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RIIO Electricity Transmission Workshop
10th & 11th November 2011

Talking Networks

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10th November 2011

Talking Networks

Jon Butterworth
Safety, Sustainability & Resilience Director

Agenda

Time	Description
9:30 - 10:00	**Coffee & Registration**
10:00 – 10:30	**Introduction – Jon Butterworth**
10:30 – 12:30	**Business Plan Q&A** An overview of our July submission and how stakeholders' views have influenced our plans followed by Q&A
12:30 – 13:15	**Lunch**
13:15 – 15:15	**Uncertainty Mechanisms** -The principles of uncertainty mechanisms -The uncertainties we have identified -Our proposed mechanisms to deal with those uncertainties
15:15 – 15:30	**Coffee Break**
15.30 – 17.00	**Charging** -What could all of this mean for your charges?
17.00 – 18.15	**Drinks Reception**

Stakeholder Engagement: Round 3

- This round of workshops will focus on the areas where you have asked for more detail and the areas where we would like to explore your views further
- What's different this time?
  - We have built in more time for discussion so that we can fully explore your thoughts and opinions
  - We are asking you to provide written responses to the questions we are discussing following the workshop, to ensure we are interpreting the discussions here today correctly
- We want to ensure that our plans are delivering what you want from our network

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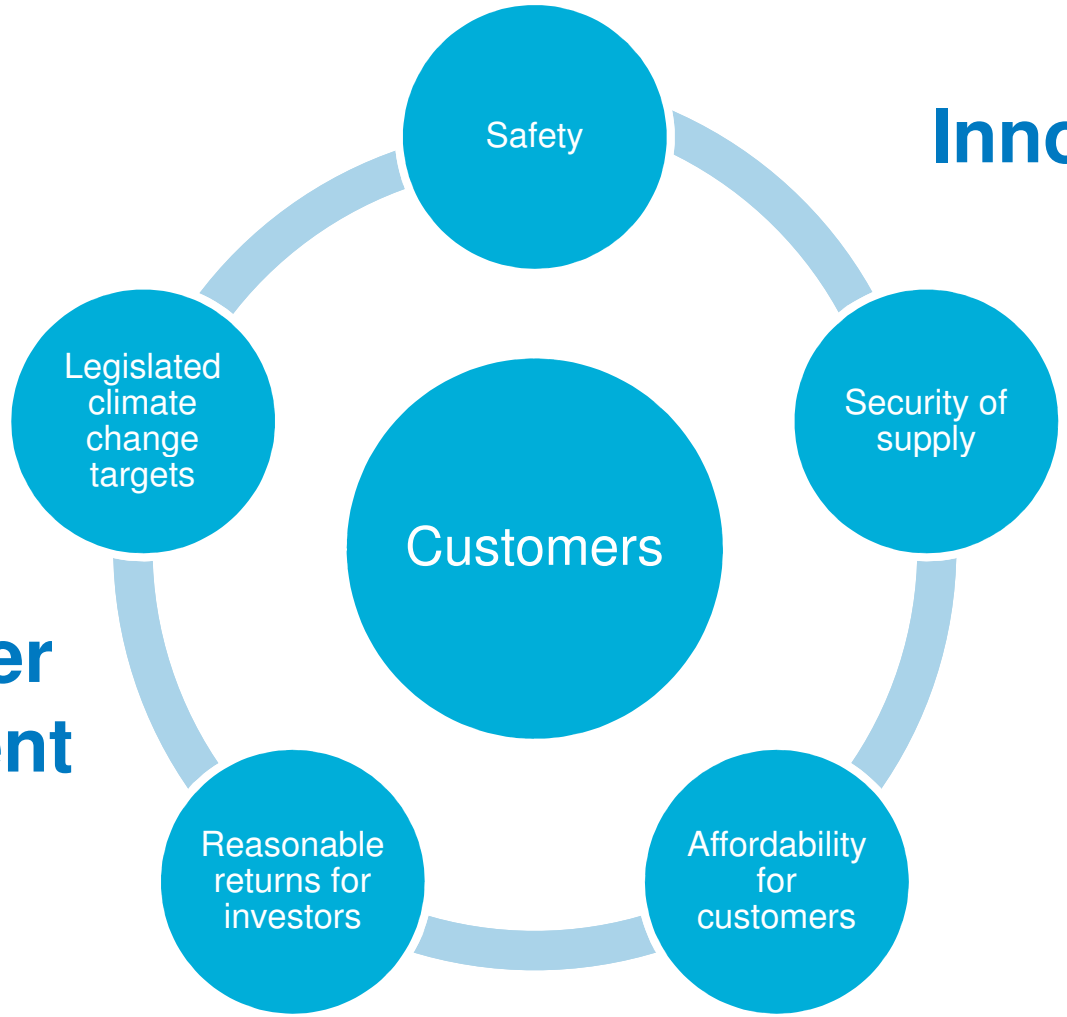
Business Plan Q&A

Talking Networks

Pauline McCracken
Price Review Manager

The business plans



Innovation

Stakeholder Engagement

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We developed our plans in conjunction with stakeholders' views

Safety	Environment	Reliability	Customer Satisfaction	Customer Connections	Innovation
"Safety is non negotiable"	"Facilitate low carbon energy"	"Reliability must be maintained"	"Improve customer service"	"Process must be improved"	"Innovation is crucial"

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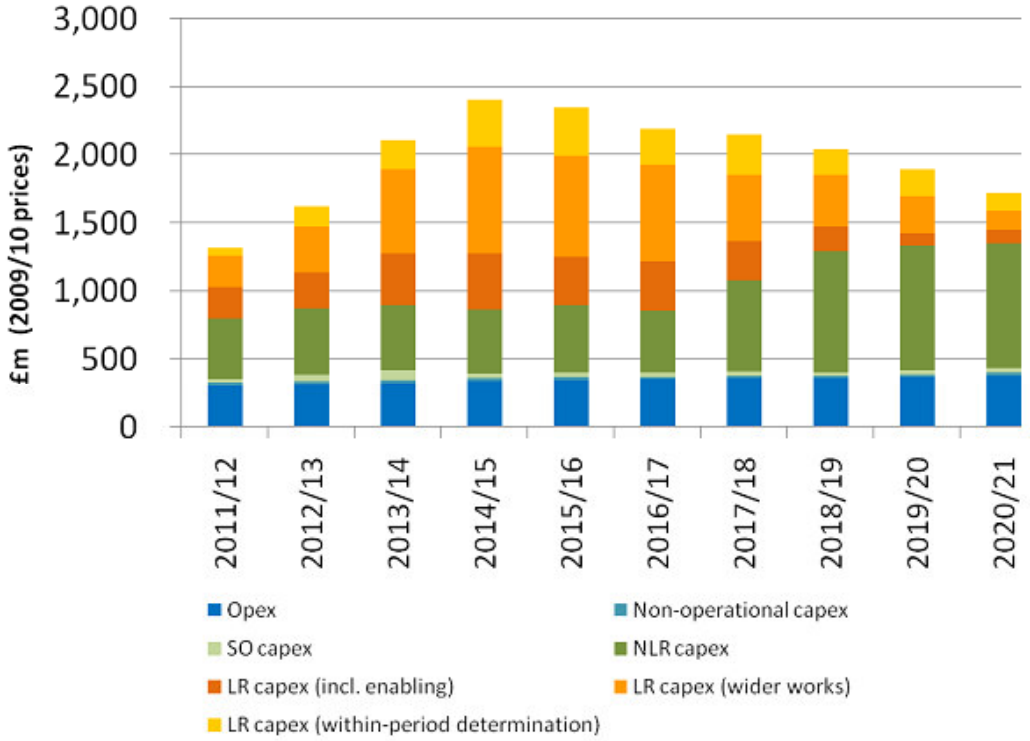
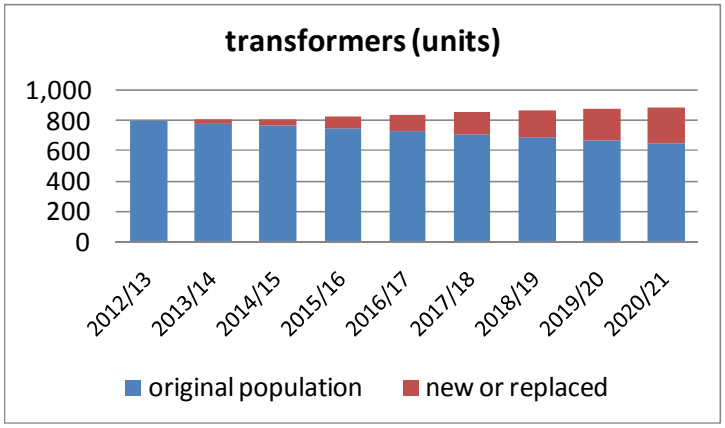
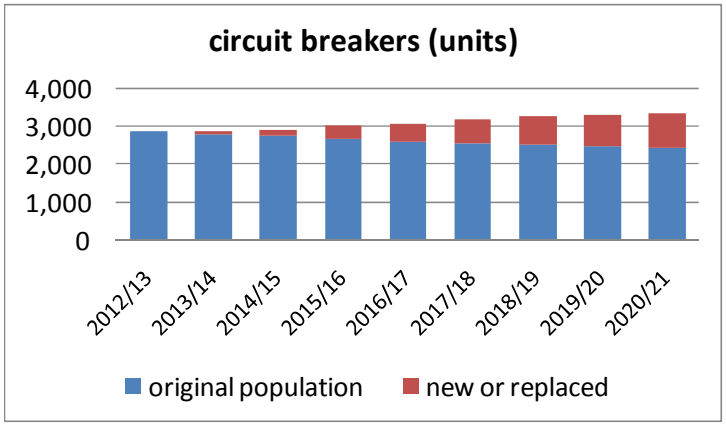
Baseline plan expenditure



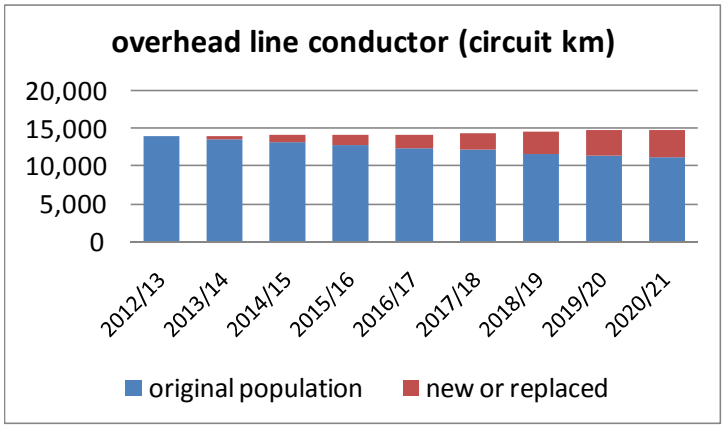
Capex		Opex		'Totex'
£14.0 bn	+	£2.8 bn	=	£16.8 bn

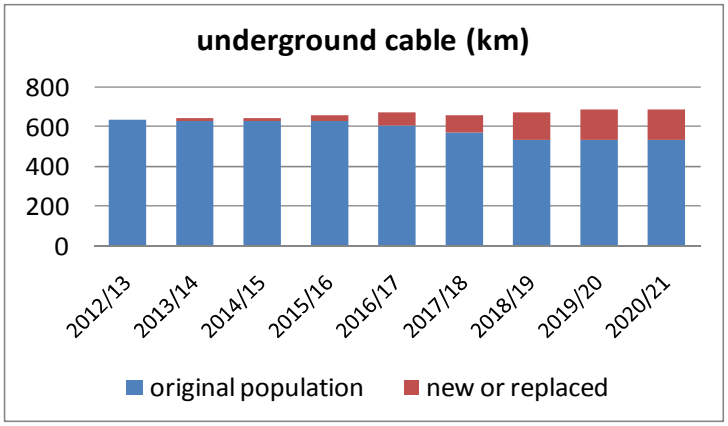
Our baseline plan will transform our network to meet customers' needs



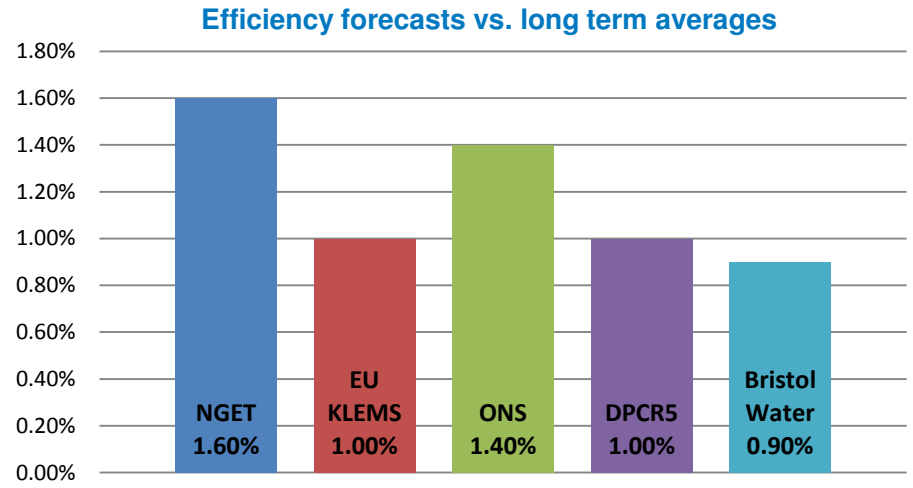


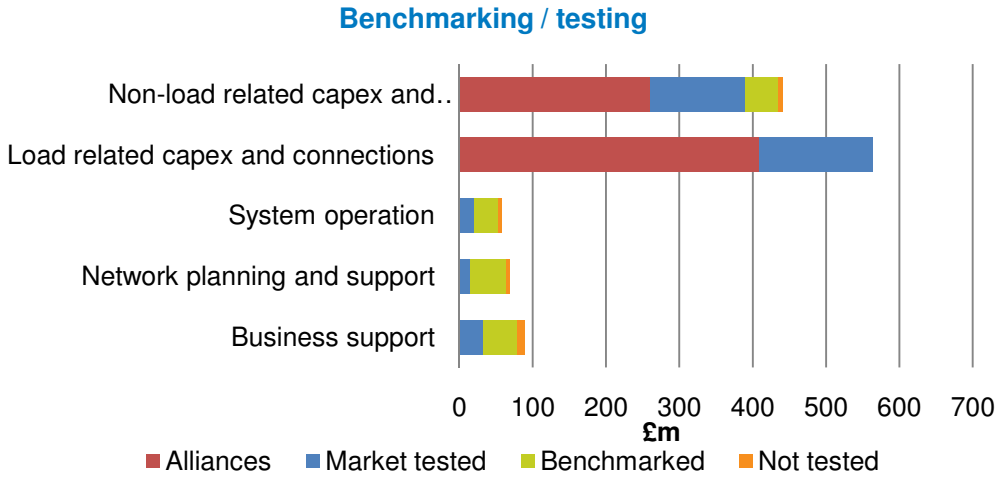
Our total load- and non-load related investment will extend, reinforce and replace our existing asset base



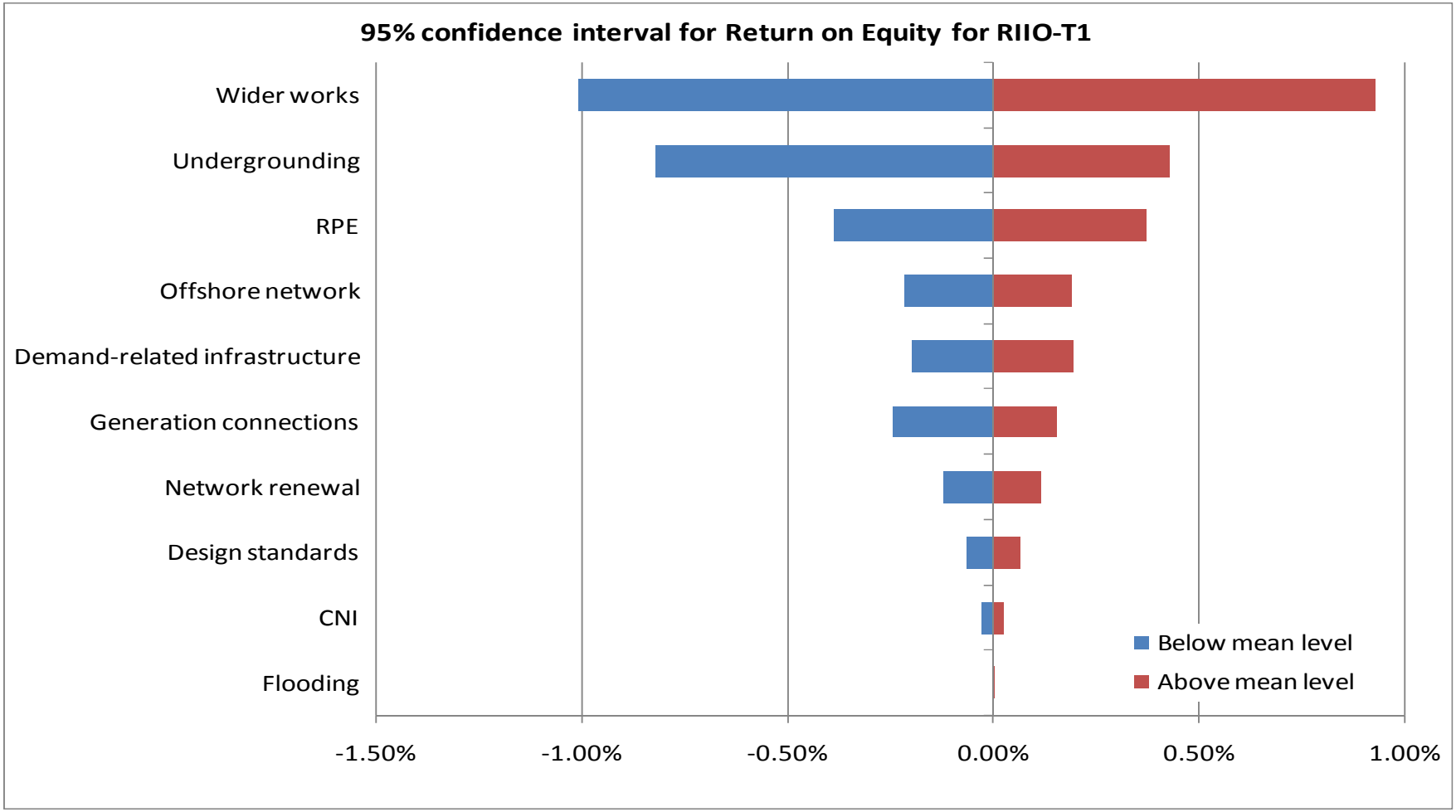


A challenging baseline plan



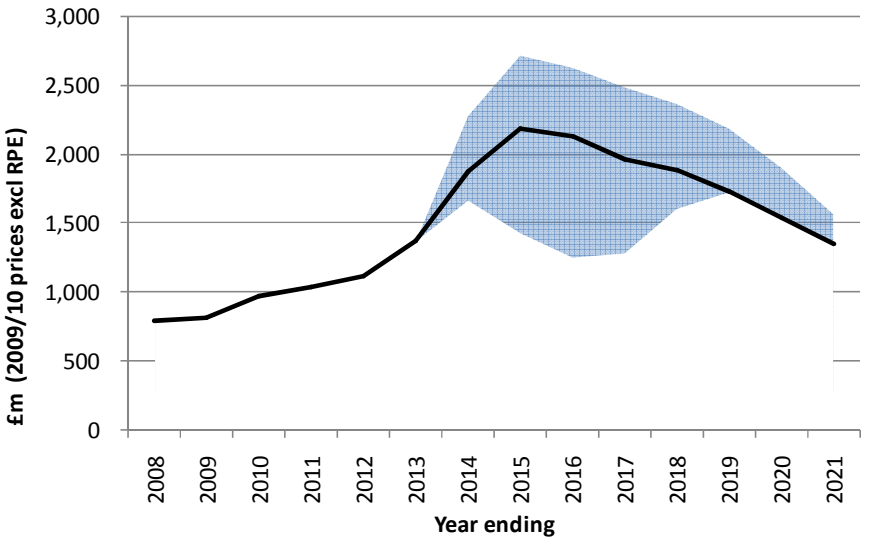


Managing risk & uncertainty



Uncertainty Mechanisms

Our baseline RIIO-T1 plan is only one view of the future…



Mechanisms we proposed:

- allow the regulatory control to adapt to an uncertain future
- ensure the RIIO-T1 package remains appropriate across a wide range of potential outcomes
- allow us to deliver desired outputs in future scenarios outside what is currently considered credible through the use of specific and targeted ‘re-openers’

welcome

National Grid’s Business Plan

Stakeholder Engagement

- Stakeholder engagement to date has been welcomed
- National Grid appears keen to hear a wide range of stakeholder views and incorporate these into the business plan
  - Enables all parties to hear both sides of the arguments
- Extent of stakeholder engagement has been challenging
  - Large number of events
  - There are a number of similar issues across TOs
  - There may be a value in co-ordinating and aligning work with other TOs

Consultations

- Online questionnaire worked well for initial feedback
- Stakeholder consultation review was also welcome
  - Short, concise and clear enabling stakeholders to respond to the issues
- There has been some duplication of consultations amongst TOs
  - May be value in co-ordinating?
- Timing of consultations needs to be considered and co-ordinated

National Grid's Business Plan

- Very transparent – everything was published
- Clearly represented culmination of a large piece of work
- We welcome the detail to inform our business plans and decisions
  - Detail of what was being proposed was hard to find
  - Summary of what was being proposed with a short explanation would have been useful
  - Could have benefitted from a clear concise summary using a standard format
- Issues of importance for stakeholders and National Grid may not always been aligned

Lunch…..

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Managing risk and uncertainty

Talking Networks

Hêdd Roberts
Price Control Commercial Manager

Key messages

- There are uncertainties surrounding our forecasts, driven by delivery of outputs, input prices and volumes of activity
- We have identified the risks and uncertainties within our business and proposed management responses to deal with them
- Our principle is that risk should sit with the party best placed to manage it
- Have we identified an appropriate range of uncertainty mechanisms?

How we quantified the risks

Uncertainty	Data sources & analysis
Wider reinforcement works	Generation & demand scenarios Slow progression, gone green and accelerated growth
Local generation connections	
Costs of meeting planning requirements	Range of stakeholder views
Real price effects	Range of independent forecasts
Demand-related infrastructure	DNO forecasts & information from other directly-connected customers
Network renewal volumes	Probabilistic analysis around forecast asset degradation
Offshore network impact	Separate analysis of possible outcomes
Design standard changes	
Critical National Infrastructure	
Flood and erosion protection	

Management response

- We have considered how each risk could be managed by National Grid
- There are three generic types of management action that might be taken:
  - Actions to reduce the probability of an adverse event
  - Actions to 'buy' an option to reduce the impact if an adverse event occurs
  - Actions to be taken when the adverse event occurs to mitigate the effect
- There are costs associated with some of these actions, but they must be considered against the potential effect

Management response summary 1

Uncertainty	Management response
All	Re-profile non-load related expenditure based on network output measures
	Develop new smart techniques by developing commercial arrangements and specialised service contracts with users
Costs of meeting planning requirements	Commit sufficient resources to ensure planning applications include an effective presentation of need case, the consideration of stakeholder views and an exploration of alternative options
	Explore alternative technology options, such as Gas Insulated Line
Real price effects	Hedging against commodity prices
	Hedging against currency fluctuations
	Procurement activities including forward purchase
Flood & erosion protection	Engagement with Environment Agency on future approach to funding

Management response summary 2

Uncertainty	Management response
Network renewal volumes	Development of numerical techniques to forecast asset degradation
	Availability of appropriate spares to cover failure of high criticality assets
	Deploy enhanced asset monitoring approaches (e.g. line surveys, monitoring equipment) and mitigation options (e.g. establish safety management zones)
	Insurance
Design standard changes	Keep standards up to date to reflect the latest technology, characteristics of user requirements and commercial opportunities
	Application for a derogation against the requirements of the security standards
Critical National Infrastructure	Engagement with DECC on the prioritisation and timing of increased requirements

Risk allocation

- Risks should fall on those parties best able to manage them
  - We need to find the management responses which reduce standard deviation

National Grid	Customer	Consumer
• For risks that can be managed by National Grid, we have calculated the impact on our regulatory contract value	• For risks that can be managed by customers, we will pursue commercial developments which better share those risks between National Grid and customers and make information available to allow them to be managed	• Where there are good arguments for risks to fall on consumers, we have proposed the associated uncertainty mechanisms

Measuring risks
Standard deviation

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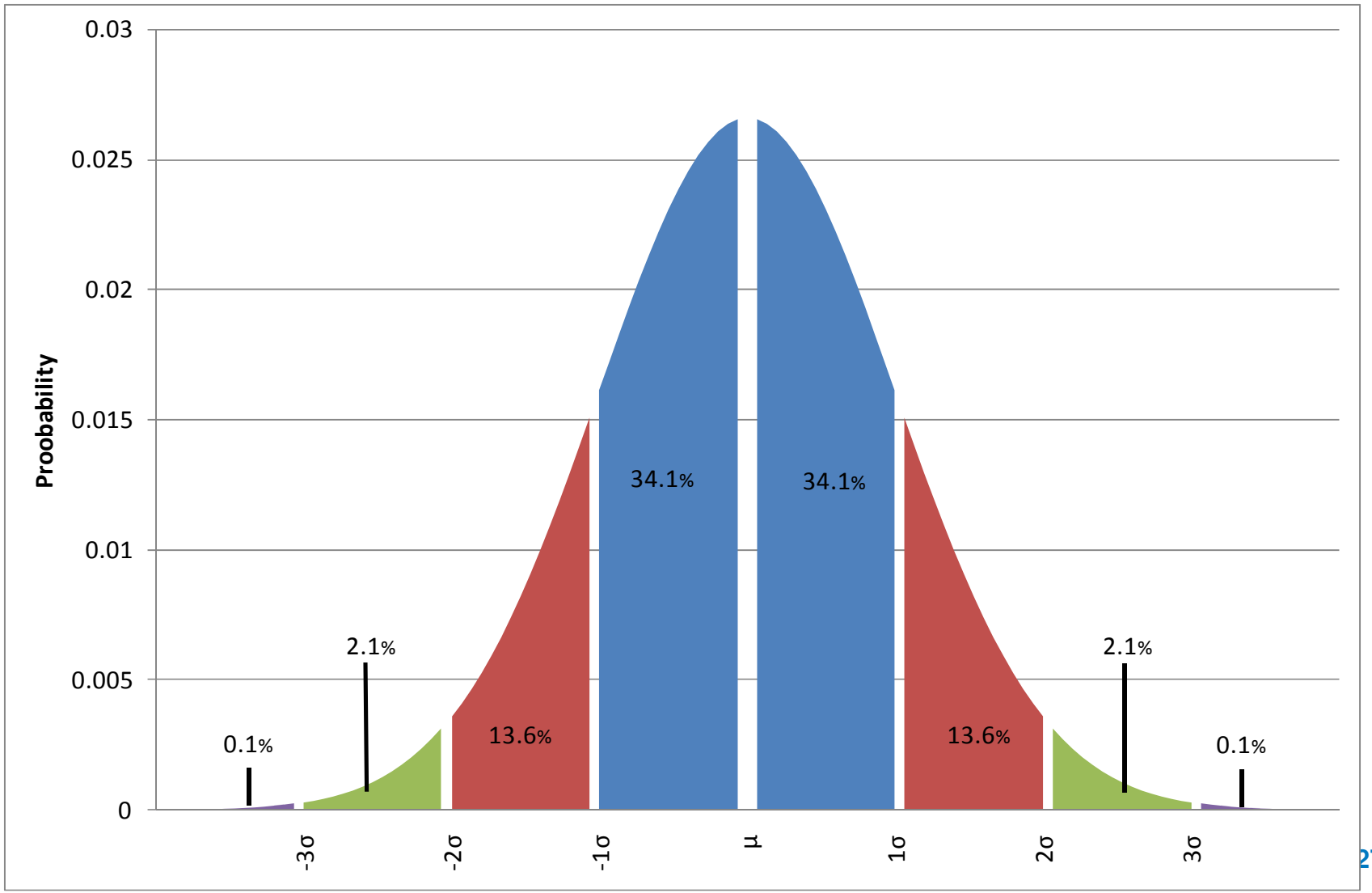
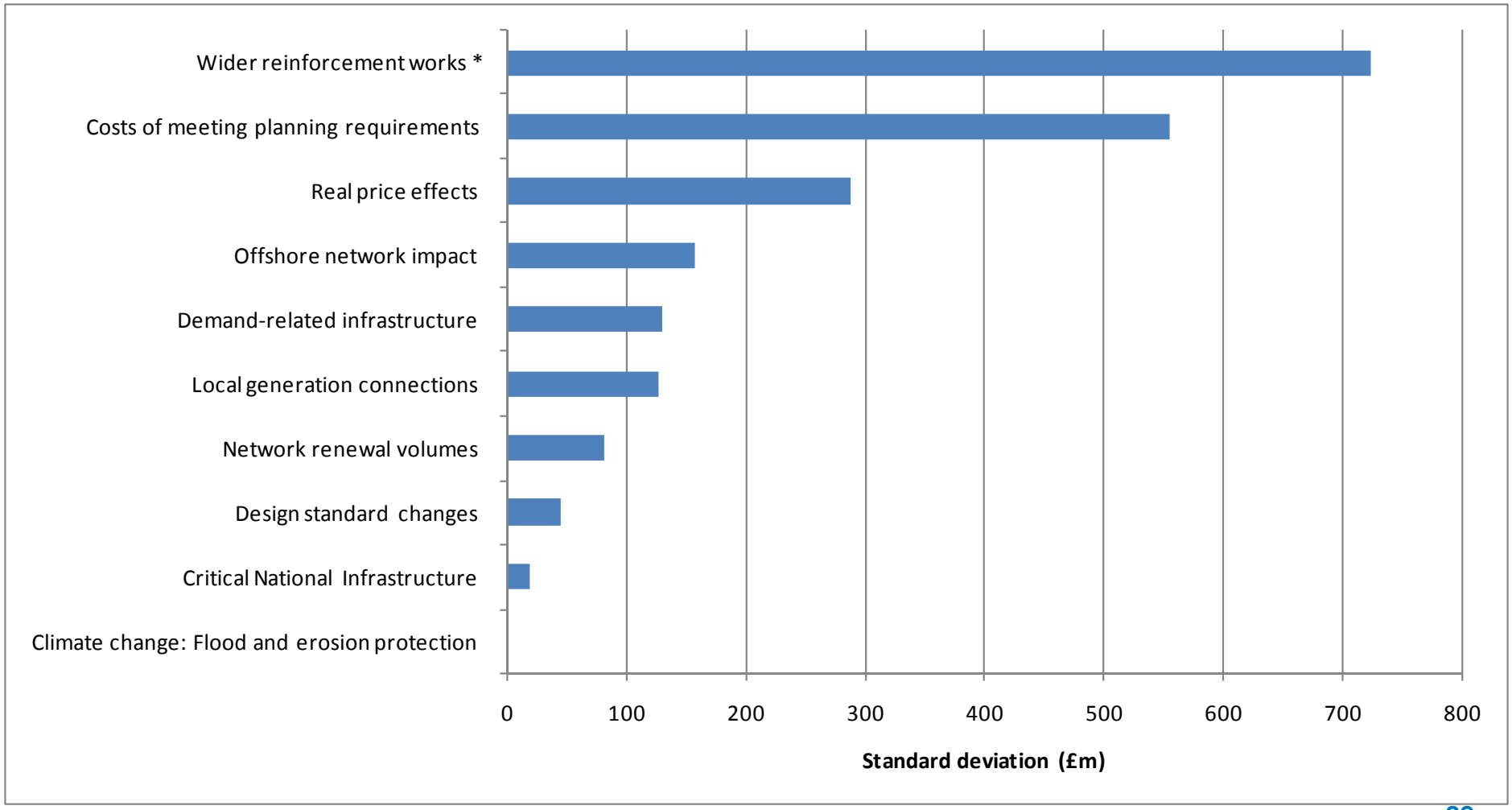


Quantifying risks



* Based on 3 boundaries wider system only

Uncertainty mechanism summary 1

Uncertainty	Proposed uncertainty mechanism
Wider reinforcement works	Network planning policy with volume-drivers based on incremental boundary capacity delivered
	Within-period determination for projects with sufficient materiality
Costs of meeting planning requirements	Volume-driver based on length of underground cable and cost of other mitigations
Real price effects	Copper price tracker with dead-band and time-lag
Offshore network impact	Specific re-opener for changes to the offshore regime that would otherwise undermine other uncertainty mechanisms
Demand-related infrastructure	Volume-drivers based on number of new transformers for different reinforcement types
	Volume-driver for associated overhead lines

Uncertainty mechanism summary 2

Uncertainty	Proposed uncertainty mechanism
Local generation connections	Volume-drivers based on connection capacity for different connection types
	Zonal volume-driver for other enabling works
	Volume-driver for associated overhead lines
Network renewal volumes	Appropriate design of Network Output Measures secondary deliverables
Design standard changes	Specific re-opener for fundamental changes with a materiality threshold. Impact on allowances determined as part of regulatory impact assessment
Critical National Infrastructure	Specific re-opener windows with materiality threshold
Climate change: Flood and erosion protection	Specific re-opener windows with materiality threshold

Calculating the standard deviation: Risk modelling

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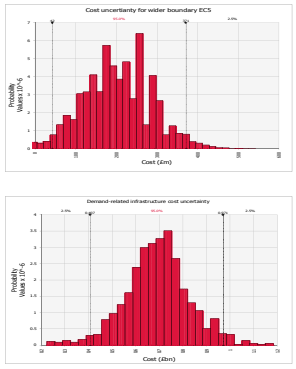
Probability distributions for each of the uncertainties
Including specific management actions

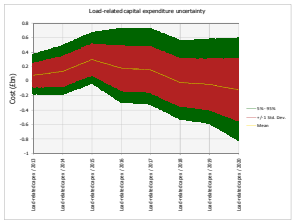


Uncertainty mechanisms

Other management actions
Re-profile non-load related capex

Monte Carlo simulation

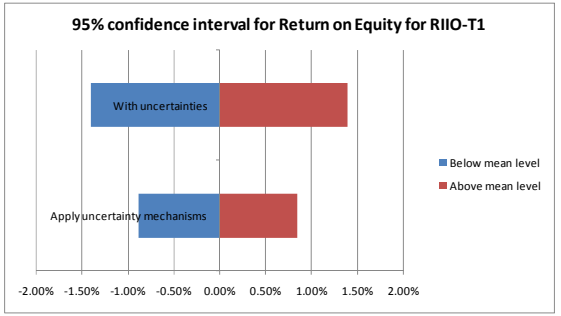
Simulation output
Δ load-related capex
Δ non-load related capex
Δ opex
Δ outputs



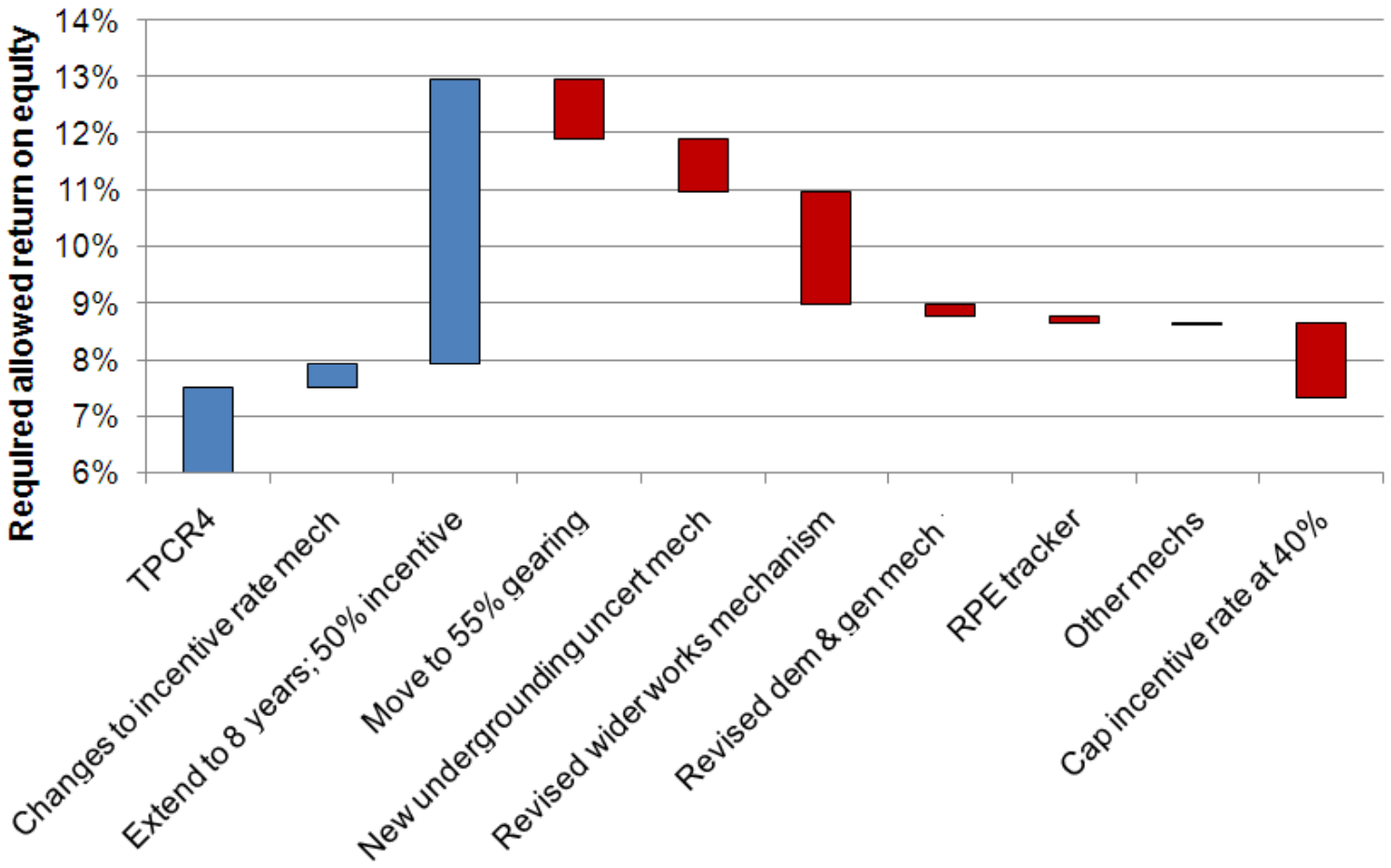
Price control
TPCR4
RIIO-T1
Gearing
Number of years
Incentive rate

RIIO T1

Output
Internal Rate of Return
Return on equity
Present Value Cashflow
Pre and post-tax



Sharpe ratio analysis



Exploring different combinations

- We have published a simplified version of the risk model which runs in Excel

- This allows stakeholders to explore different combinations of uncertainty mechanisms and see the impact on the standard deviation of National Grid's return

QUESTIONS

- Do you agree that uncertainty mechanisms should be employed to adjust allowed revenues where the associated costs are uncertain and outside of our control? If not, what other mechanisms do you consider could be appropriate?
- Do you believe that the range of the uncertainty mechanisms proposed is appropriate? Have we correctly identified the uncertainties outside of our control?

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Coffee….

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Charging

Mark Ripley
Regulatory Frameworks Manager

Key messages

- We believe that predictability and transparency are the most important elements of charging for you
- We do a lot to help customers understand their charges, but could we do more?
- There are additional things we could do to improve predictability
- The treatment of allowed revenue under RIIO combined with uncertainty mechanisms may result in year on year allowed revenue variation so we want to understand how we can help you more in this area

Stakeholder charging concerns

Predictability

Ability of users to forecast future transmission charges

Transparency

Information availability for customers to make informed charging forecasts

Stability ?

Level of change to charges over time

Are these your concerns regarding electricity transmission charges?

Which charges are we talking about?

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- Transmission Network Use of System (TNUoS) Charges

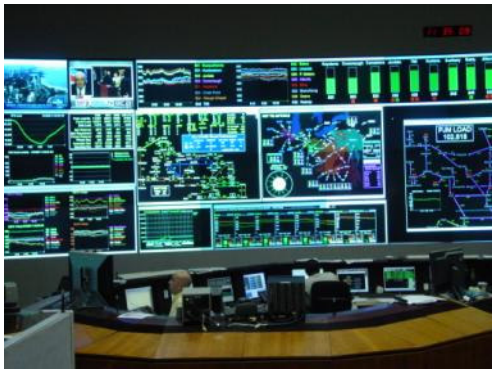
  (~ £1700m GB Wide forecast for 2011/12)

  - Recover transmission investment costs for all transmission owners
  - £/kW Tariff set annually ex-ante

- Balancing Services Use of System (BSUoS) Charges

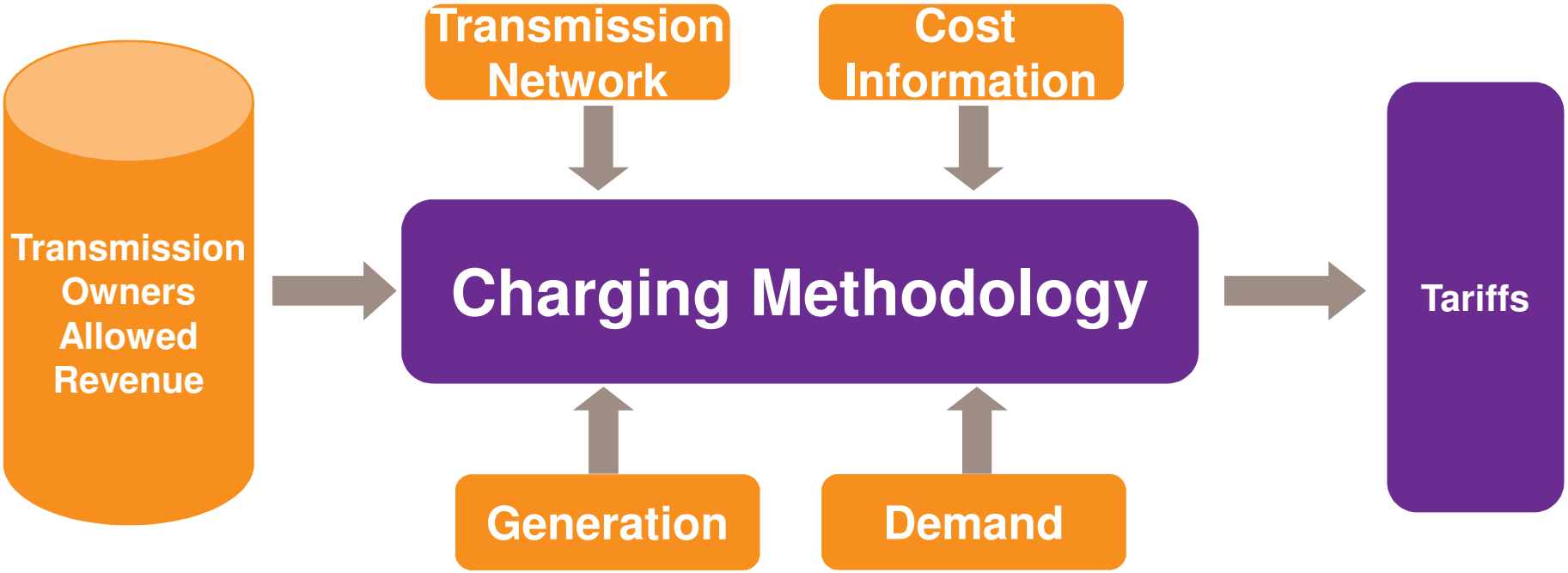
  (~ £770m forecast for 2011/12)

  - Recovers costs of operating the transmission system
  - £/MWh Tariff charged half hourly ex-post



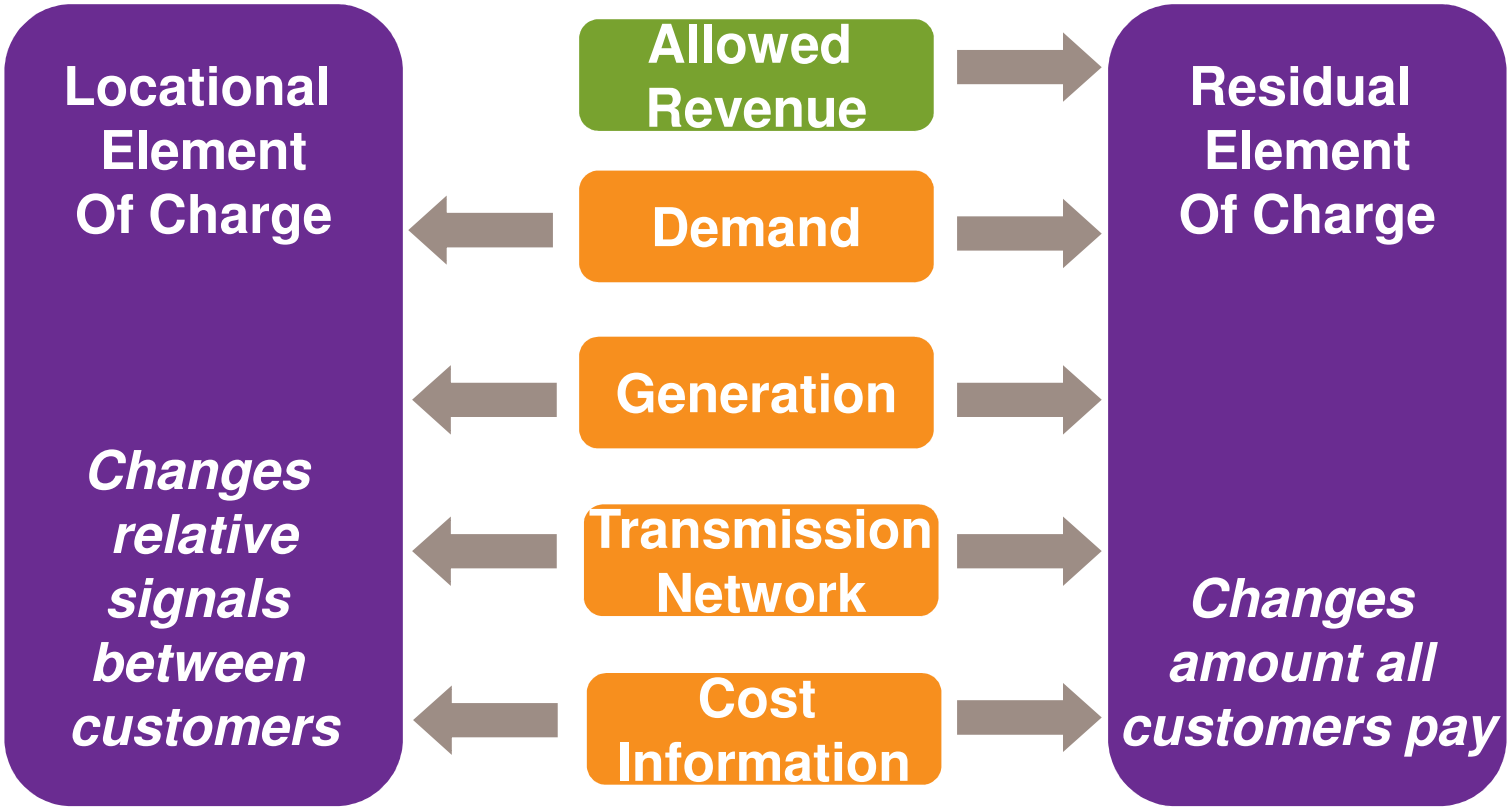
Predictability of TNUoS Charges

- Changes to tariffs can be caused through:
  - Changes to the actual methodology (Project TransmiT)
  - Changes to the inputs to the methodology



Which of these areas is of greatest concern to you?

Impact of changes to charging inputs



The predictability of which charging element is of more interest to you?

Illustrative example - additional £240m year 1 investment

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- Impact on revenue (size of the cake)

	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Incentive mechanism only	+£25.8m	+£10m	+£9.8m	+£9.7m	+£9.5m	+£9.4m
Incentive & uncertainty mechanisms	+£43m	+£16.7m	+£16.4m	£16.1m	+£15.9m	+£15.6m

- **Assumptions:**
  - **86% capitalisation rate; 40% efficiency incentive rate**
  - **5.14% WACC; 45 year depreciation life**

Illustrative example - additional £240m year 1 investment

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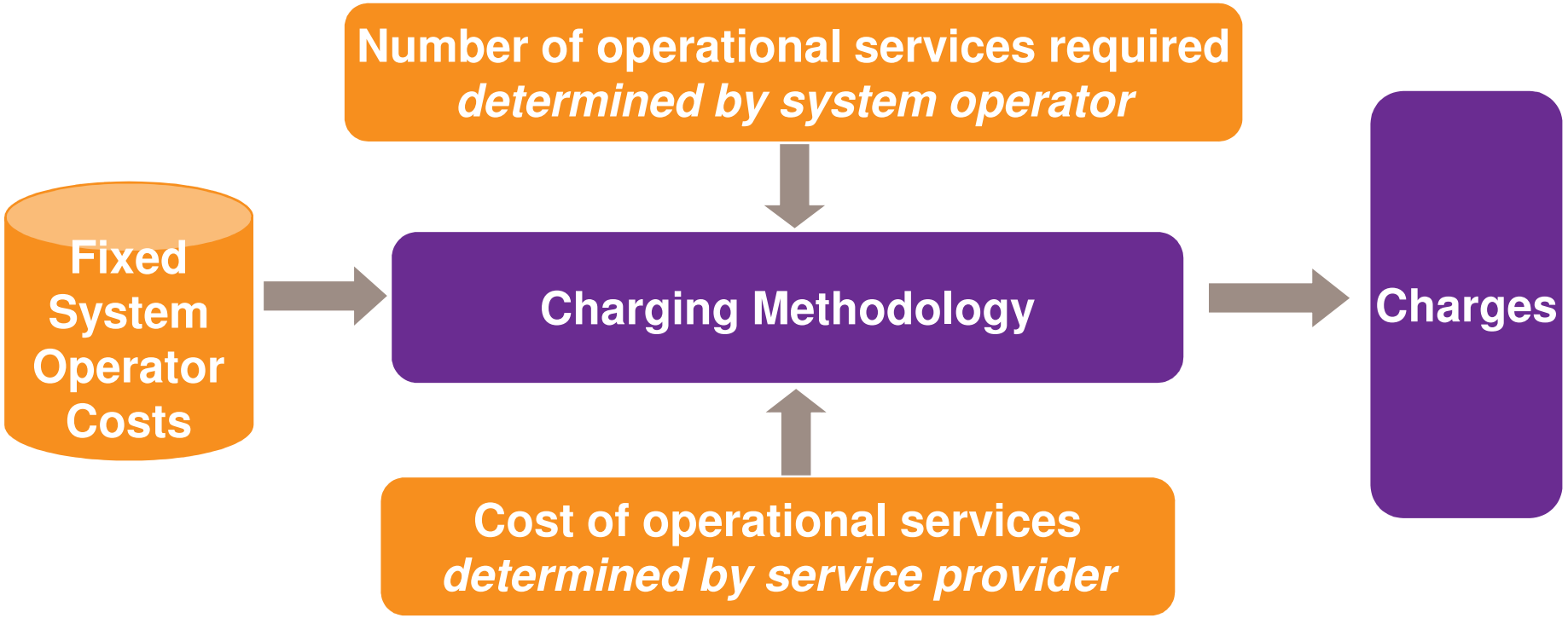
- Impact on charges (size and slicing of the cake)
  - This will depend on the reason for the investment

Investment driver	Charging Input Changes
Investment to accommodate a new power station connection	↑ Allowed revenue increases
	↕ Generation background changes – alters locational element to ensure cost reflectivity
	↑ Generation charging base increases
Investment to complete flood defence works at an existing transmission site	↑ Allowed revenue increases
Investment to underground an existing transmission line	↑ Allowed revenue increases
	↕ Transmission network changes – alters locational element to ensure cost reflectivity

Predictability of BSUoS Charges

- Changes to charges can be caused through:
  - Cost of services required by system operator
  - Number of services required by system operator



We believe that transparency can help predictability

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Predictability ← **assists** — **Transparency**

- We currently help customers understand their charges by;
  - Forward publication of use of system tariffs
  - Making available our TNUoS calculation model
  - Producing a 5 year indicative forecast of locational TNUoS charges
  - Presenting and discussing proposed methodology changes at TCMF
  - Providing charging tutorials to industry
  - Publishing generation, demand and network data in the Seven Year Statement

Can we do more to help you understand and predict transmission charges?

How else can predictability be managed?

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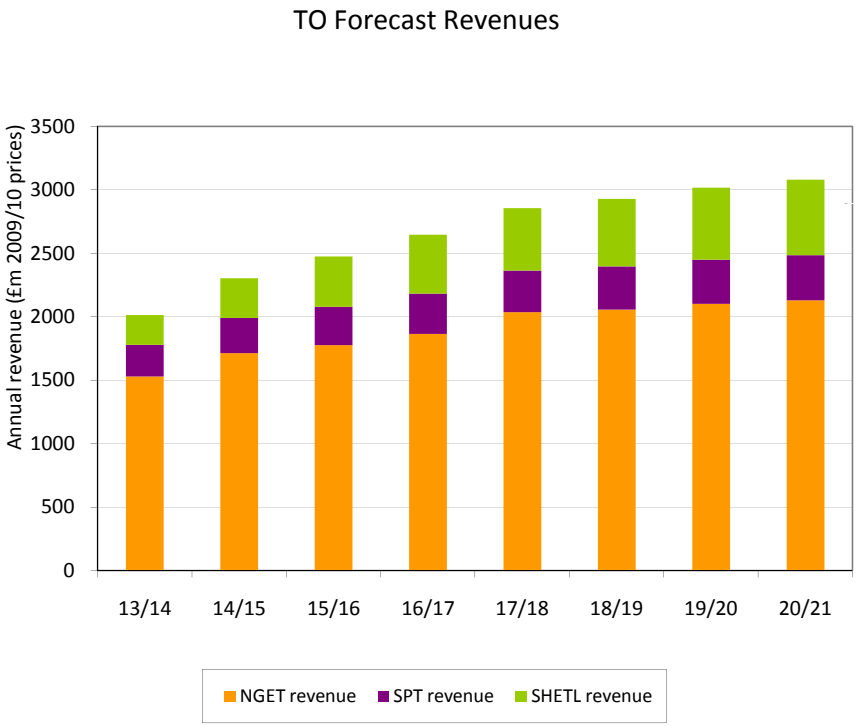
- Methodology changes
  - Consideration of transitional arrangements
  - Communication of changes
- Input changes
  - Improve transparency of information
  - Better forecast information – can you help?
  - Fix one or more inputs to charging methodology
- Output changes
  - Fix charges
  - Fix element of charges (e.g. locational)
  - Frequency of tariff setting

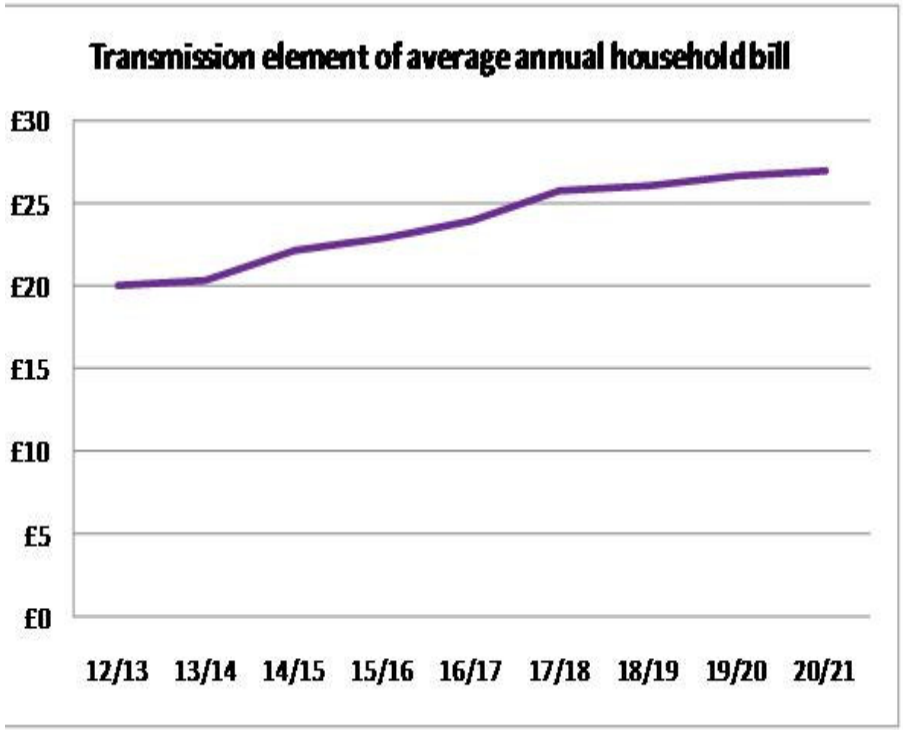
} ***How do we manage increase in volatility on remaining customers?***

Do you have any other suggestions?

Stability of Charges

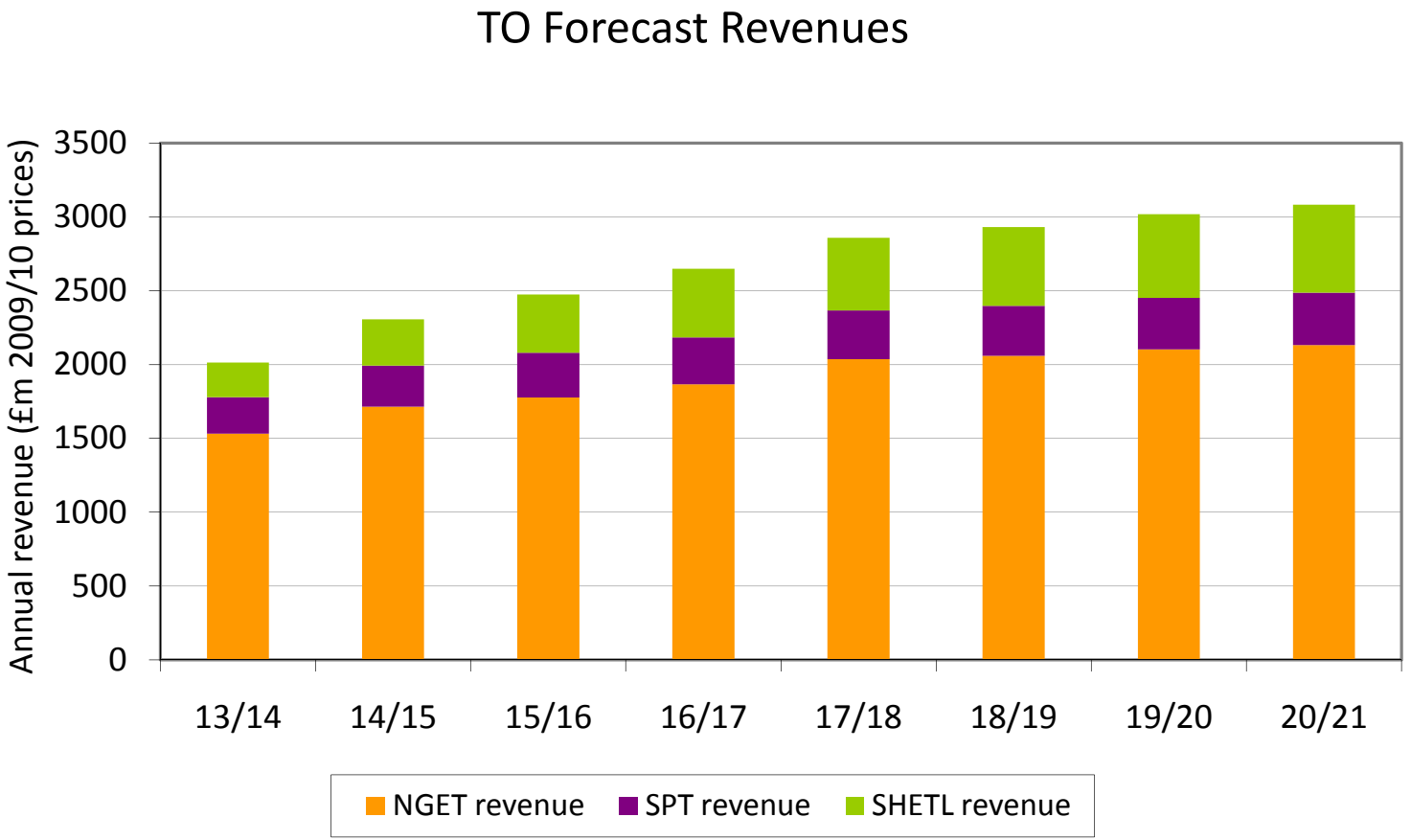
Transmission Investment → **can result in** → **Transmission Charges**





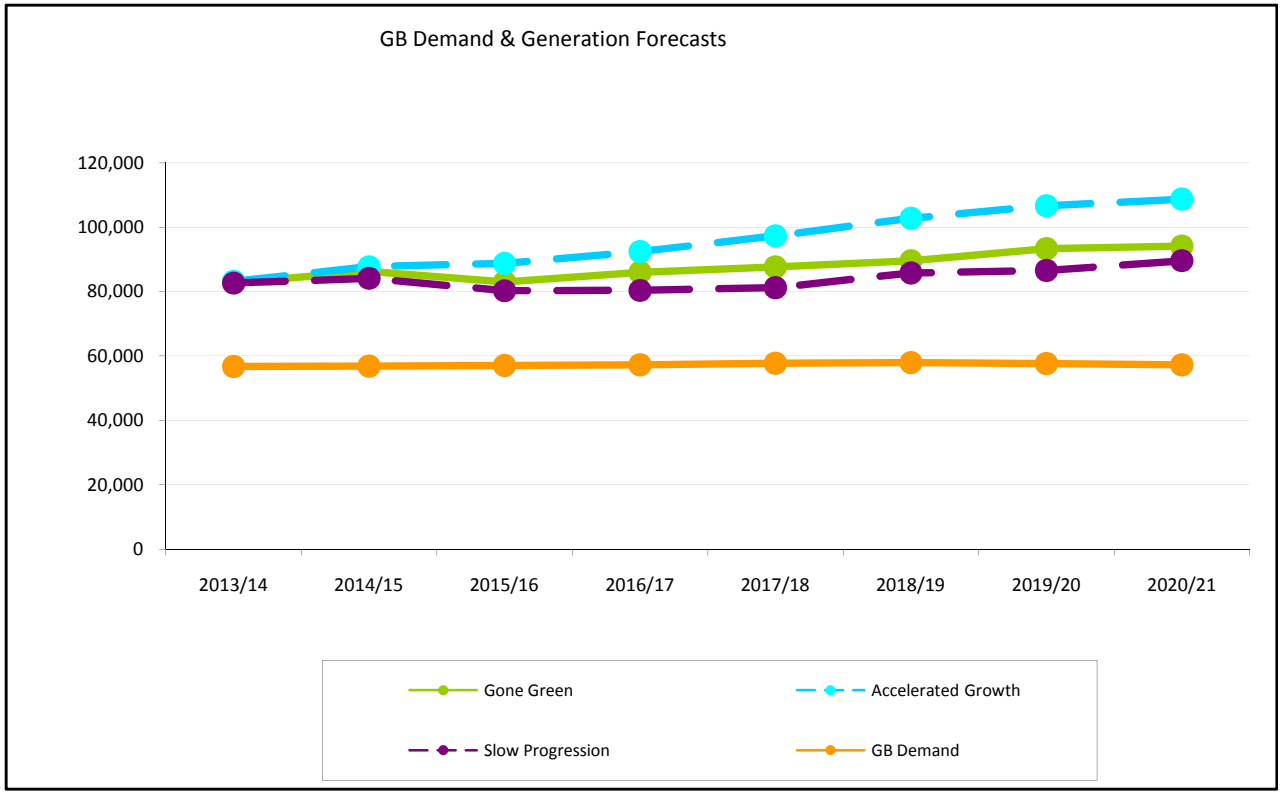
Is stability of charges an issue providing it is forecasted & predictable?

What does RIIO mean for revenue?



- NB – No allowance made for offshore TOs at this stage

Generation & Demand Forecasts



2020/21 Generation Forecast Uncertainty

109GW

(*accelerated growth*)

94GW

(*gone green*)

90GW

(*slow progression*)

Gone Green Generation Forecast

85GW (*2011/12*) → **94GW** (*2020/21*)

Effect of revenue changes on Use of System tariffs

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+/- TNUoS revenue of £30M

- Generation tariffs +/- 10p/kW
- Demand Half Hourly tariffs +/- 39p/kW
- Demand Non Half Hourly tariffs +/- 5p/kWhr

NB - Figures based on 2011/12 Transport & Tariff model

+/- BSUoS revenue of £30M

- **BSUoS charge +/- 4.5p/MWHr**
- **Overall impact on annual customer bill +/- 36p**

NB - Figures based on 2011/12 BSUoS forecast costs

QUESTIONS

- Are predictability and transparency your concerns in relation to charges?
- Which of the factors that can change TNUoS charges are of most concern to you?
- The predictability of which charging elements are most important to you?
- Can we do more to help you understand and predict transmission charges?
- Is stability an issue provided charges are forecast able and predictable?

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Concluding Remarks

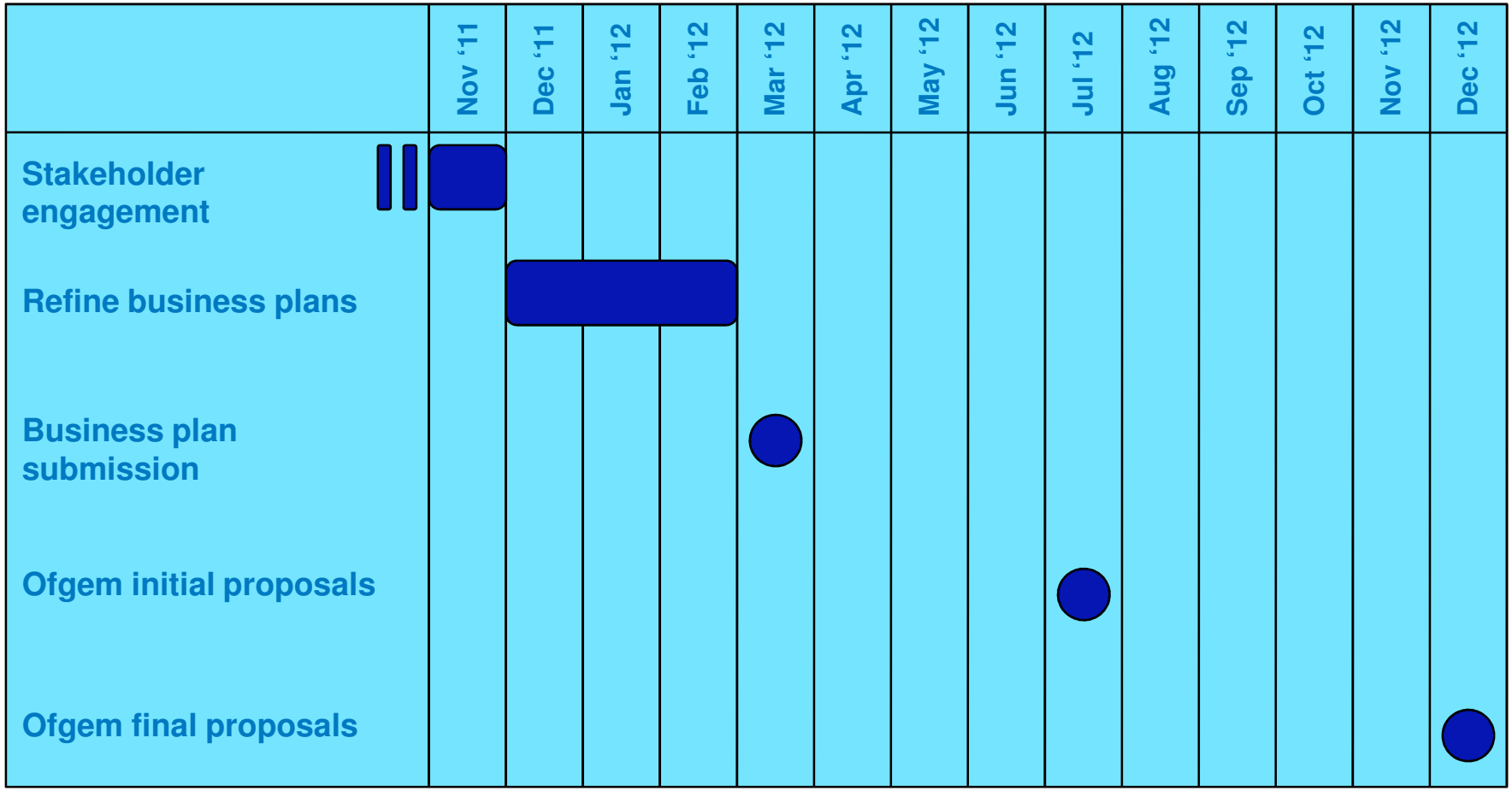
Talking Networks

Next steps

- We will collate the feedback from today and publish a summary
- We would like your written responses to the questions we have discussed today, to check we have understood what you are saying correctly by 18 November 2011
- RIIO-T1-2-1
  - If you would be interested in a 1-2-1 to run through your feedback on our business plan, please contact:

    talkingnetworkstransmission@uk.ngrid.com
- We will also ensure that all feedback received by 18 November 2011 is reflected in the development of our business plan

Timetable


Nov '11
Dec '11
Jan '12
Feb '12
Mar '12
Apr '12
May '12
Jun '12
Jul '12
Aug '12
Sep '12
Oct '12
Nov '12
Dec '12
Stakeholder engagement
Refine business plans
Business plan submission
Ofgem initial proposals
Ofgem final proposals

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CLOSE

Talking Networks

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RIIO Electricity Transmission Workshop
11th November 2011

Talking Networks

Agenda

Time	Description
9:00 – 09:30	**Coffee**
9:30 – 10:00	**Introduction – Peter Boreham**
10:00 – 12:00	**Renewable UK Stakeholder Engagement** (Coffee will be served during this session. Also a 2 minute silence will be held at 11:00). **Information Sharing – What our Plan delivers**
12:00 – 12:45	**Lunch**
12:45 – 14:45	**SO / TO Interaction** -Operating a smart network, including the interactions with SQSS and targeted N-1 operation -Network Development
14:45 – 15:00	**Coffee Break**
15.00 – 16.30	**SO Investment** -The changing SO environment -Control room tools and capabilities, including international comparisons -Focus on reliability, availability and system access -Consumer benefits

Stakeholder Engagement: Round 3

- This round of workshops will focus on the areas where you have asked for more detail and the areas where we would like to explore your views further
- What's different this time?
  - We have built in more time for discussion so that we can fully explore your thoughts and opinions
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- We want to ensure that our plans are delivering what you want from our network

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Morning Session

Talking Networks

renewableUK
The voice of wind & marine energy

RenewableUK previously: BWEA

The Transmission Companies and the Renewables / Decarbonisation Agenda:

Zoltan Zavody
Grid Policy Team

CONTEXT

Government Low Carbon Milestones

Source: The Committee on Climate Change www.the-ccc.org.uk

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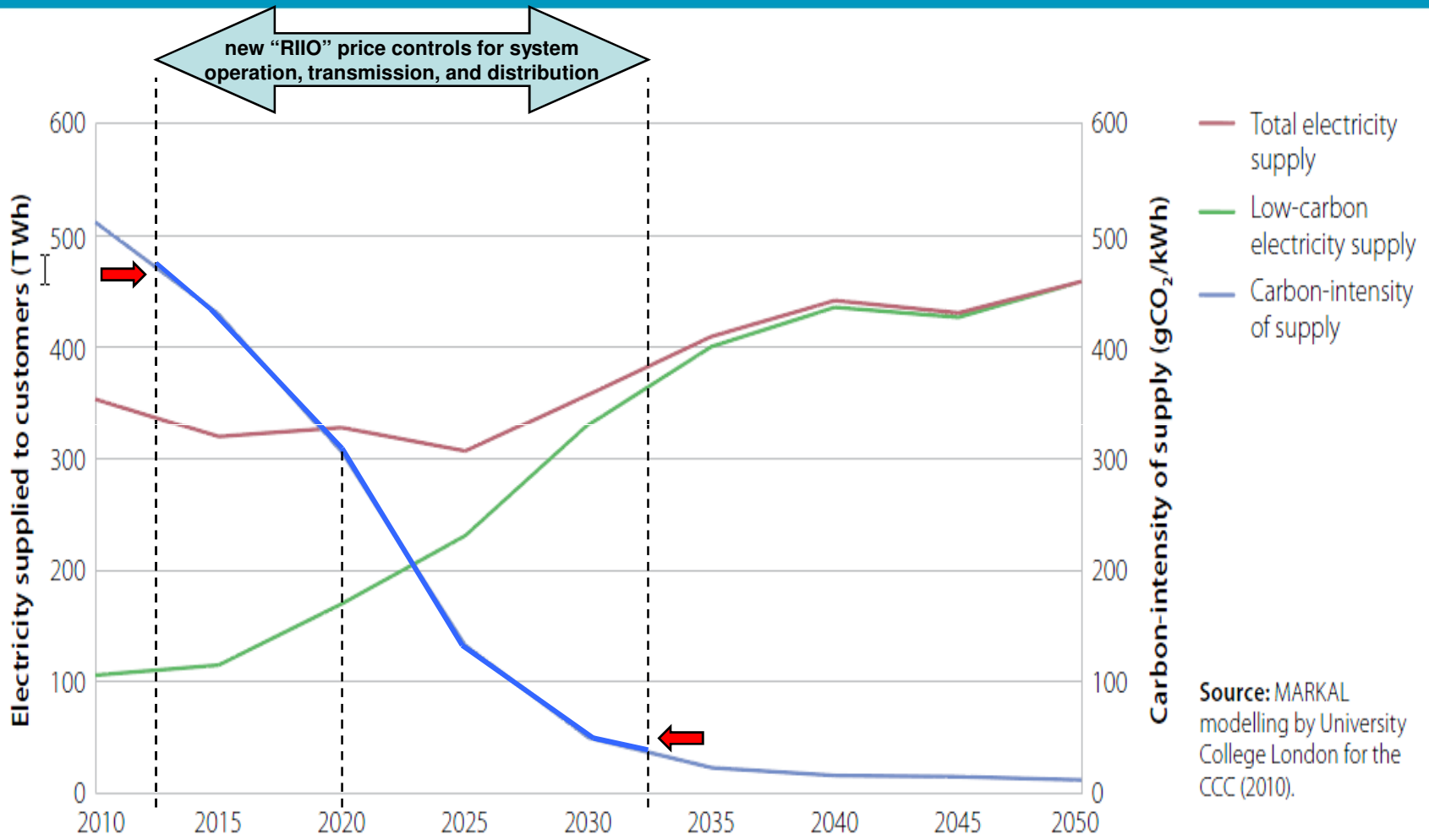
The voice of wind & marine energy

RenewableUK previously: BWEA

Government Low Carbon Milestones & RIIO Price Control Review Periods



Source: The Committee on Climate Change www.the-ccc.org.uk

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The voice of wind & marine energy

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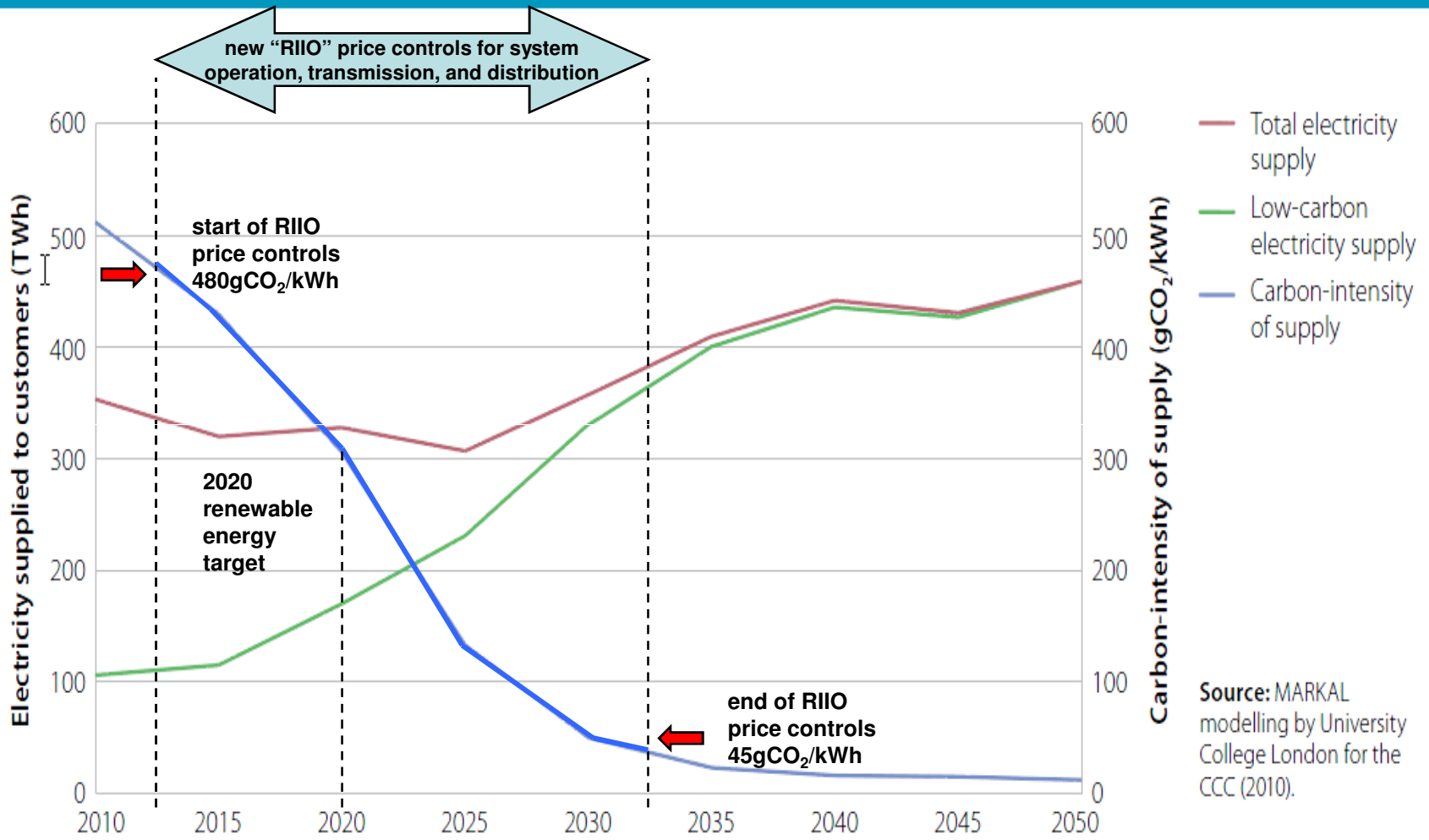
Government low carbon milestones & RIIO price control review periods



Source: The Committee on Climate Change www.the-ccc.org.uk

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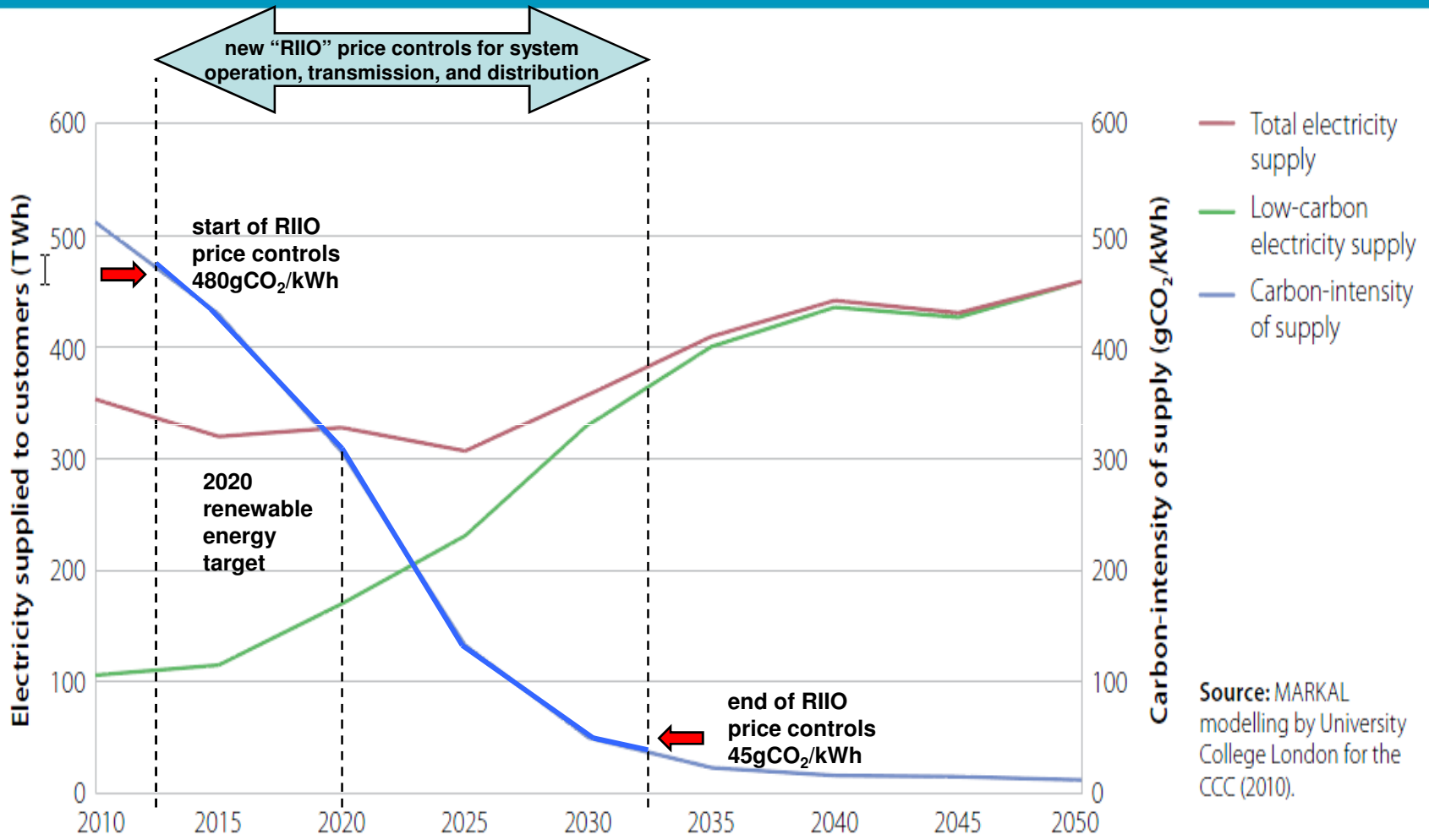
Government Low Carbon Milestones & RIIO Price Control Review Periods



Source: The Committee on Climate Change www.the-ccc.org.uk

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Practical Context

- “Connect & Manage”
- grid connection requirements
- grid operational development
- cost reduction agenda
- localism agenda

Transmission Company Business Plans

- customer engagement & support
- efficient & timely delivery
- infrastructure solutions
- co-ordination of works & outages
- pro-active innovation

Facilitated Questions

In an ideal world, what should a renewables developer experience in terms of connecting to and using the transmission network?

How would this be different for other generators?

Facilitated Questions

What, if any, difficulties do you experience as a renewables developer in connecting to and using the transmission network?

How is this different to other generators?

Facilitated Questions

How have any of the above difficulties affected your projects?

How have these difficulties affected other generators?

Facilitated Questions

What specifically would you like the network to do, or how would you like it to change, to make life easier?

How is this different to other generators?

WHAT NEEDS TO HAPPEN

Proposed RIIO-T1 Incentives

1. Customer Satisfaction
2. Safety
3. Reliability and availability
4. Conditions for connection
5. Social obligations
6. Environmental Impact

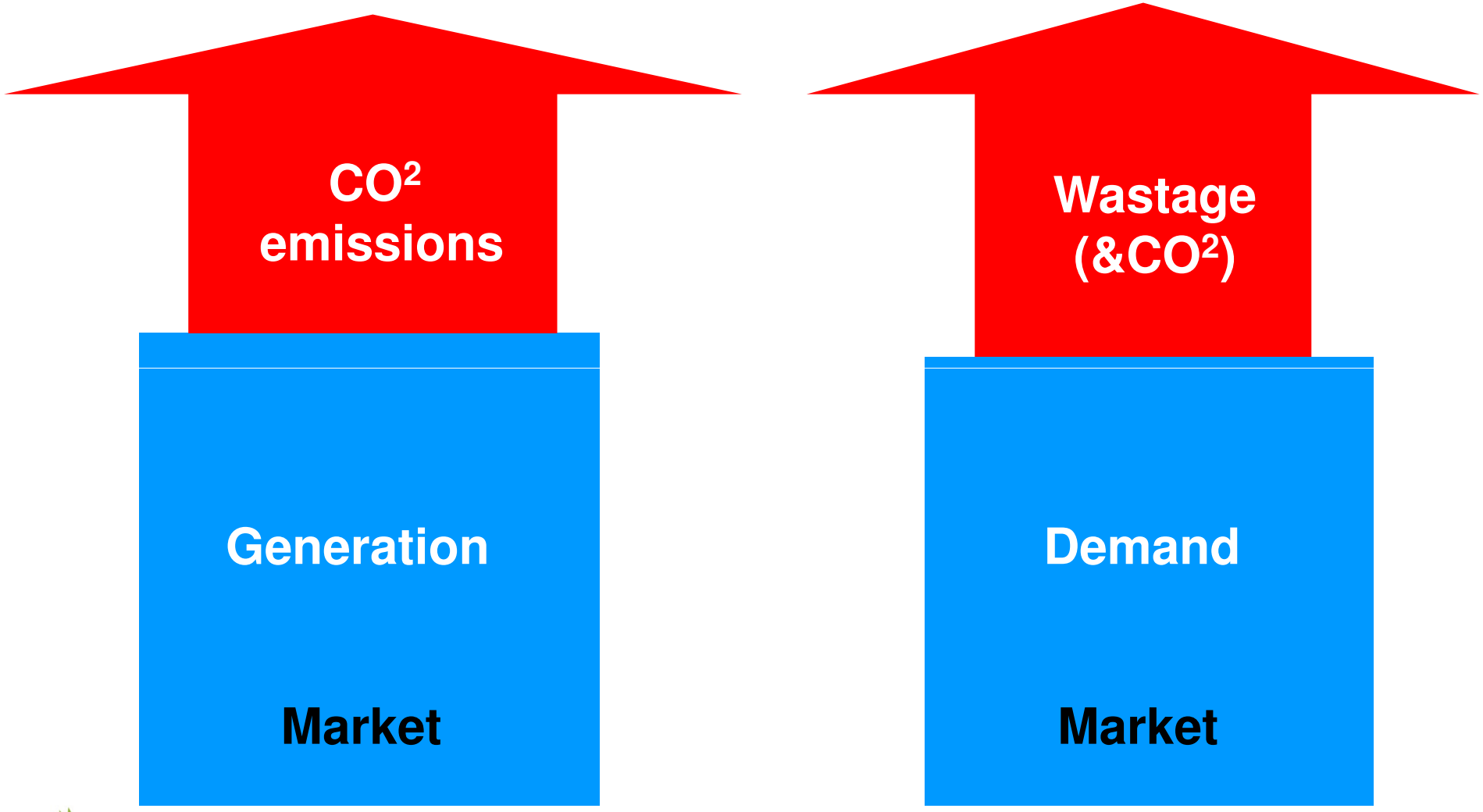
Proposed RIIO-T1 Incentives: Comments

1. Customer Satisfaction - unspecific/subjective
2. Safety - N/A
3. Reliability and availability - working against each other
4. Conditions for connection - unambitious timelines
5. Social obligations - N/A
6. Environmental Impact - low materiality

Other Potential Forms of Incentive

- specific but not directly related incentives
- specific low-carbon activity incentives
- case by case project re-openers
- damages for specific non-compliance
- cash reward for each low-carbon connection
- risk-based increased rate of return for anticipatory investments
- broad environmental incentive based on national targets

Networks Connect Generation and Demand



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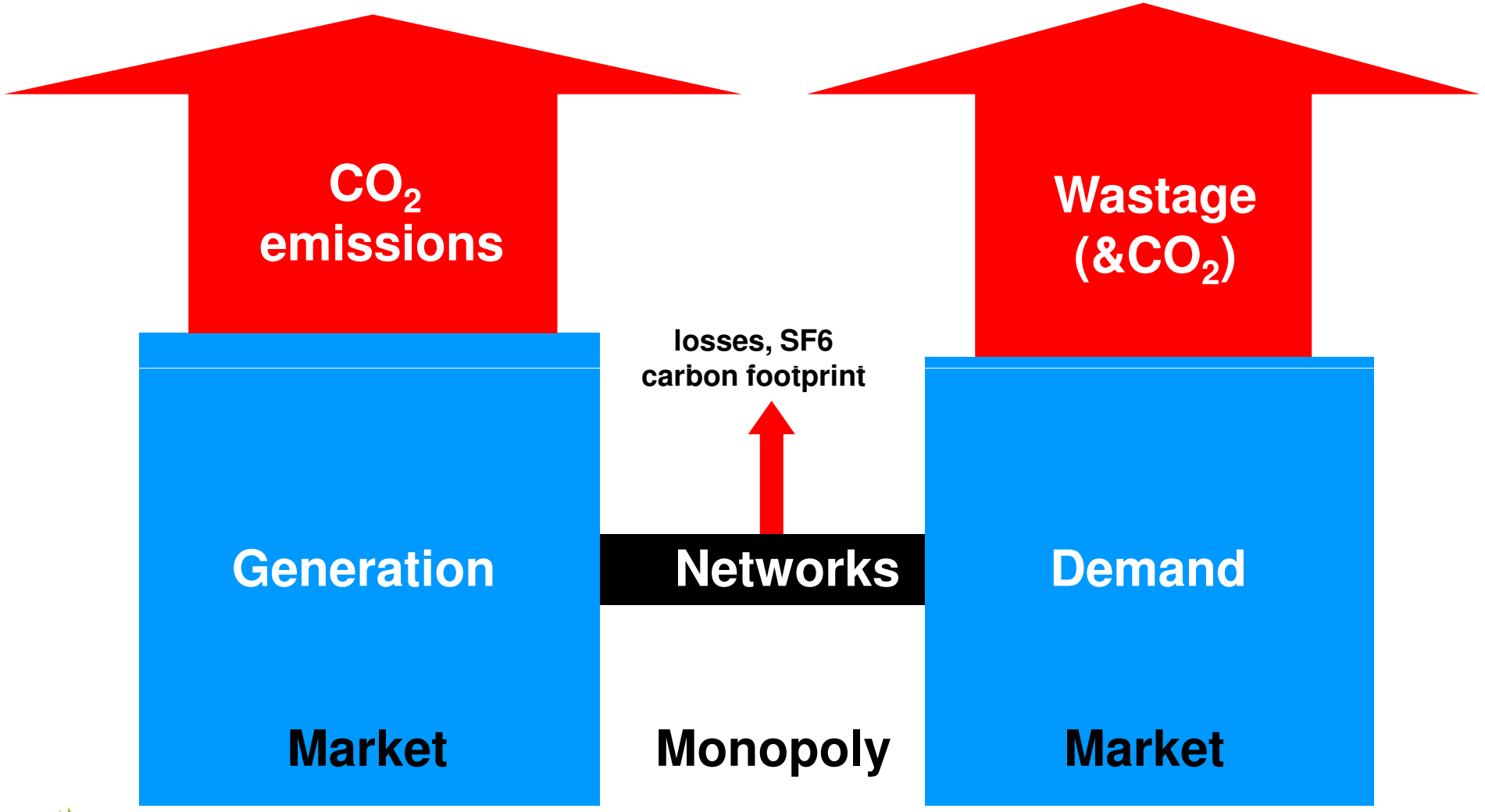
Networks Produce Little Emissions Alone



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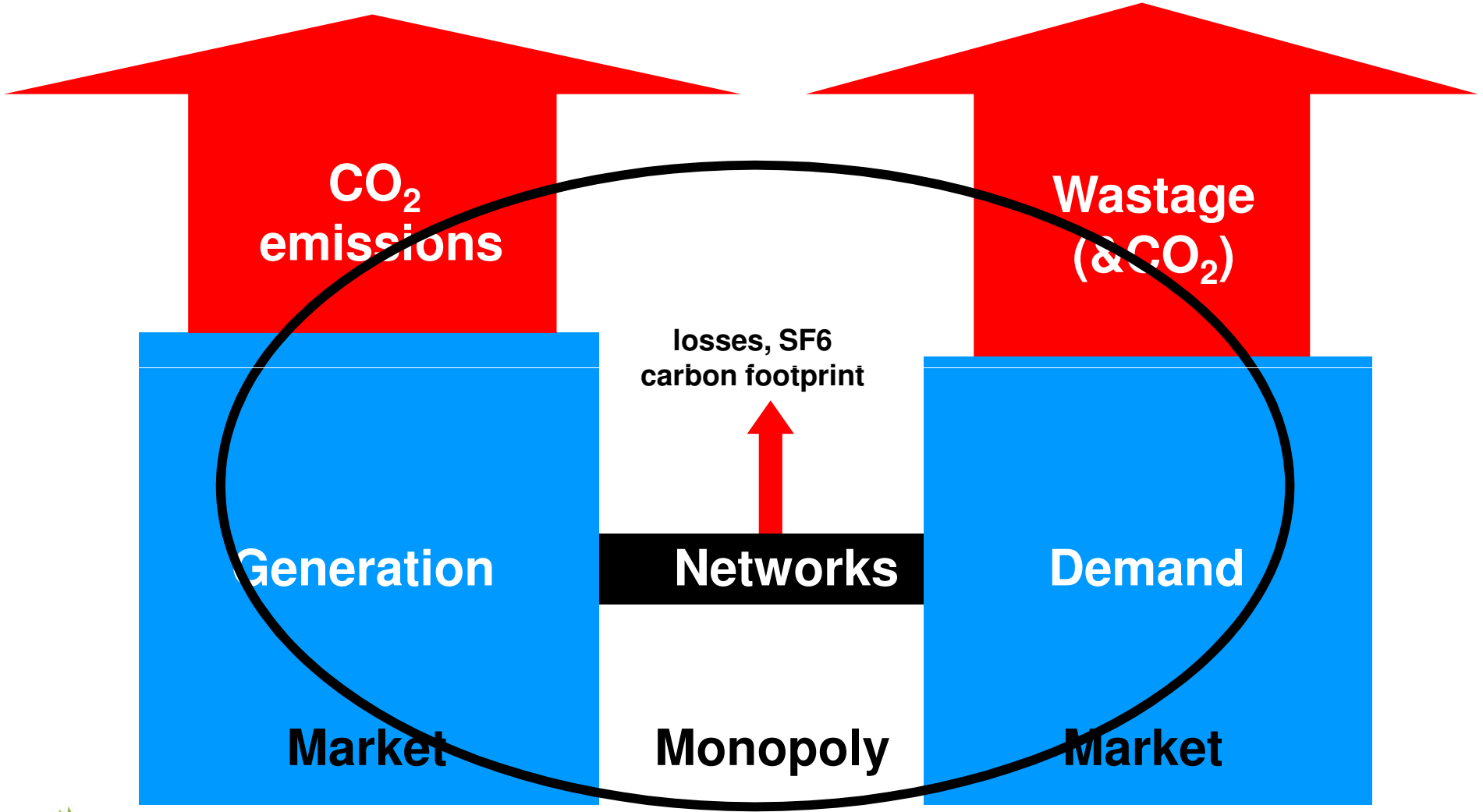
How can we Fulfil the Potential of Networks to Facilitate the Wider Decarbonisation Agenda?



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Facilitated Questions

For what reason would the network company change in the way you would like it to?

Facilitated Questions

What can you as an industry player do to make it easier for the network to engage with renewable energy?

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Expert sessions

Talking Networks

David Wright
Electricity Network Investment Manager

Expert sessions

- Opportunity to talk through key elements of our plan, including:
  - Major investment projects
  - Smart transmission
  - Targeted N-1
  - Network Availability Policy
  - Visual amenity
  - London power tunnels
  - Switchgear and Overhead Lines
  - Risk and uncertainty
  - Network Output Measures

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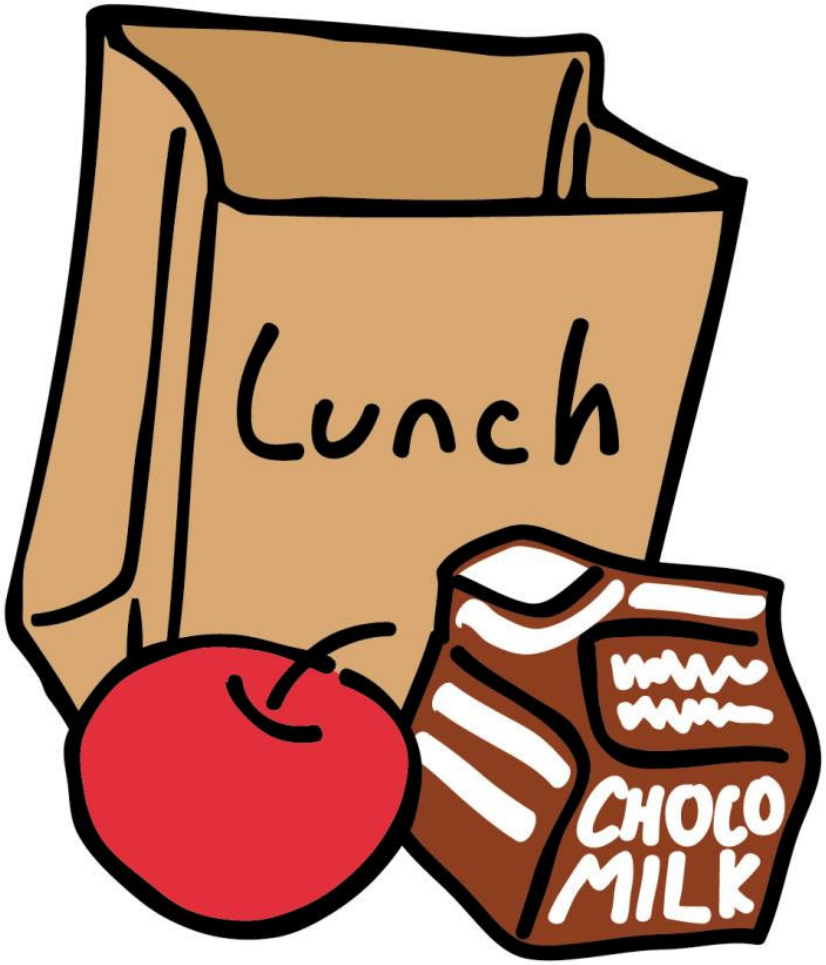
Lunch…..



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SO/TO Interaction

Talking Networks

David Wright
Electricity Network Investment Manager

Key messages

- The future will not just be a continuation of the past
- We are actively considering how to meet the challenges the next ten years will bring through an appropriate balance of investment and other approaches to releasing capacity
- This may involve trading increased risk of unreliability occurring or constraints against deferred or reduced capital investment

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Smart operation and targeted N-1

Talking Networks

Lewis Dale
Regulatory Strategy Manager

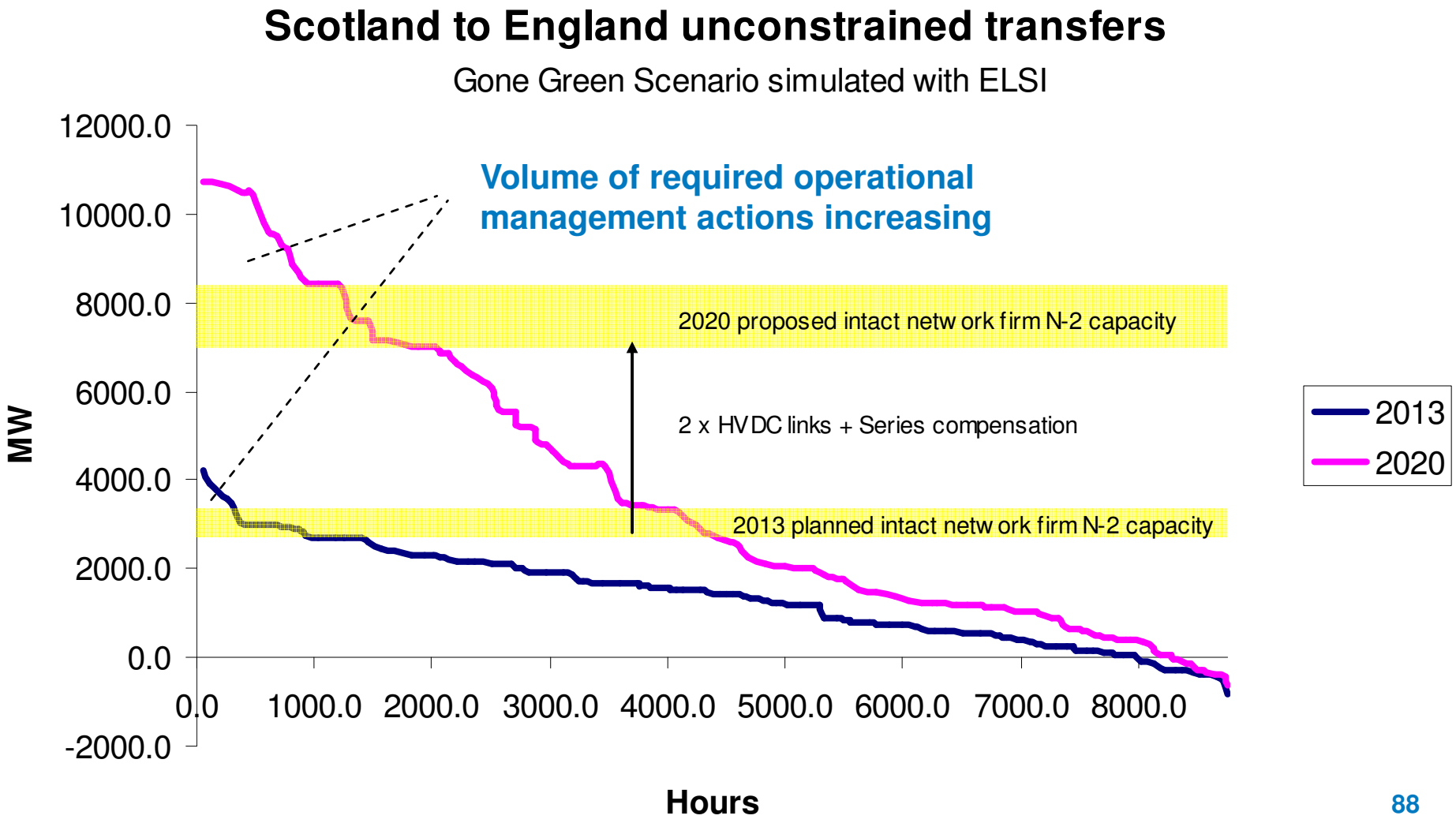
Smart operation & targeted N-1

- Introduction
  - About smart operation & targeted security
  - Existing state of the art

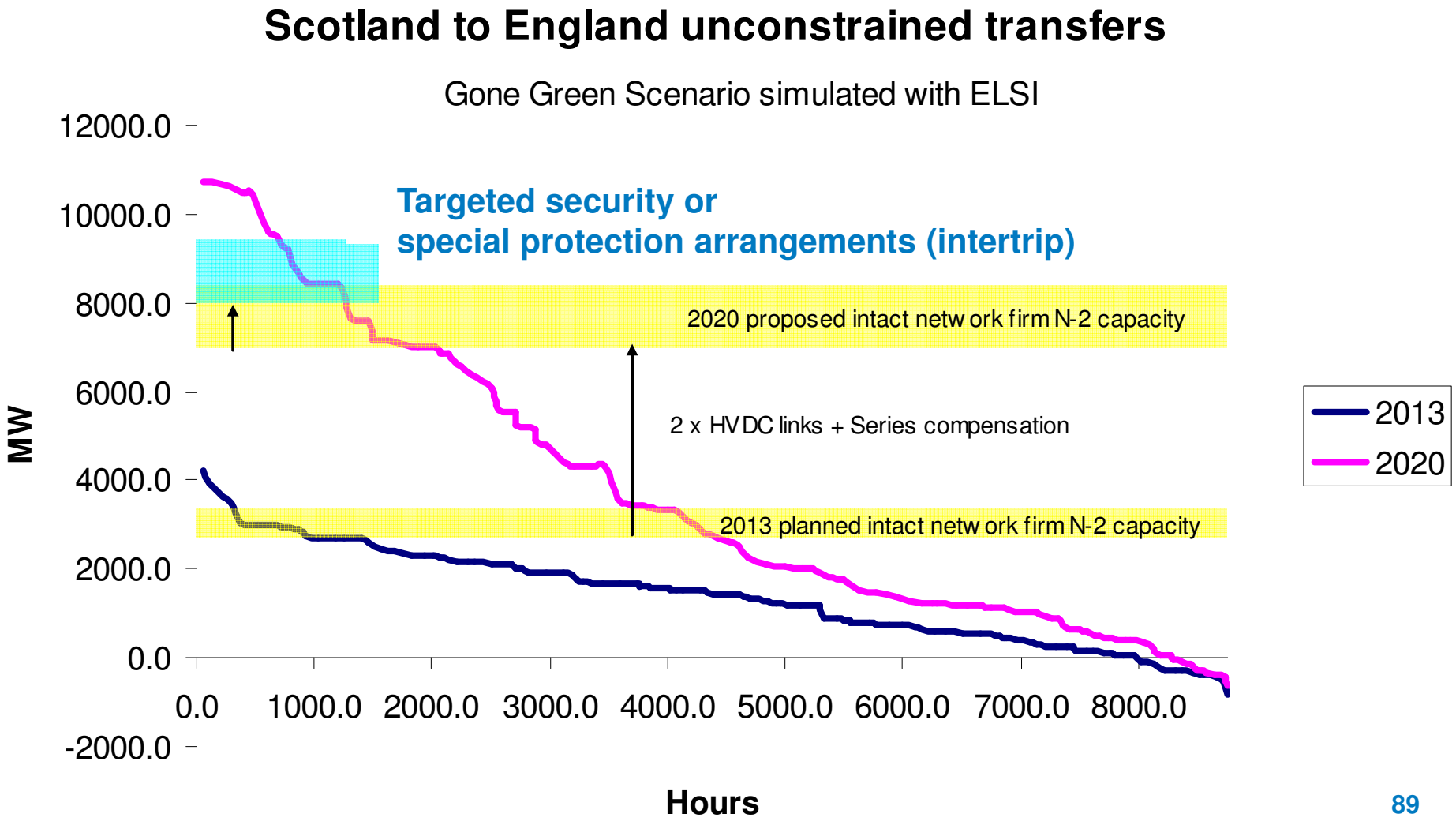
- Current content of our plan:
  - Feedback received
  - Developments planned in RIIO period
  - Trade-offs made and feedback received

- Stakeholder feedback requested:
  - Options missing from our plan?
  - Additional evidence to finalise trade-offs

The need for more smart actions



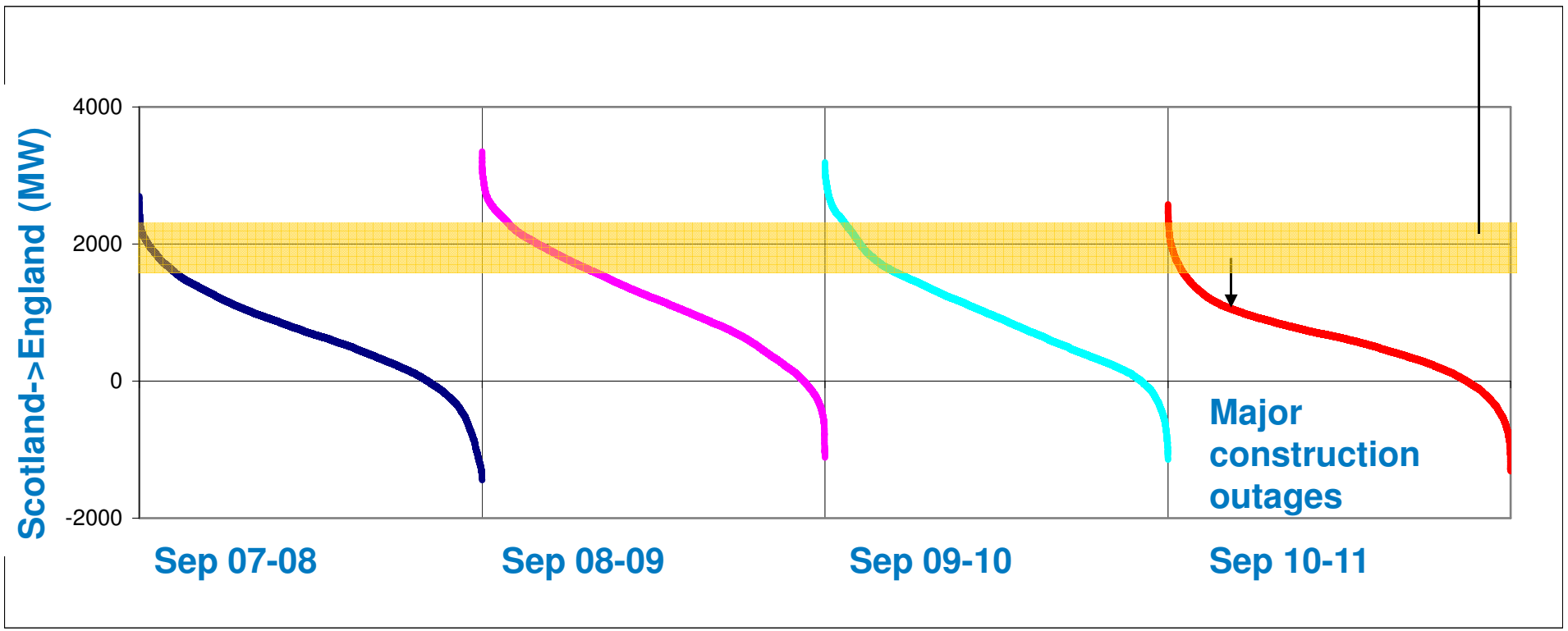
The role of targeted security



Current performance

Achieved flows (metered) following operator actions

Nominal firm capacity (all circuits in service)



Stakeholder feedback so far

- Maintain supply reliability
- Make most of existing and new assets
- Explore targeted N-1 further

Constraints vs. intertripping vs. targeted security

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- Supply interruptions due to network faults can be avoided by:
  - Establishing backup network capacity (Constrain prior to fault to network N-2 firm limit)
  - Fast switch users in event of faults and restore balance by using reserves with tailored speed and location (E.g. establish intertripping schemes)
- Such actions can be expensive and complex to tune as conditions rapidly change
- Targeted security represents a risk management approach that releases more network capacity when risks known to be contained in various circumstances
  - Dynamic ratings likely to be present
  - Exporting area generation sufficiently controllable
  - Backup reserves available and conveniently located

What is “Targeted N-1”?

- A release of network capacity (with reduced network resilience and increased utilisation):
  - In locations where countermeasures available:
    - Special protection or control arrangements
    - Conveniently located reserves of sufficient response speed
  - At times of:
    - Lower fault risk (i.e. not storms)
    - Higher capacity value (e.g. high wind power availability)
    - Usable network dynamic ratings (e.g. wind cooling of lines)

The congested Scotland -> England boundary is a key candidate

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Targeted N-1 impacts

Measure:	Capacity released	Costs	Tx Losses	Complexity	Reliability
Secure N-2 network	N-2 firm limit	Potentially large constraint costs		Low	++
Intertripping for secured events	Between N-0 & N-2 (depends on scheme)	Reduced constraints but scheme setup and call-off costs	+	High	+ Mal operation risk
Targeted N-1	N-1 backstop (depending on availability of risk counter-measures)	Reduced constraints but some counter-measure costs (e.g. reserve adjustments)	+	Mid?	Managed risk approach

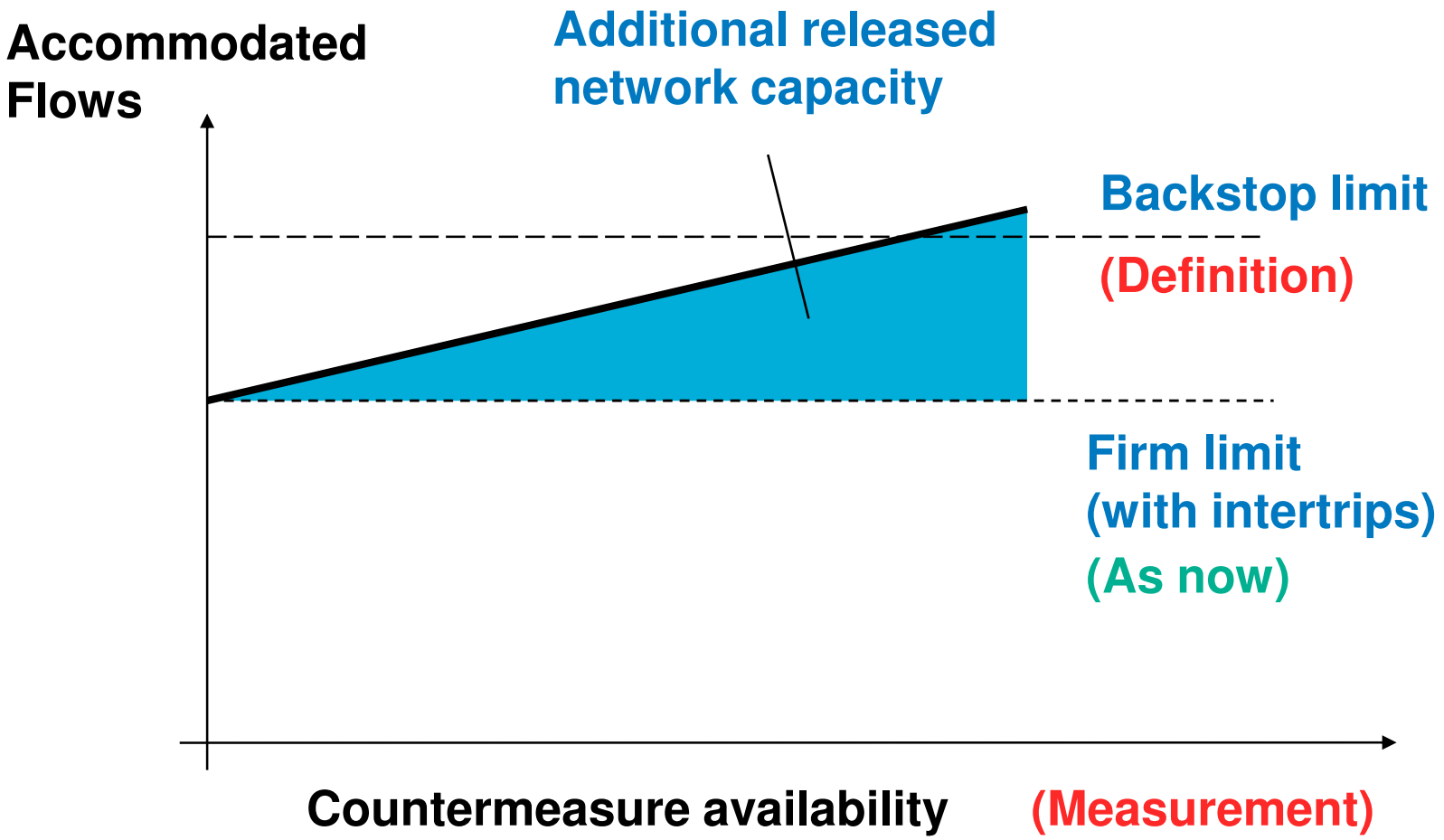
What we are already doing

- Strategic contracting and real-time optimisation of balancing services, including inter tripping
- Central forecasting and strategic management of wind
- Real-time measurement and assessment of network performance (flows, voltages, stability wobble-meter)
- Real-time (dynamic) equipment ratings using weather data and wide area monitoring ⟹ Links to strategic asset management investment to increase capability
- Manual control of circuit flow control devices
- Enhanced network maintenance/construction scheduling
- Enhanced information provision to market

Our plan contains

- Enhancement of control system functionality (as part of energy management system renewal/refresh):
  - Enhanced information and operator ergonomics
  - Additional automation of selected activities
- Focus on smart systems integration/refinement
  - See Humber SmartZone
- Further optimisation of congestion management measures
  - Service procurement arrangements (constraint contracts and special protection)
  - Development of targeted risk approach (i.e. targeted N-1 security)

Formalising targeted N-1



QUESTIONS

- Are we missing any issues and/or actions?
- What views do you have on risk trade offs?

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What does Smart mean for Transmission?

Andy Hiorns
Future Networks Manager

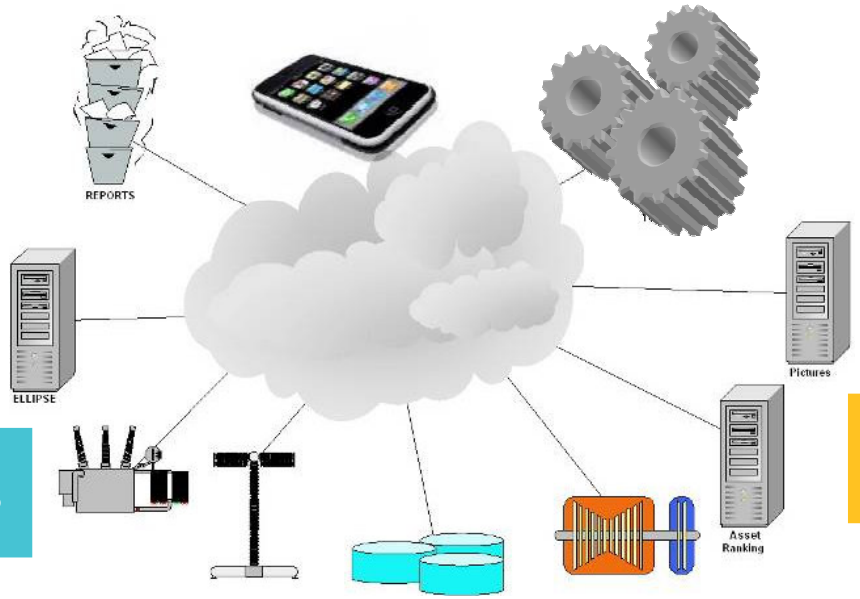
Is Transmission already Smart?

Condition monitoring

Network Output Measures

Risk management

Remote asset management and monitoring (RAMM)



Voltage Control

Auto-switching schemes

Circuit Rating Enhancement

Operational Tripping Schemes (OTS)

Remote Substation Control

Power Flow Control

Electricity Transmission Strategy

- **Ensuring a 'Fit for Purpose' network responsive to Stakeholders needs**
  - Retain network reliability & availability performance
- **Provision of timely information on which to make decisions**;
  - Enhance network and asset understanding
  - Improve network models, state estimation & condition monitoring to predict future impacts
  - Manage network complexity
- **Develop solutions & services to address the challenges**;
  - RIIO has increased focus on R&D including the Network Incentive Competition (similar to Low Carbon Networks Fund)
  - New technology – Integrated High Voltage Direct Current (HVDC), series compensation, composite conductors
  - New Systems - Humber Smartzone – Develop proof of concept for intelligent automation & control schemes
  - New Processes - Strategic Asset Management – techniques & services to seamlessly support decision making.

Investing in a Smarter Grid

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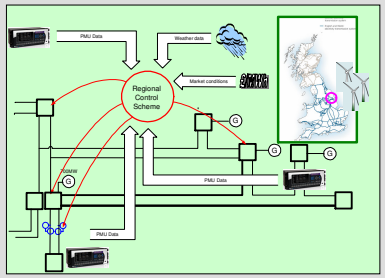
R&D Pilots

- **Strategic Asset Management**
  - Services to manage system risk & criticality
  - Increase operational efficiency
- **SmartZone**
  - Intelligent automated control & dynamic rating
  - Congestion & demand side management
- **Digital Substation**
  - Speed up & reduce outage durations

New Technology

- **Integrated HVDC**
  - Reduce Anglo- Scottish constraints
  - Submarine 400km circuit
- **Series Compensation**
  - Increase asset utilisation
  - Reduce constraints
- **Composite conductor**
  - New low sag material
  - Increase circuit capacity
- **IS Transformation**



Impact of Smart for Stakeholders

If the Grid is already Smart, why develop it further?

Benefits to Stakeholders

- Increasing network access
- Reducing network constraints
- Minimising asset visibility
- Improving asset utilisation
- More transparency

Implications

- Lower cost than new assets but increased complexity
- Needs to be integrated into a living network
- Cost impacts across the whole value chain
- May only delay investment of new infrastructure

Network Performance & Reliability

How do we preserve reliability and network security?

- Increasing network complexity
- Wider application of control and automation
- Communications resilience
- Cyber security
- Data management

- Consult outside of the Electricity Industry
- Identify best practice
- Understand the risks and impact on system integrity
- Manage innovation through R&D and pilots
- Only roll out production tools

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Summary

- The Transmission network is already Smart – but needs to be even Smarter to manage the challenges that we are facing
- We are evolving our thinking & assessing technology to make the system Smarter
- We believe these new solutions are not disruptive…
  - Need to be implemented sensibly to ensure reliability and security are not compromised
- Smarter Transmission is addressed in the RIIO plan
- This is work in progress…

QUESTIONS

We believe that we have demonstrated that the Transmission system is already quite Smart…

- Do you agree?
- Which approaches do you consider relevant/important/likely to bring benefits over the next ten years? Which approaches do you consider to be irrelevant/unimportant/unlikely to bring benefits over the next ten years?
- Have we missed anything, e.g. is there technology that we are not considering but should?

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Planning wider works

Talking Networks

Hêdd Roberts
Price Control Commercial Manager

Stakeholder feedback

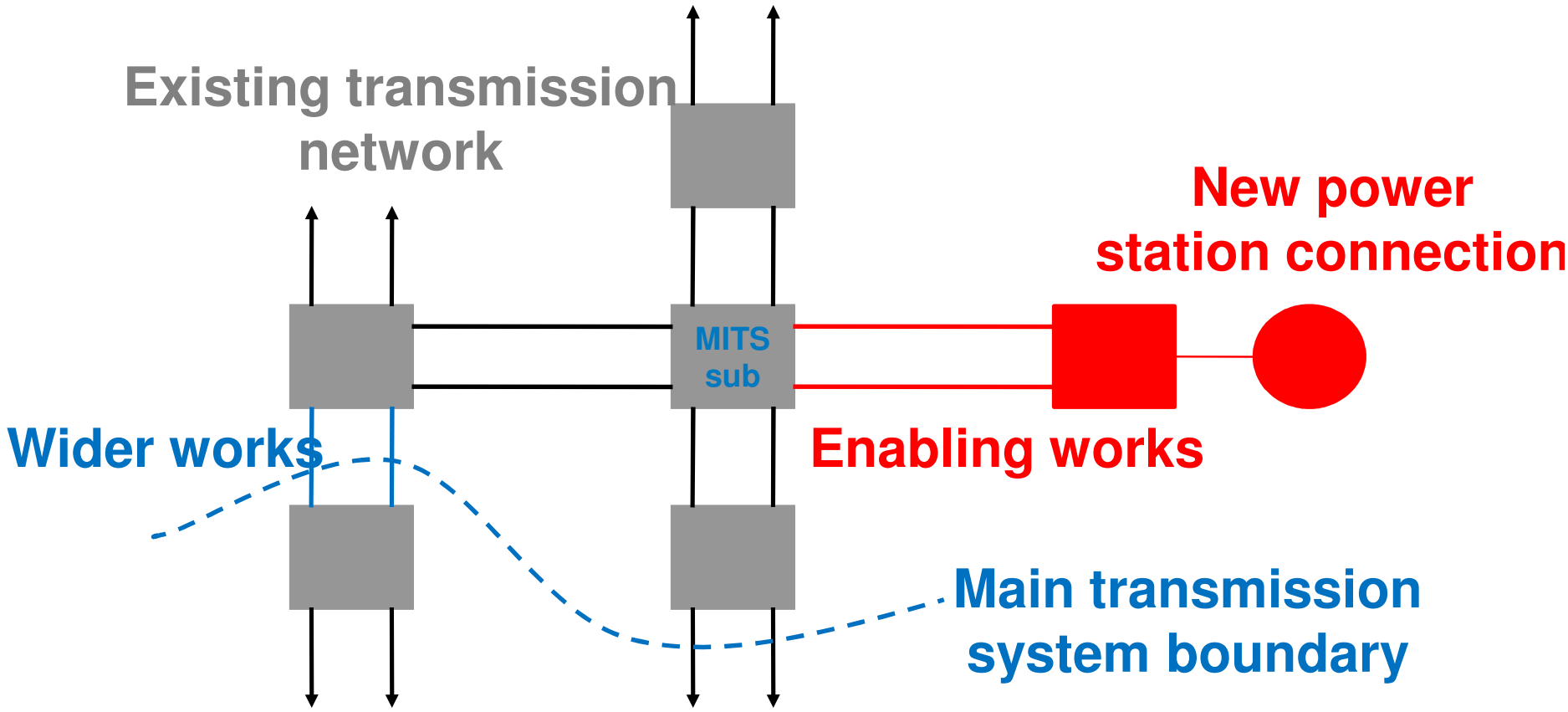
> *The financial framework must accommodate anticipatory investment (Stage One Workshop: Electricity Industry Scotland)*

> *Please ensure your business plan makes a clear, concise and robust case for strategic / anticipatory grid investment that persuades Ofgem of the merits of your case (Stage One Workshop: Electricity Industry Scotland)*

> *There were also a number of calls to allow anticipatory investment, as it was felt that without this, the industry will struggle to make the changes it needs at the speed that is required (Stage One Workshop: Electricity Industry London)*

> *Secure a working and timely means to deliver anticipatory investment (Stage One Workshop: Electricity Industry London)*

What are wider works?

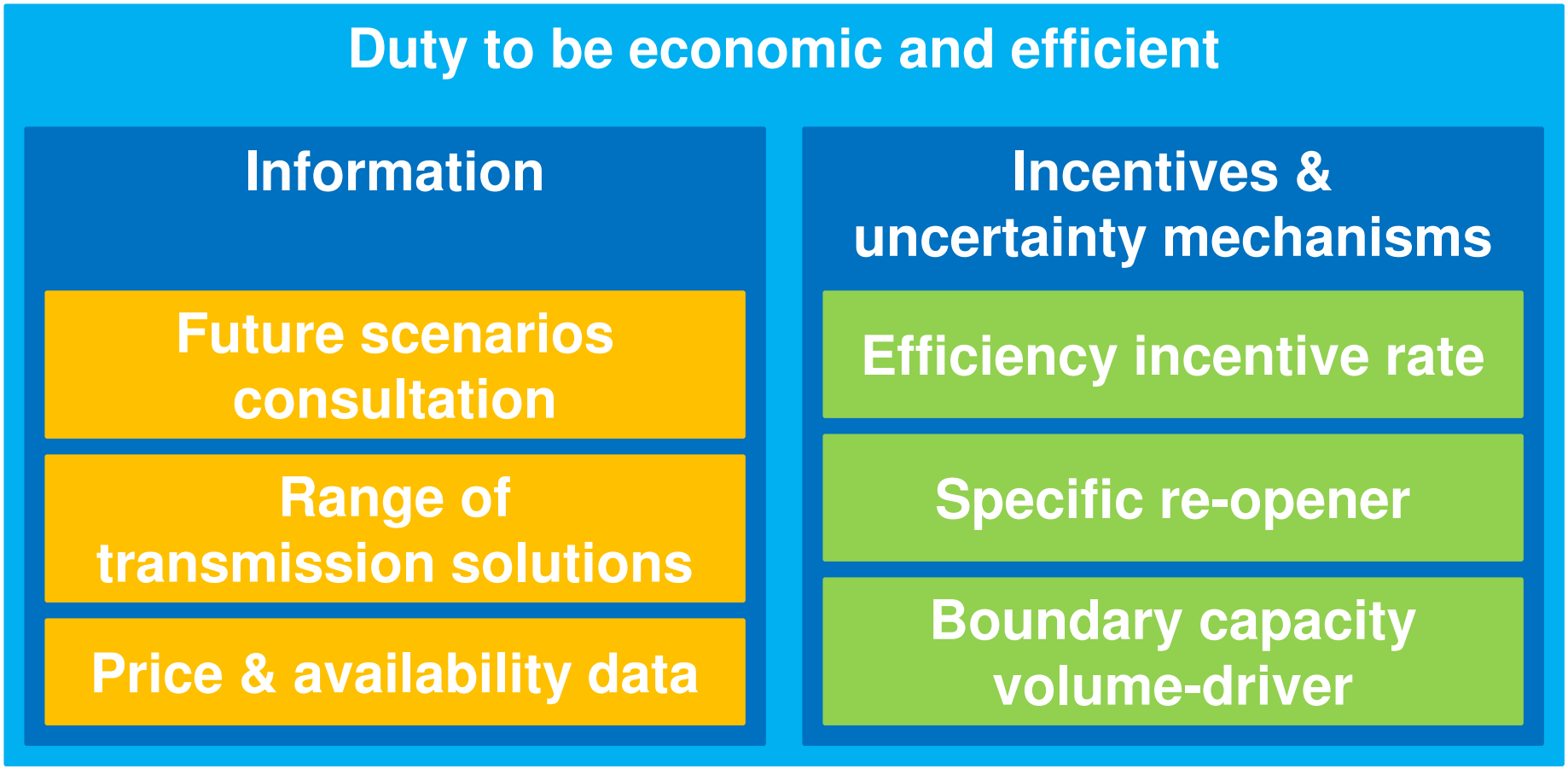


Generation & demand uncertainty

- Considerable uncertainty about the level, type and location of generation
- Wider works lead-time could be greater than power station lead-time
- Connect & manage access arrangements break contractual link between connection and completion of wider works

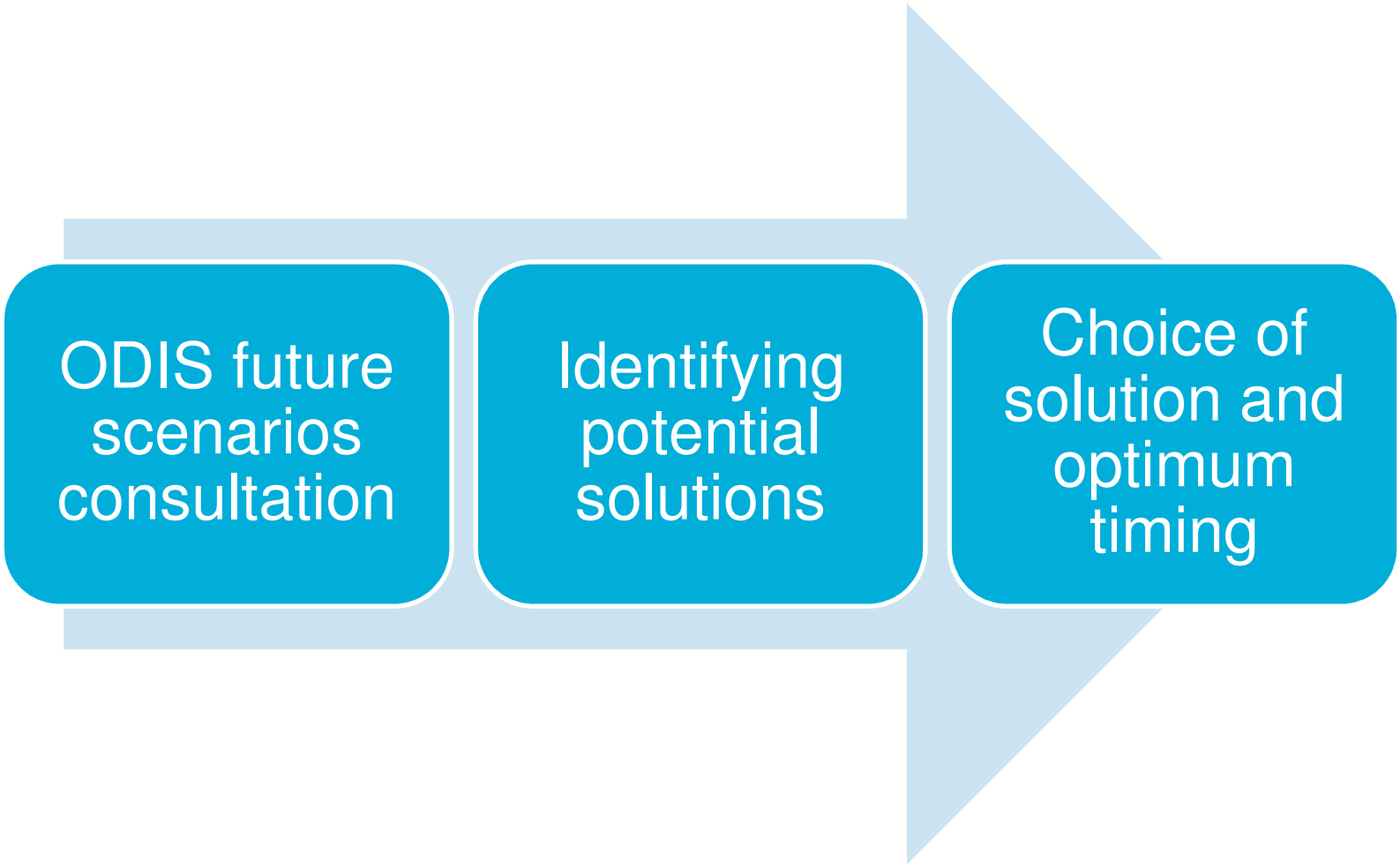
Invest too early	Invest too late
Inefficient financing cost Risk of stranding	Inefficient congestion cost

Making wider works decisions



- How do we make decisions about wider works based on these incentives and sources of information?

Decision making process



ODIS Future Scenarios Consultation

Future Scenarios

Wider Stakeholder Engagement

Future Scenario Consultation

Consultation Period: February – April

Enhanced Information

Proposed Extension to Study Period

Additional clarity on development of scenarios & assumptions made

Compare, align & contrast

- Comparison and alignment against existing/alternative industry scenarios

- Compare and contrast against TEC Register

Identifying potential solutions

- Identify range of solutions with the application of the security standards to each of the scenarios and associated sensitivities
  - Reinforcements
  - Commercial alternatives (e.g. availability contract)
- For each potential solution, we establish:
  - Cost
  - Lead-time
  - Deliverability and planning requirements
  - System benefits (impact on security, constraints, losses, etc)

Choice of solution & timing
Example: Western HVDC link

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Basic Scheme details

- HVDC cable connection; 400km from Hunterston to Deeside
- New 400kV substation at Deeside
- DC converters Deeside and Hunterston
- 2.1GW capacity

Western HVDC Link
Applying the security standards

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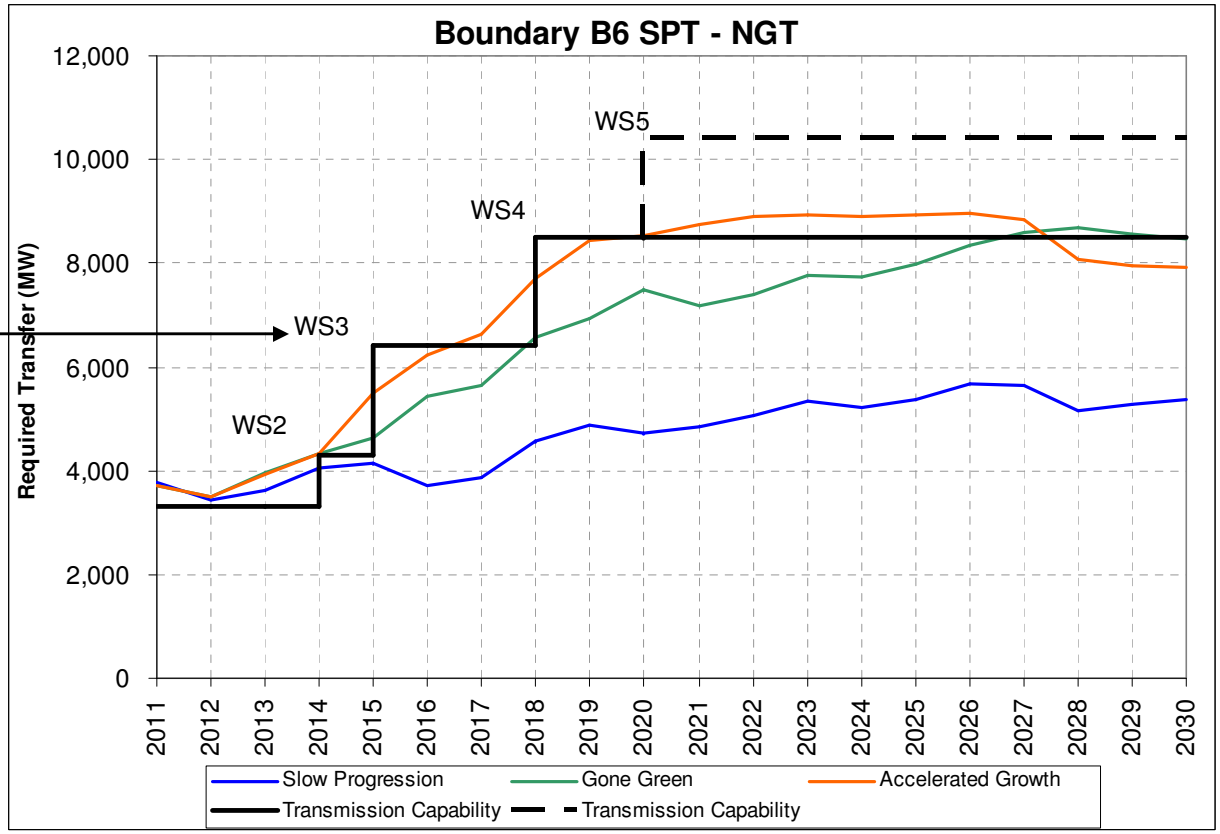
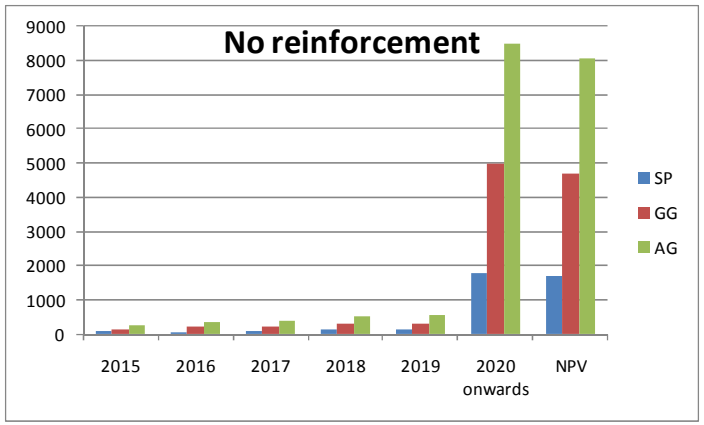
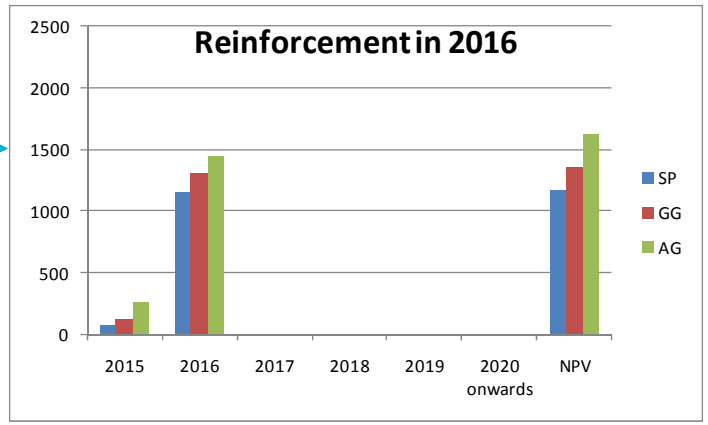
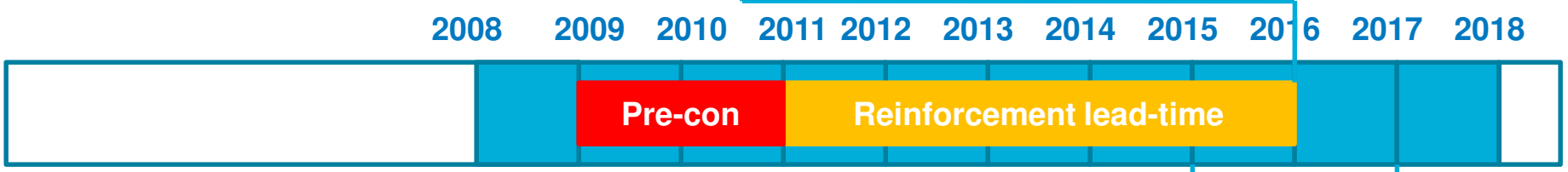
WS3 – Western HVDC link required in 2015/16 against "GG" and "AG"

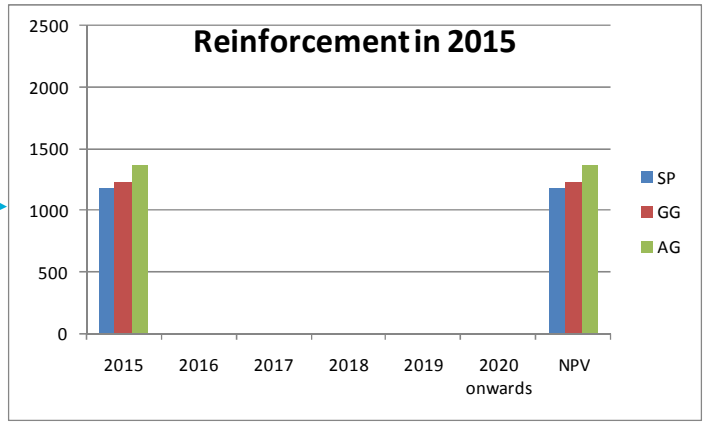


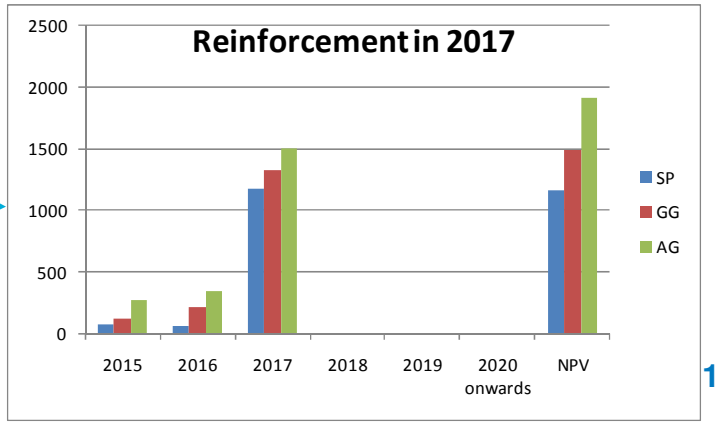
Western HVDC Link
Cost benefit analysis











Western HVDC Link
Least regret analysis

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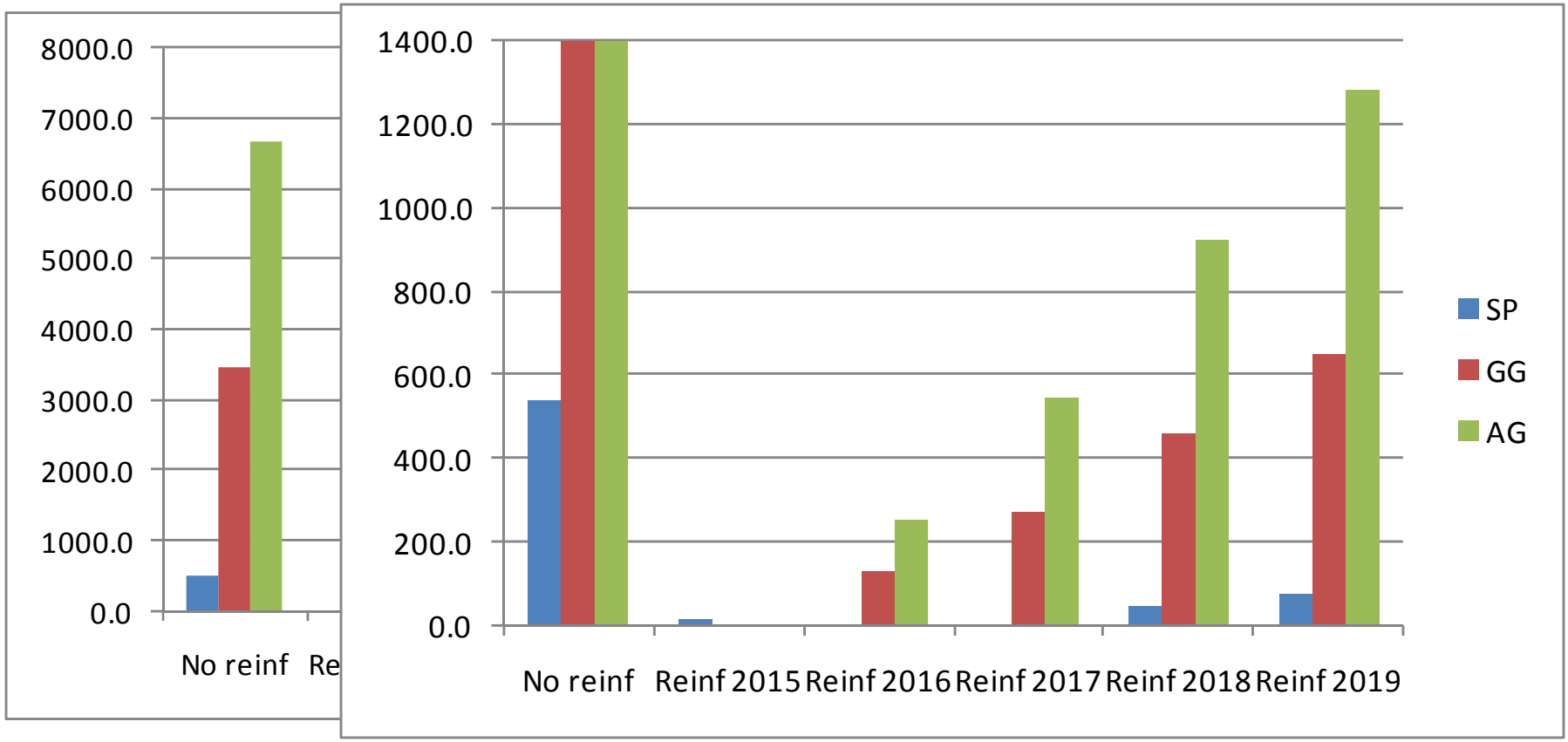
- Consider difference between what we would get and the best possible outcome if a different course of action had been taken



Identifying option value

- Least regret analysis also allows us to understand the potential for more reactive strategies

- For example:
  - The value of pre-construction work which will reduce project lead-times
  - The risks and opportunities associated with waiting for evidence (e.g. constraint costs) prior to initiating construction works

Conclusions

- We intend to enshrine the decision making process described in our Network Development Policy

- Central to this policy is the use of least regret analysis to determine:
  - our pre-construction funding requirements
  - the appropriate solution to address capacity shortfalls and the associated optimum timing

QUESTIONS

- Do you think that we have chosen the most appropriate mix of RIIO-T1 methodologies for reflecting investment in wider works? If not, what alternative arrangements would you propose?
- Do you have any comments on the ODIS future scenarios stakeholder engagement process?
- Do you agree with our proposed approach to identifying, optimising and triggering wider works in a timely fashion?

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Coffee….

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SO Investment

Talking Networks

Nigel Williams
Electricity Operations Manager

Agenda

- Our System Operator (SO) plan as part of the total RIIO-T1 submission
- The changing SO environment
- SO capabilities
- Influencing our system operator approach
- Benefits from our SO investments

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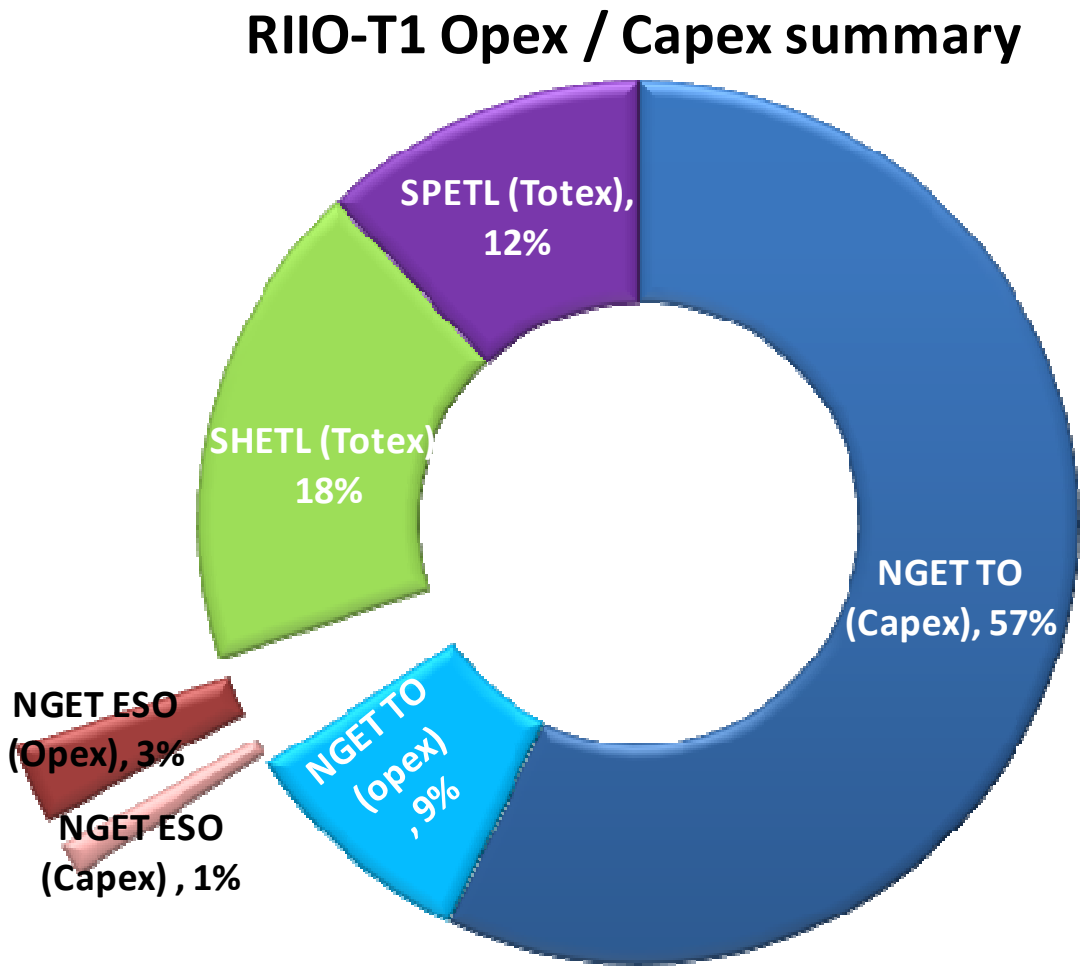
Our SO plan as part of the total RIIO-T1 submission

Electricity RIIO-T1 Investment summary



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The Changing SO environment

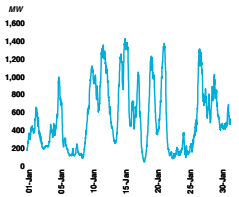
Culmination of change drivers

Distributed generation


Generation Composition

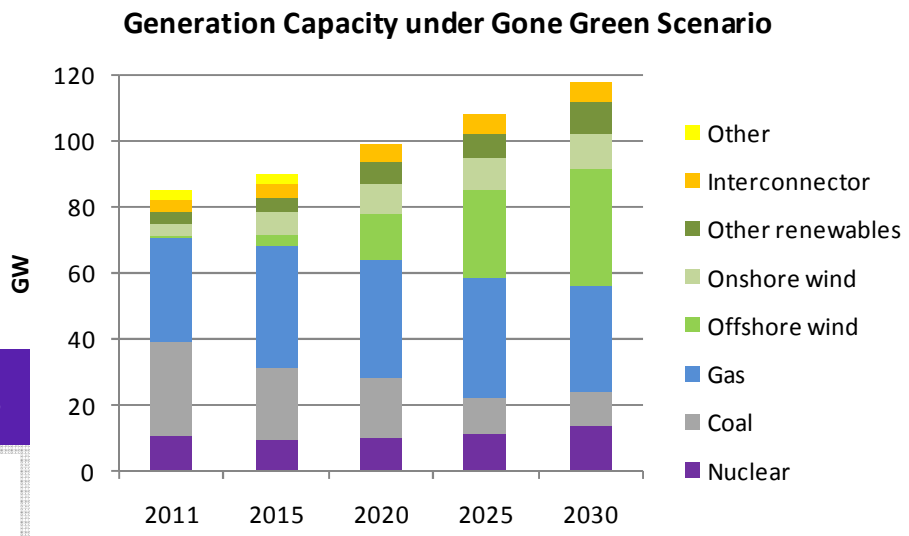


Supply & Demand volatility

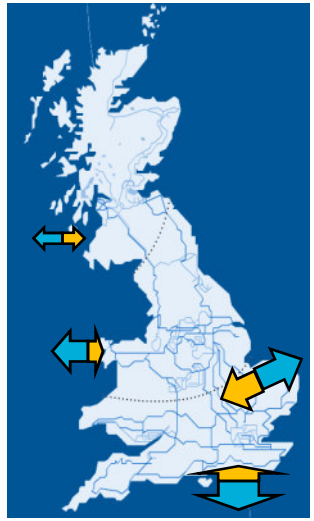


Active distribution networks

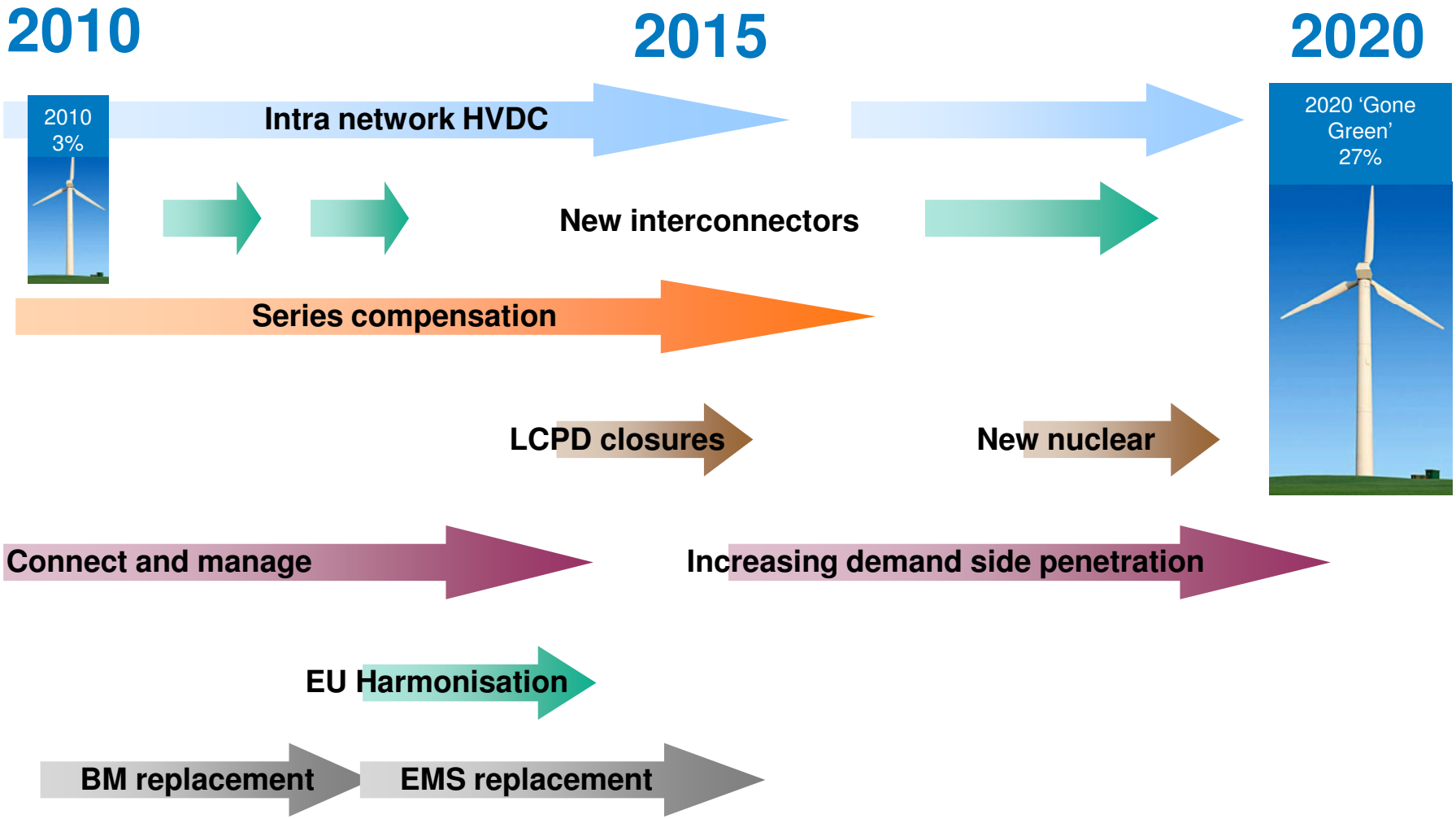
Smart(er) grids & meters, energy storage



Europe



Indicative timeline



Why invest now?

- Material impacts on network complexity already being seen, this only exacerbated further by 2014/15 and beyond
- Lead time –SO systems take 2-3 years to design, build and test to ensure that the operation of the system is not affected when they are implemented
- Critical IS systems (e.g. EMS / Balancing mechanism) need replacing for reliability purposes
- By combining the 'refresh' element with delivering enhanced capabilities, Capex savings will be delivered
- The enhanced capabilities enable optimal operating efficiency. Delivering SO and BSUoS / end consumer savings into the future

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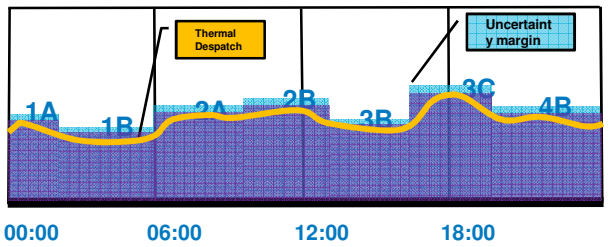
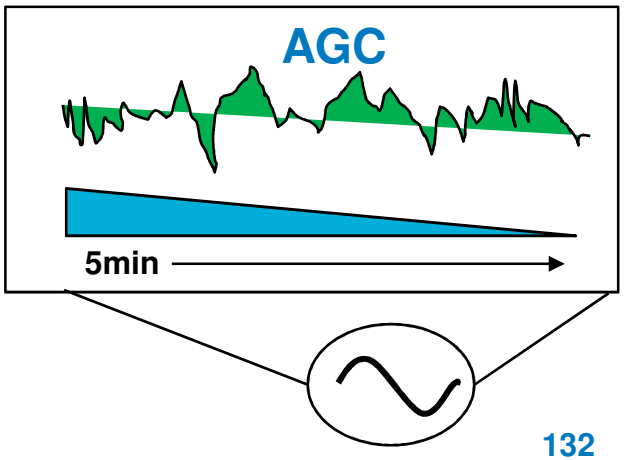
System Operation capabilities

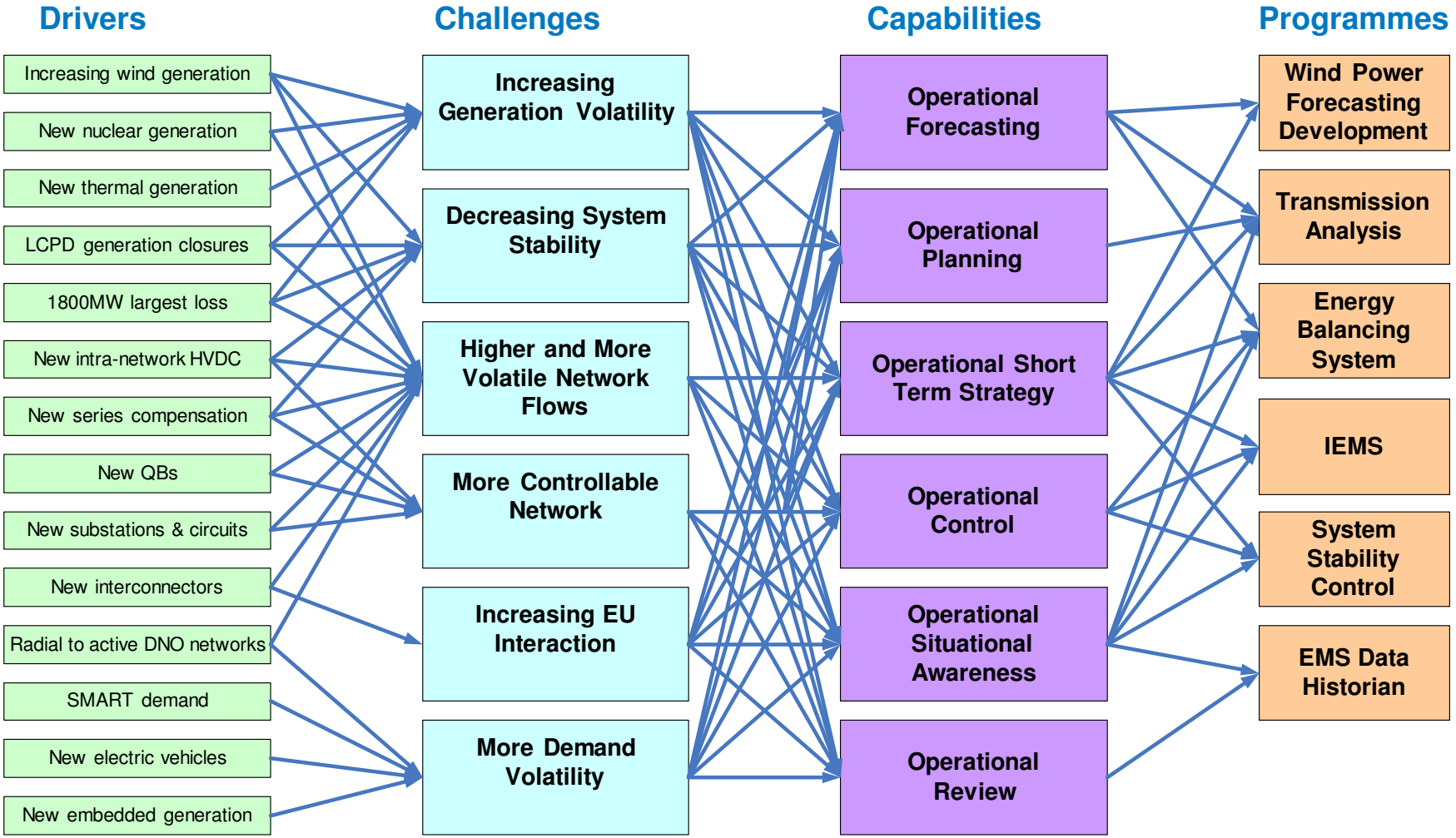
SO capabilities



- Forecasting
- Planning
- Short Term Strategy
- Control
- Situational Awareness
- Review



Linking drivers to programmes



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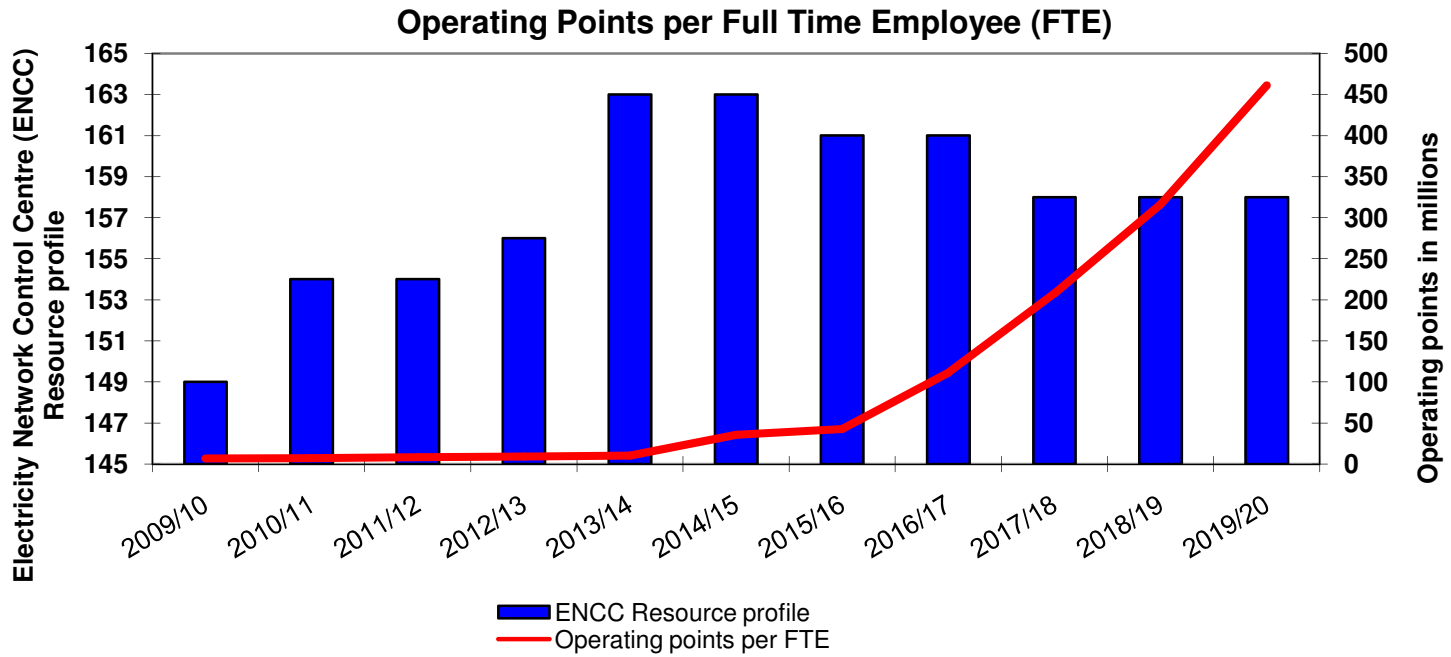
Influencing our System Operator approach

Volume of activity – Balance of tasks



- Volume of possible system configurations increases rapidly
- Resource growth minimised by increased IT investments
- Resource growth alone would not be enough to efficiently manage the number of operating points

System Operator control options

Increase Staff

- Would allow a higher volume of activities to manage increasing levels of uncertainty
- Approach does not however enable a significant change in process, does not increase depth of capability

Improve the existing IT systems

- Would allow increased volume of activities to manage the increasing levels of uncertainty
- Alignment with asset health replacement cycles and expected operating environment changes would allow minimum requirements for lowest cost of capital

Hybrid Approach

- Need to enhance our overall capability and make sure that our processes are suitable for the future challenges
- Volumes of work will need greater automation but will still require experienced control room staff to validate and optimise

Balances existing and future needs whilst minimising system risks

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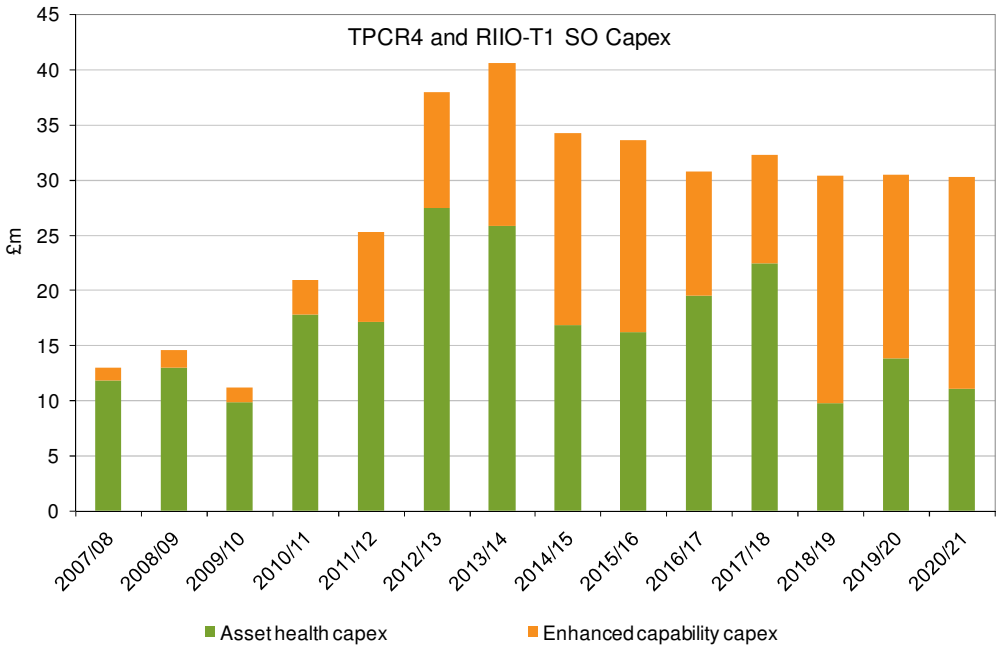
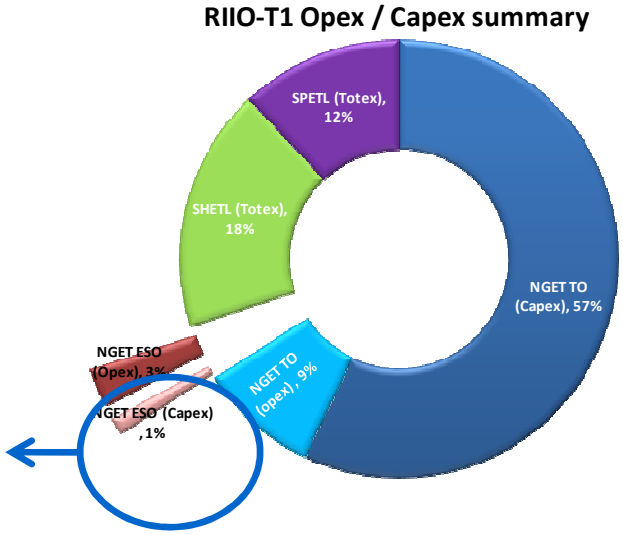
Benefits from our SO investments

NGET SO Capex RIIO-T1 forecast





- Asset Health Capex during RIIO period = £135m
- Enhanced Capability Capex during RIIO period = £127m

Benefits of our SO investments

- By investing in the enhancement of our future system operator capabilities we can achieve the following benefits:

Reducing future BSUoS / End consumer costs

Maintain Reliability

Avoid System Operator opex costs

Improve Market efficiency

Protect safety of staff, contractors and public

Facilitate Meeting Renewable Targets

Measuring BSUoS benefits

- Enhancement of our SO IT capabilities has a net positive financial effect
- Benefits are calculated against Balancing Services Incentive Scheme reductions
- Based on current BSIS spending, Reserve and Constraint costs will increase by ~£1.8bn for the RIIO period

NGET Invests	Balancing Cost Increase
£0bn	£1.8bn
£0.13bn	£1.1bn - £1.2bn

BSIS savings are forecast to be in excess of £0.6bn

In Summary

- The future System Operation Environment will become more complex, shaped by multiple drivers
- Greater uncertainty from generation variability and European interactions
- Requirement to maintain existing systems whilst enhancing our SO capabilities through investing in new and innovative control systems
- Will allow the measurement and maximisation of installed transmission system assets
- Investments will allow us to continue to facilitate meeting renewable targets and improve market information and efficiency
- Investments are forecast to deliver BSUoS / Consumer savings of £0.6bn

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QUESTIONS

- Do the benefits identified from our investments justify enhancing our control room capabilities?
- Do you think that the timing of our SO investment plan is appropriate?
- Do you agree with our approach in balancing the mix of resources and IT systems in undertaking the SO role?
- How does planned / unplanned outages of our control room systems affect you?

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Concluding Remarks

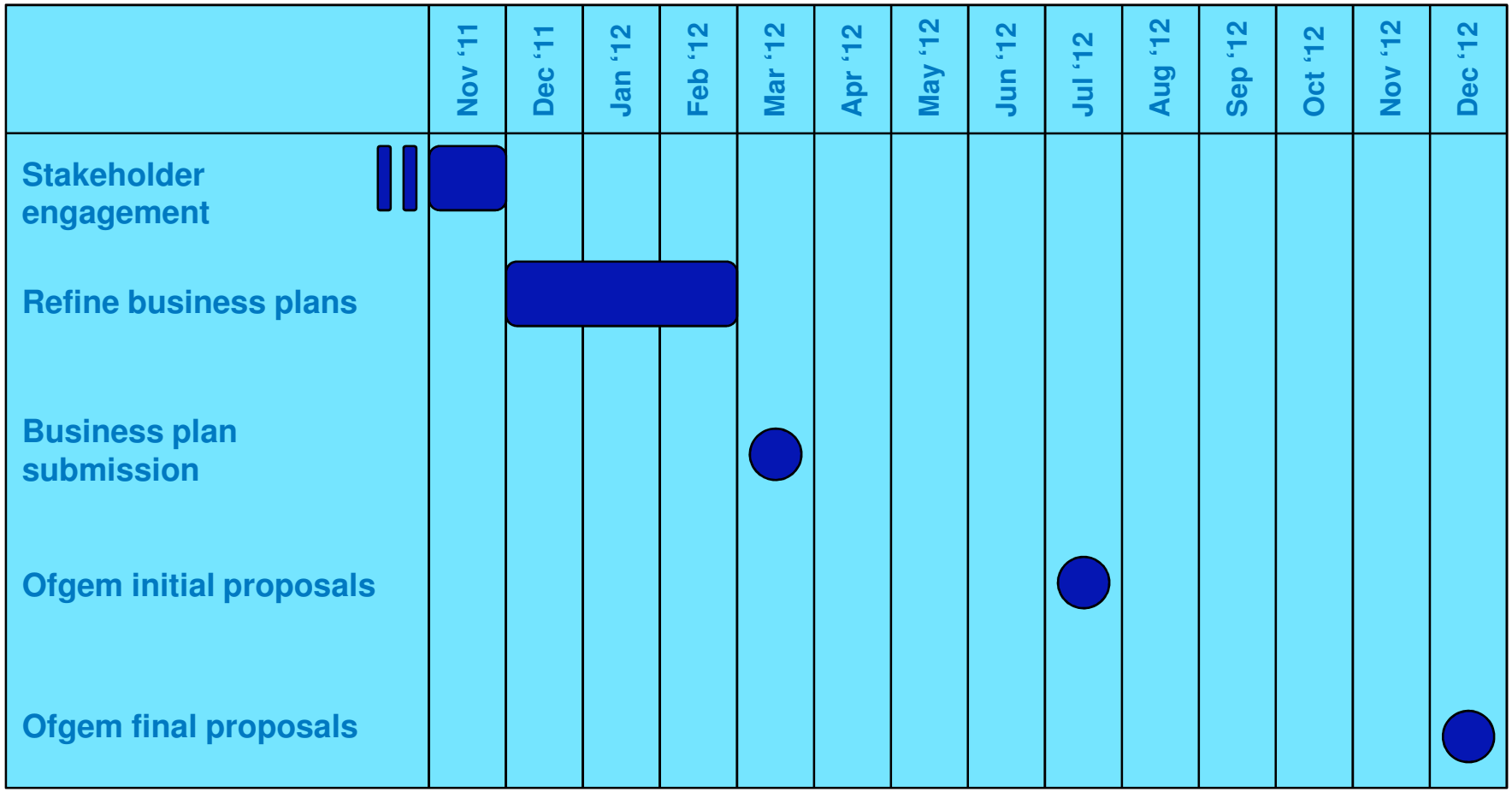
Talking Networks

Next steps

- We will collate the feedback from today and publish a summary
- We would like your written responses to the questions we have discussed today, to check we have understood what you are saying correctly by 18 November 2011
- RIIO-T1-2-1
  - If you would be interested in a 1-2-1 to run through your feedback on our business plan, please contact:

    talkingnetworkstransmission@uk.ngrid.com
- We will also ensure that all feedback received by 18 November 2011 is reflected in the development of our business plan

Timetable


Nov '11
Dec '11
Jan '12
Feb '12
Mar '12
Apr '12
May '12
Jun '12
Jul '12
Aug '12
Sep '12
Oct '12
Nov '12
Dec '12
Stakeholder engagement
Refine business plans
Business plan submission
Ofgem initial proposals
Ofgem final proposals