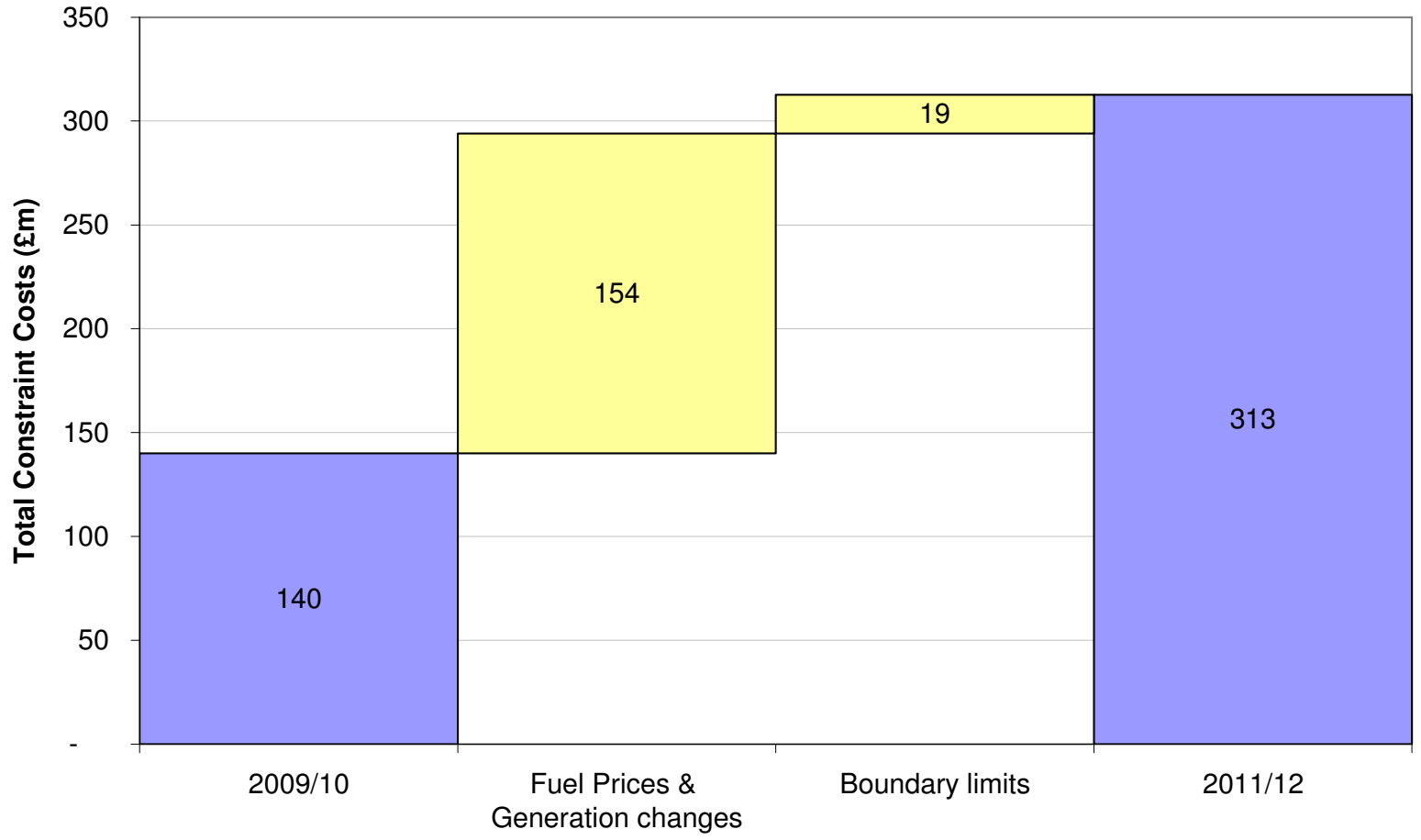
Pro-rata of values

2009/10 = 120 = £140m

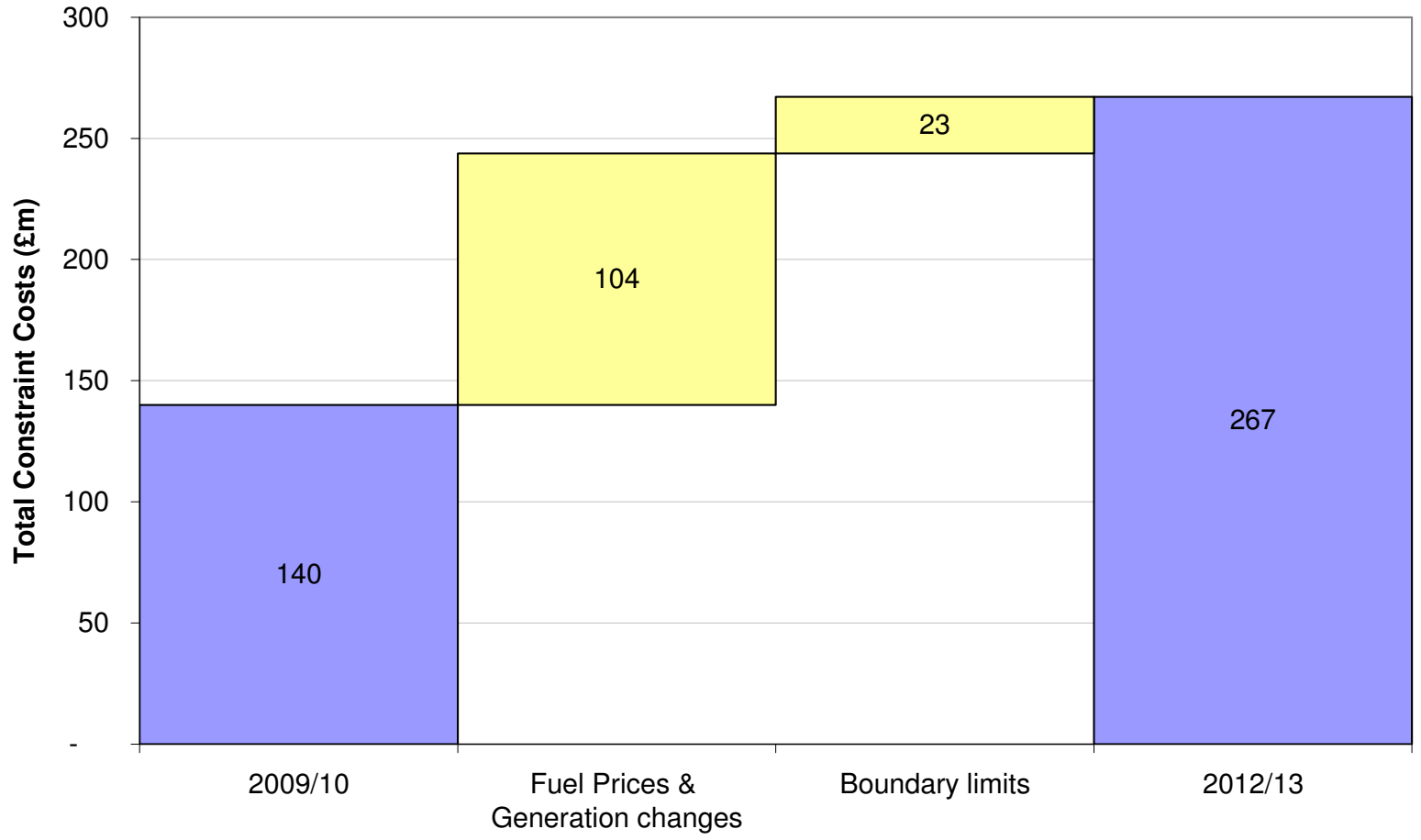
2011/12 = 268 = £313m

2012/13 = 229 = £267m

Simplified waterfall (1)



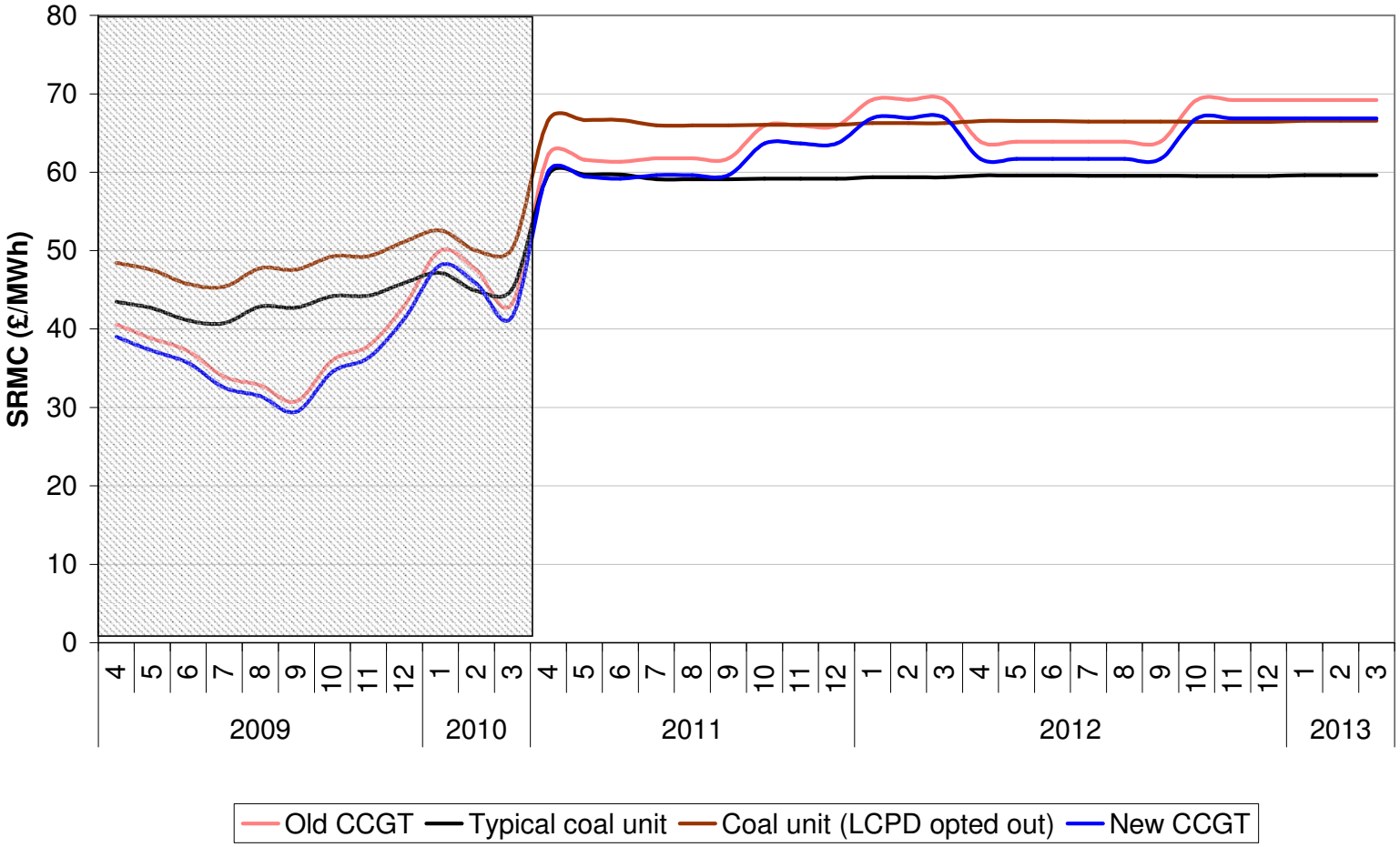
Simplified waterfall (2)



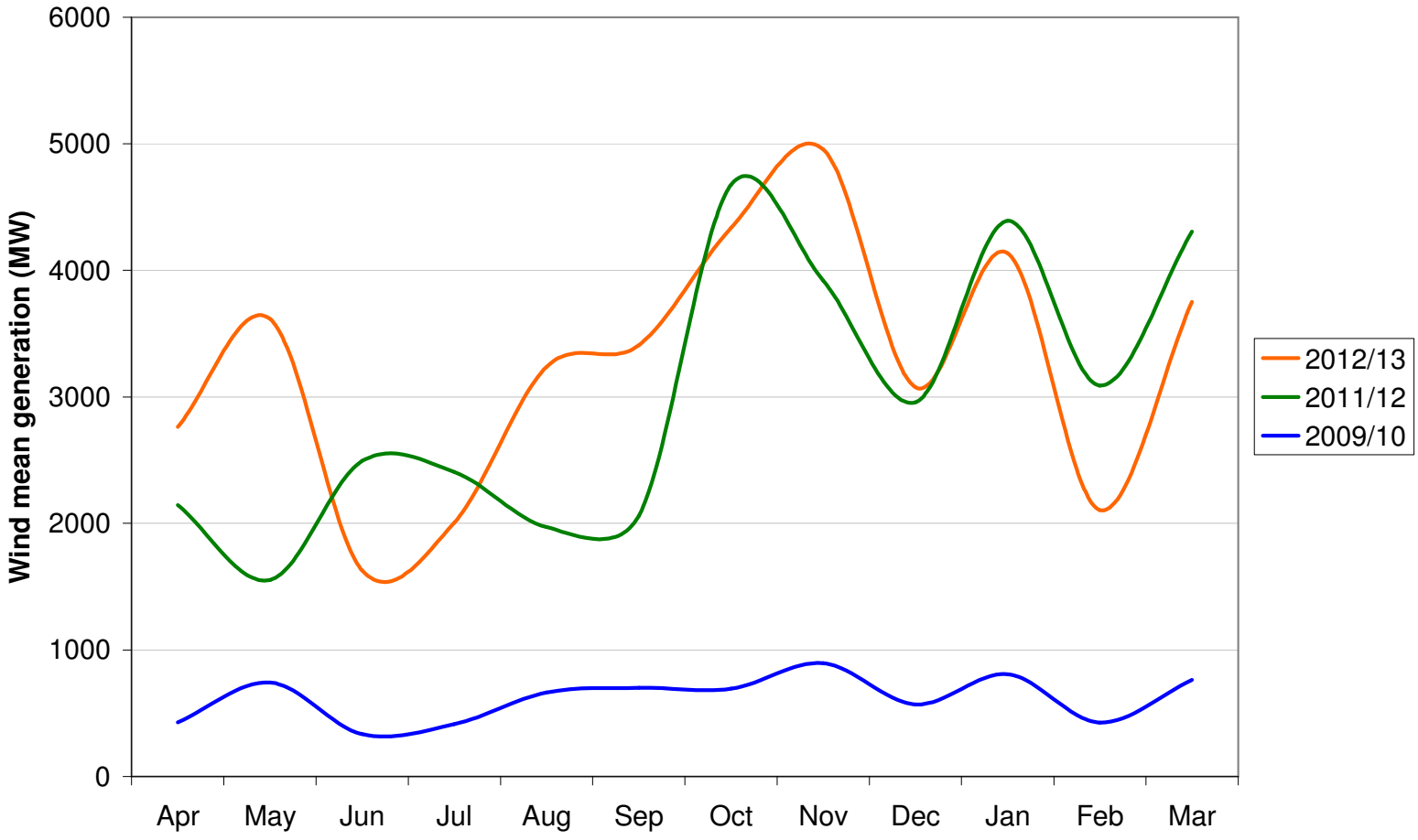
Drivers for variations

- 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

- Commodity prices
- Wind

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

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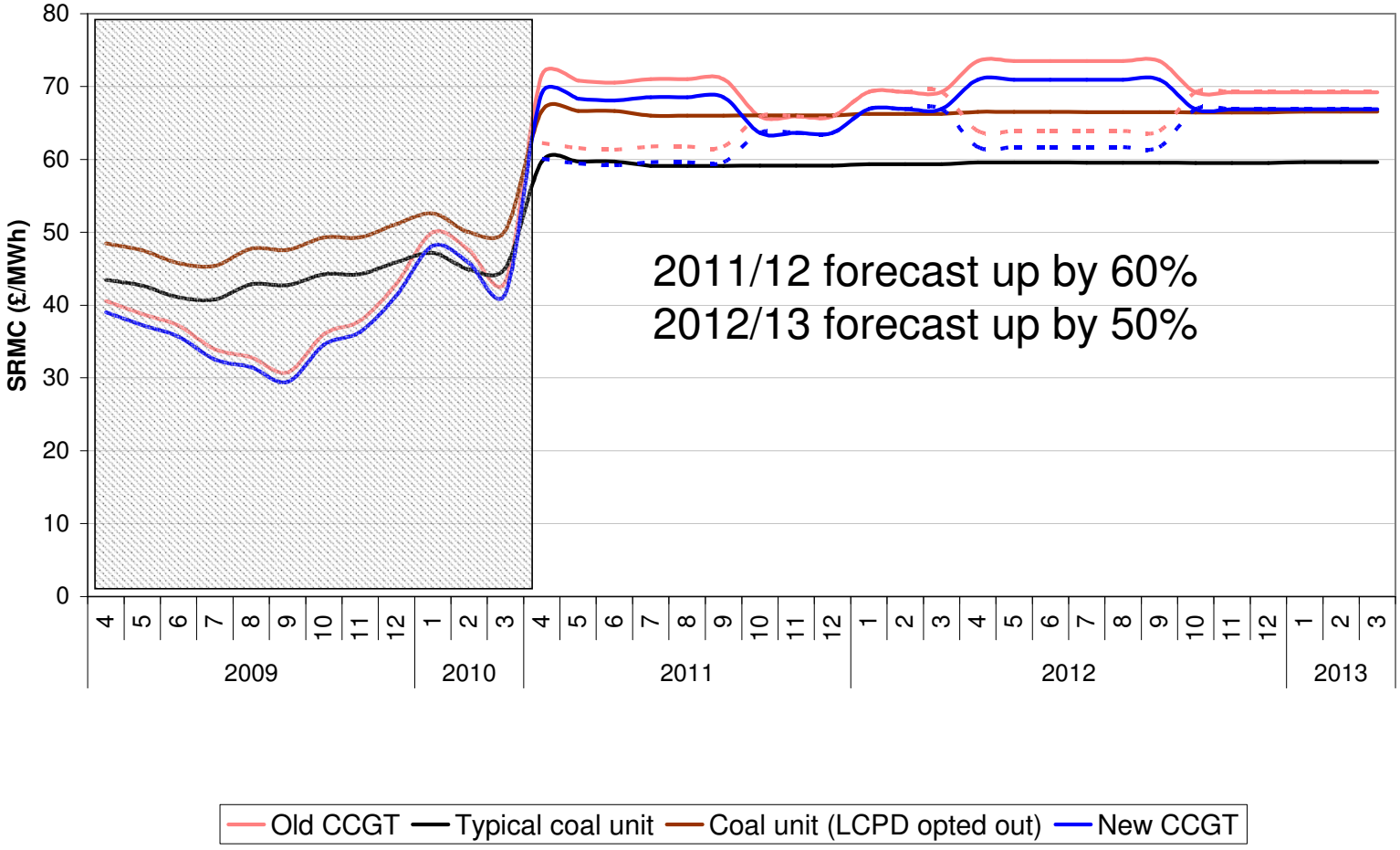

Effect of Movements in Gas Prices (down by 15% in winter)

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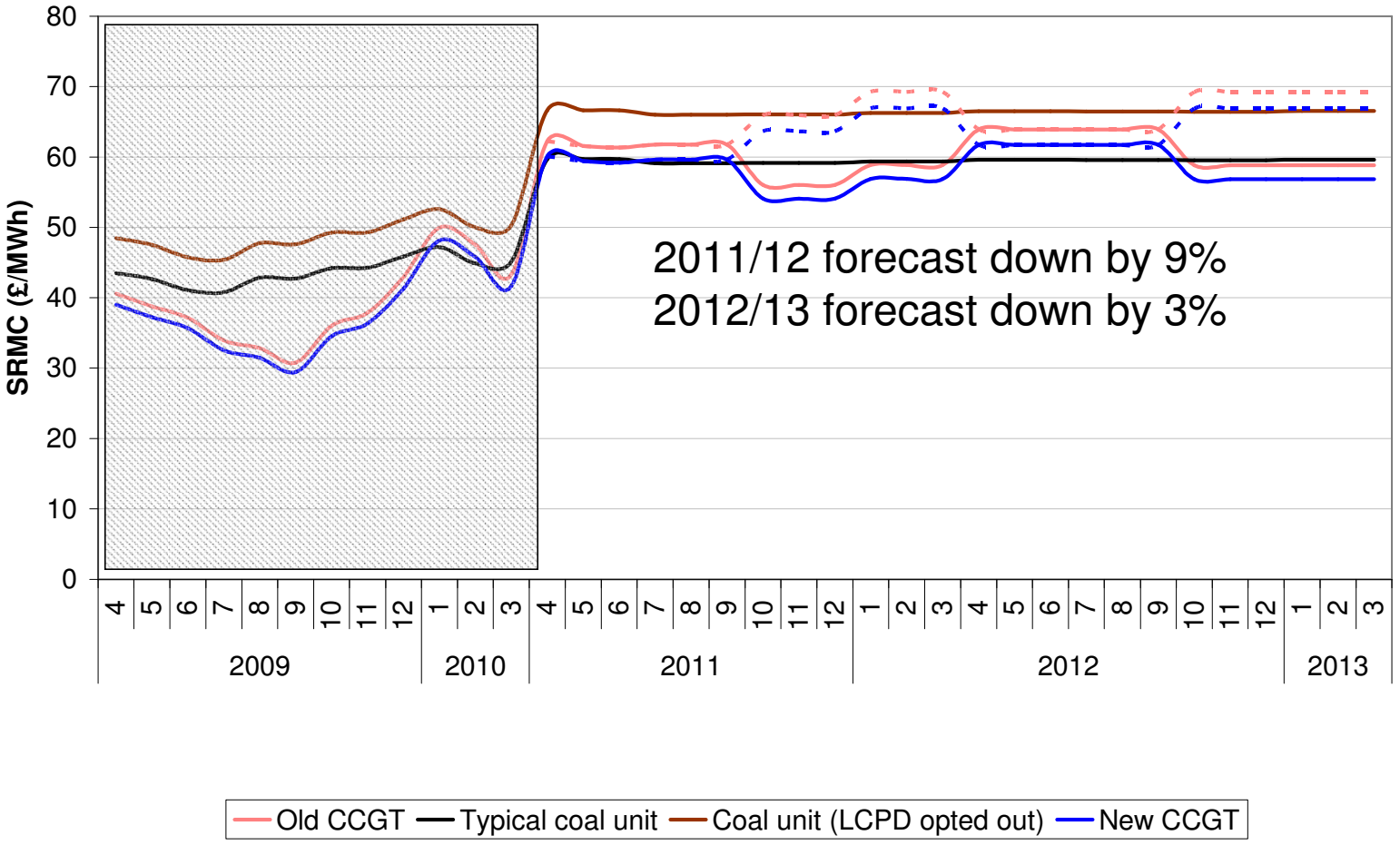
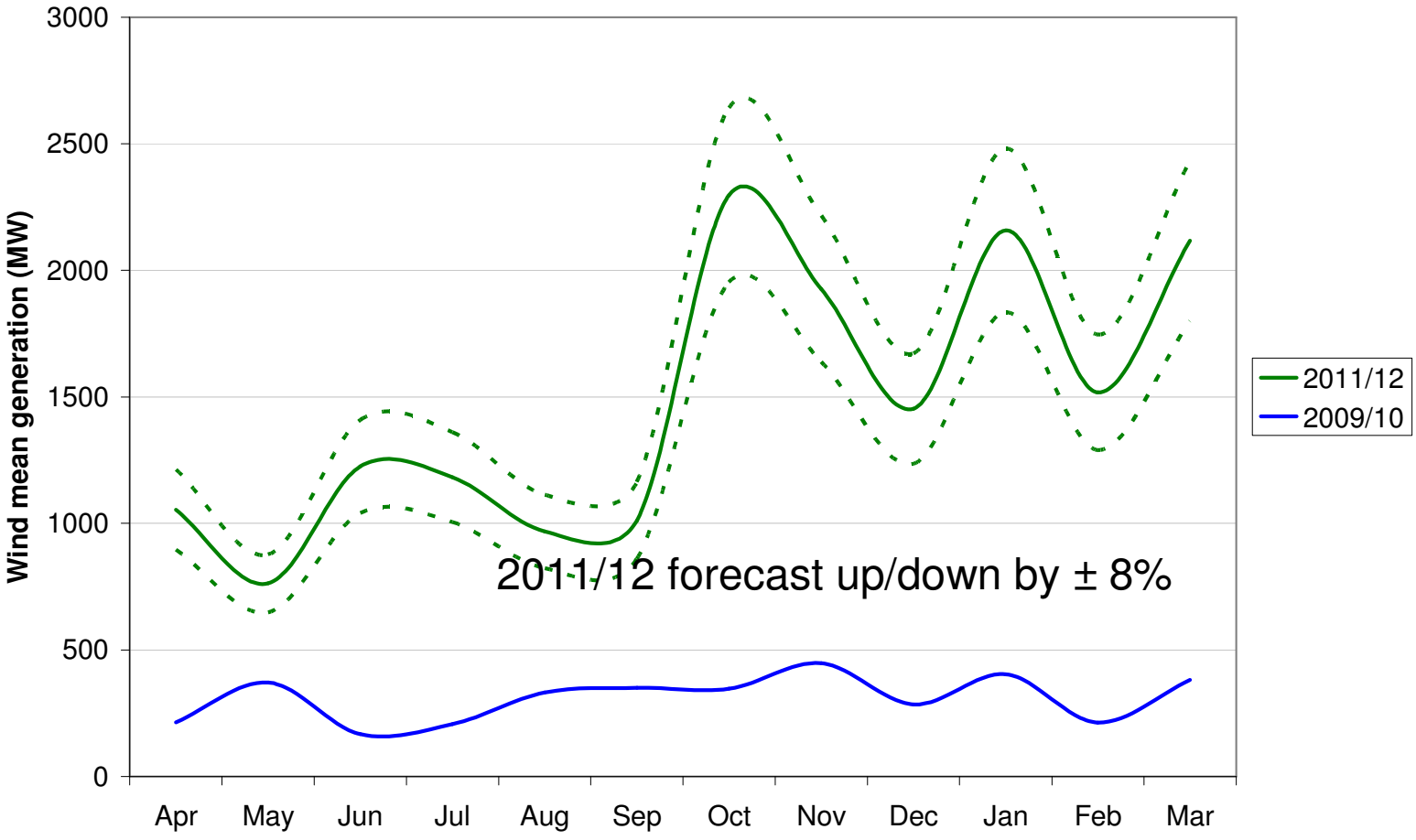
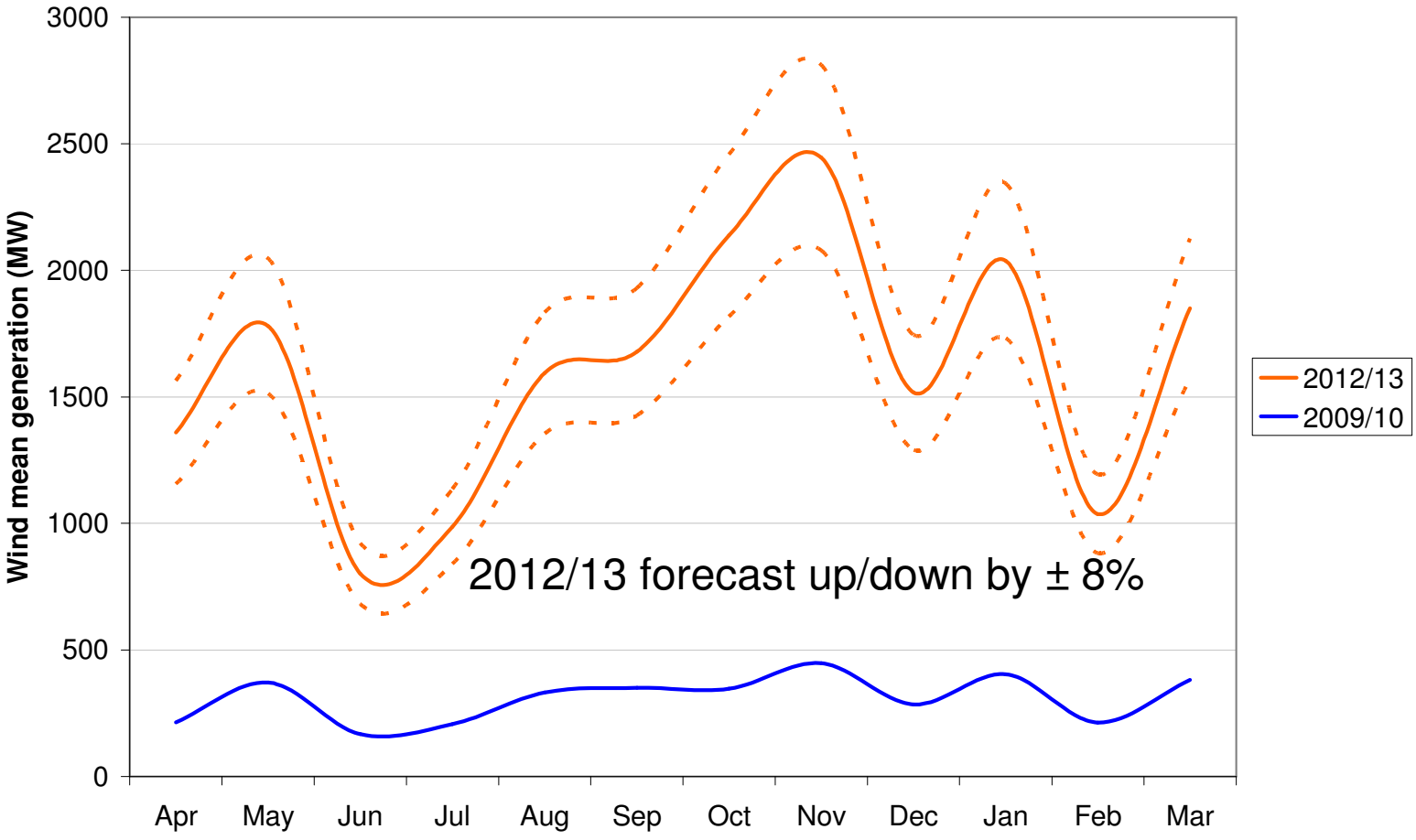


Wind sensitivity 2011/12 (±15%)



Wind sensitivity 2012/13 (±15%)



Constraints Forecast - Range

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

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

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Summary

- 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

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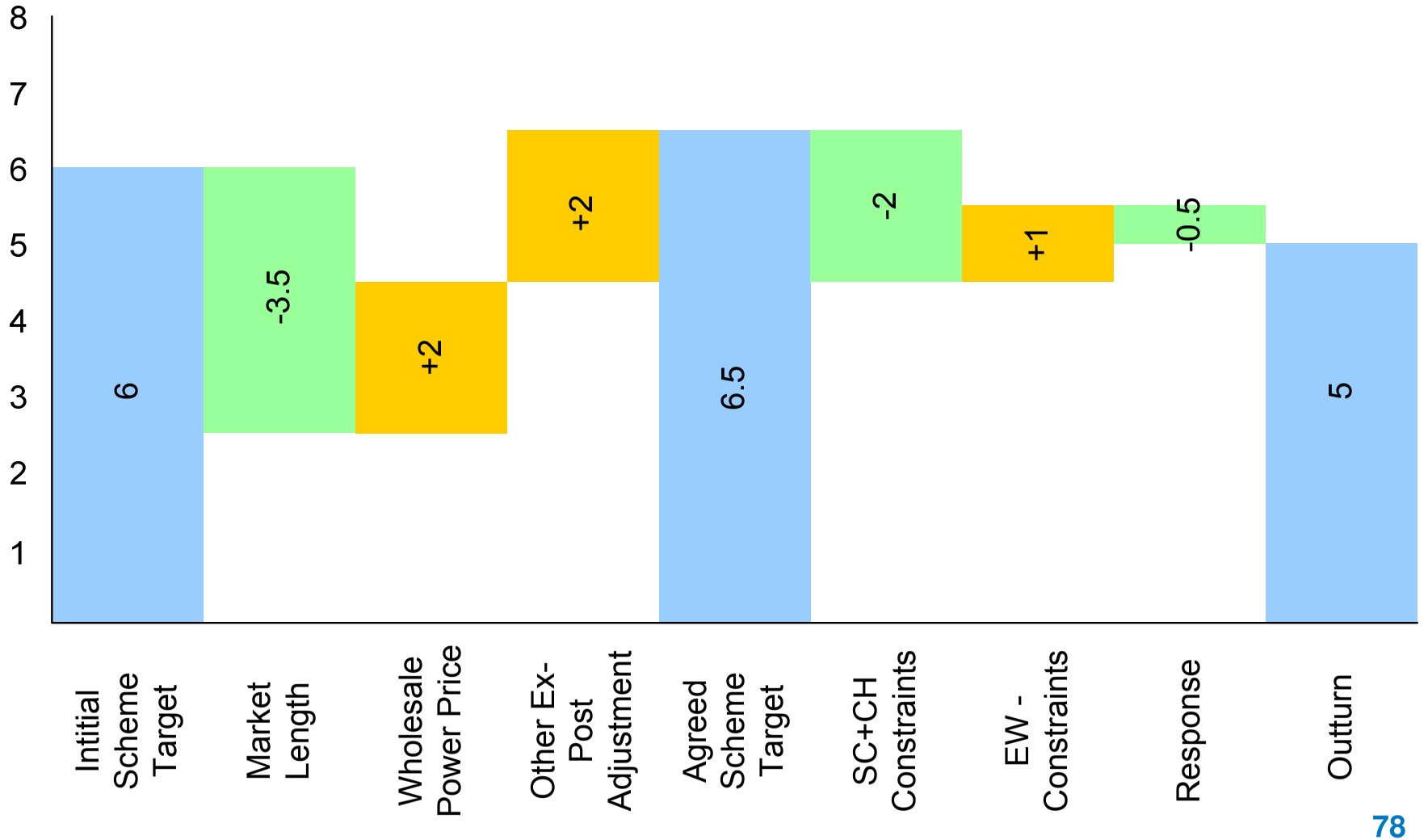
BSUoS Reporting

Jo Faulkner, Balancing Services Manager

Waterfall Example



Monthly Forecast & Outturn Example

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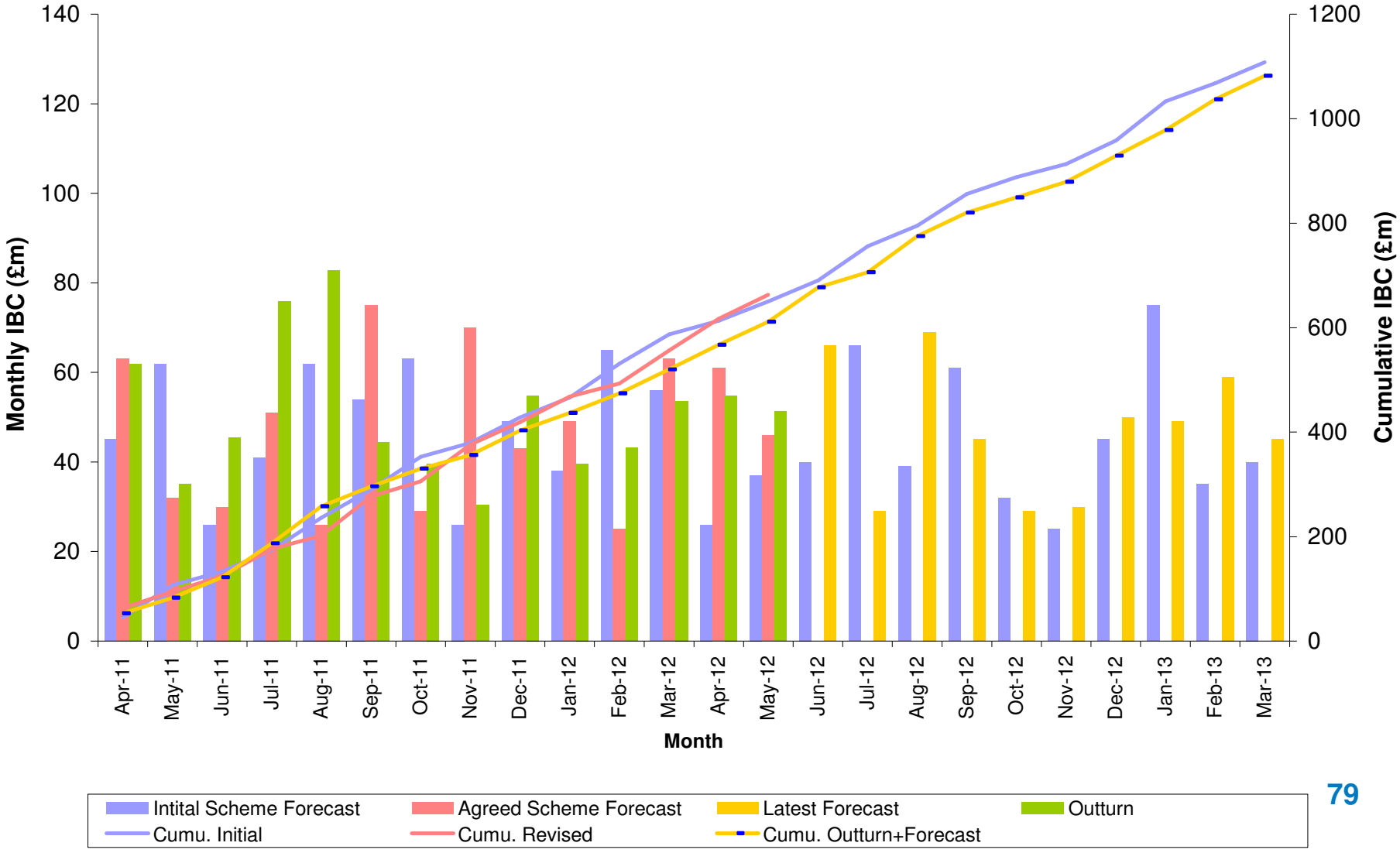
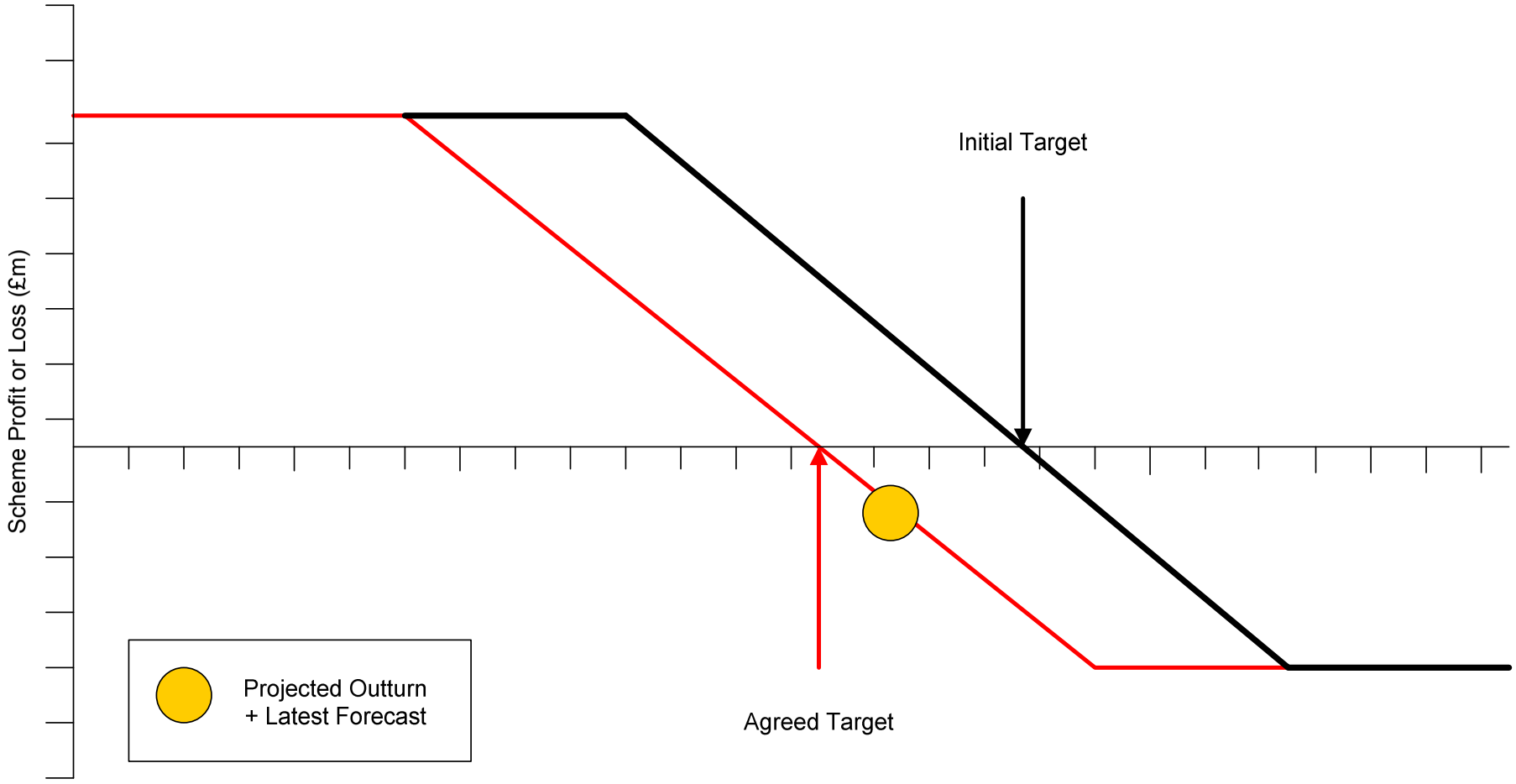


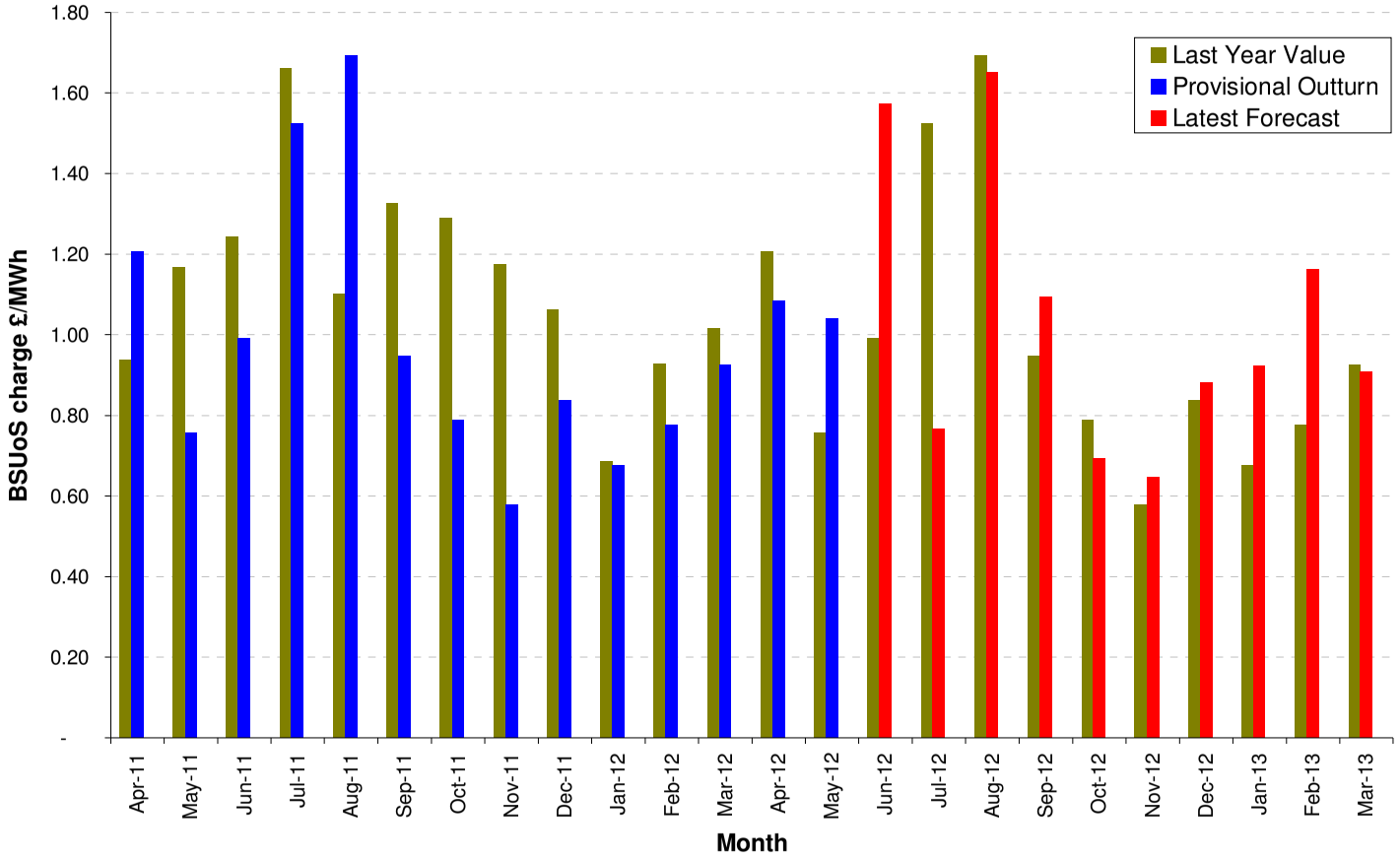
Scheme Chart Example



Monthly BSUoS Example

2011/12: £0.95/MWh

2012/13: £1.02/MWh



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Closing remarks

Alan Smart, Energy Operations Manager

Next Steps

- 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

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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General enquiries: SOincentives@uk.ngrid.com