Commercial Balancing Services Group

3rd September 2014

Chair: Mike Edgar

Agenda

- Introduction and welcome
- Actions from previous meetings
- Review Terms of Reference
- System Operability Framework
- Update on future developments
  - Constraint Market Pricing
  - Commercial Intertrips
  - Reactive Power Market Review
  - Frequency Response and REP
- AOB

Introductions and welcome

- Introductions
- Apologies for absence
- Admin
  - Fire alarm
  - Lunch
- Agree minutes of last meeting
- Review of previous actions

Review of Terms of Reference

Adam Sims

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Review Terms of Reference

- The existing aim is to discuss development of specific areas of non-mandatory balancing services
- Workgroup style meeting, terms of reference detail specific issues requiring discussion
- Goal was to provide solutions that feed back into relevant Panels / develop draft modification proposals
- Frequency – 6 weekly
- Attendees – BSSG members; providers of balancing services (i.e. non-CUSC parties)

Proposed Approach

- Change to more of a discussion forum
- All issues around development of non-mandatory balancing services
- Attendees can raise issues for discussion or request a review
- Outputs/conclusions dependant on type of issue
- Regular updates on National Grid's current service development areas
- Same attendance list
- Quarterly meetings

System Operability Framework



Liena Vilde
SMARTer System Performance, TNS

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Future Energy Scenarios

Affordability
More money available

Low Carbon Life

Economic – Growing UK economy.

Political – Short term political volatility but long term consensus around decarbonisation.

Technological – Renewable generation at a local level. High innovation in the energy sector.

Social – High uptake of electric vehicles but consumers not focused on energy efficiency. 'Going green' is a by-product of purchasing desirable items.

Environmental – Carbon target hit. No new environmental targets introduced.

*Carbon Capture and Storage

Gone Green

Economic – Growing UK economy.

Political – Domestic and European policy harmonisation, with long term certainty provided.

Technological – High levels of renewable generation with high innovation in the energy sector.

Social – Engaged consumers focused on drive for energy efficiency. This results in high uptake of electric vehicles and heat pumps.

Environmental – All targets hit, including new European targets post 2020.

No Progression

Economic – Slow UK economic recovery.

Political – Inconsistent political statements within Government, resulting in investor uncertainty.

Technological – Gas is the preferred choice for generation over renewables. Little technological innovation occurs in the energy sector.

Social – Consumers not engaged with energy efficiency. Low uptake of electric vehicles and heat pumps.

Environmental – Targets are missed, no new environmental targets introduced.

Slow Progression

Economic – Slow UK economic recovery.

Political – Political will for sustainability but financial constraints prevent delivery of policies.

Technological – Renewable generation chosen over low carbon generation. Low levels of innovation in the energy sector.

Social – Engaged consumers focused on drive for energy efficiency but with low uptake of electric vehicles and heat pumps due to affordability.

Environmental – Environmental targets missed but hit later. New European targets introduced.

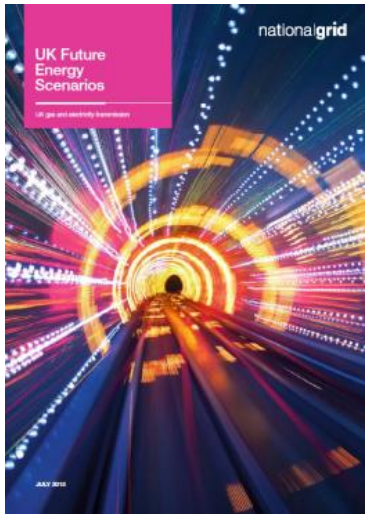
Affordability
Less money available

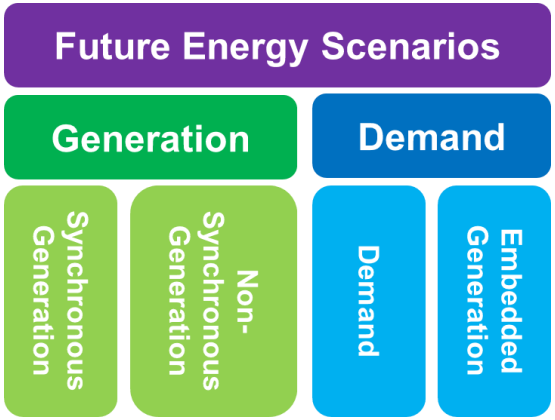
Sustainability
Less emphasis

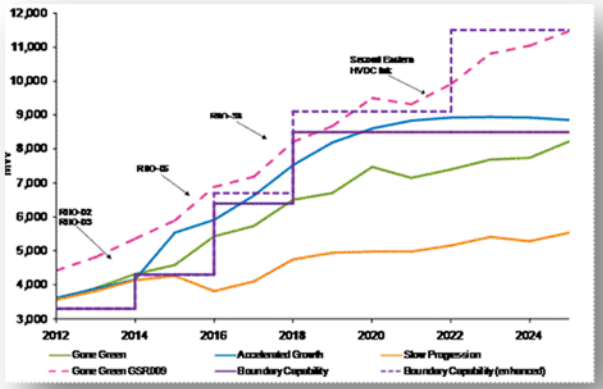
Sustainability
More emphasis

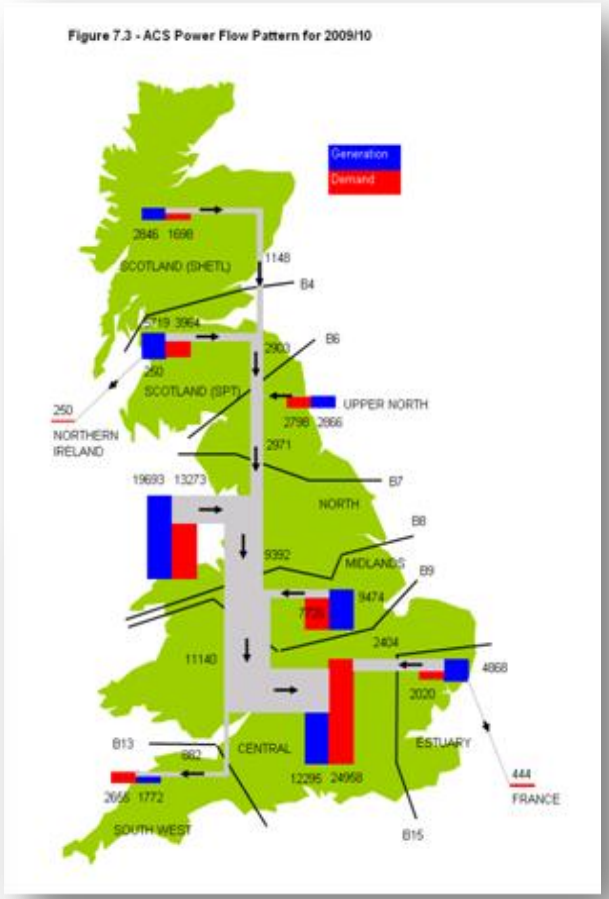
Future Energy Scenarios

- Impact of FES – power flows, transfer capacity and operability









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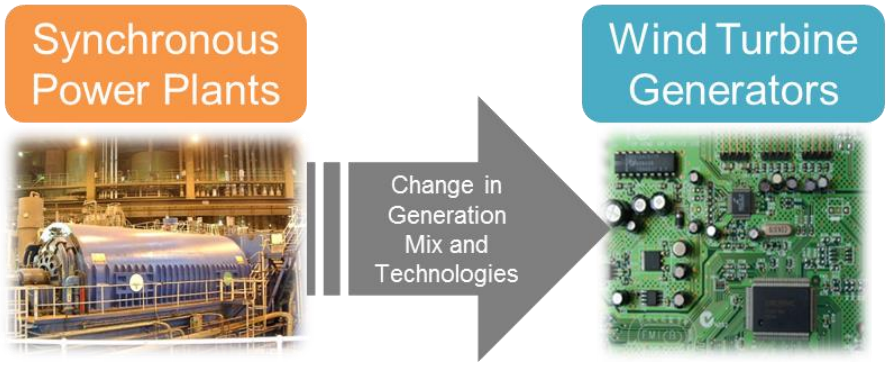
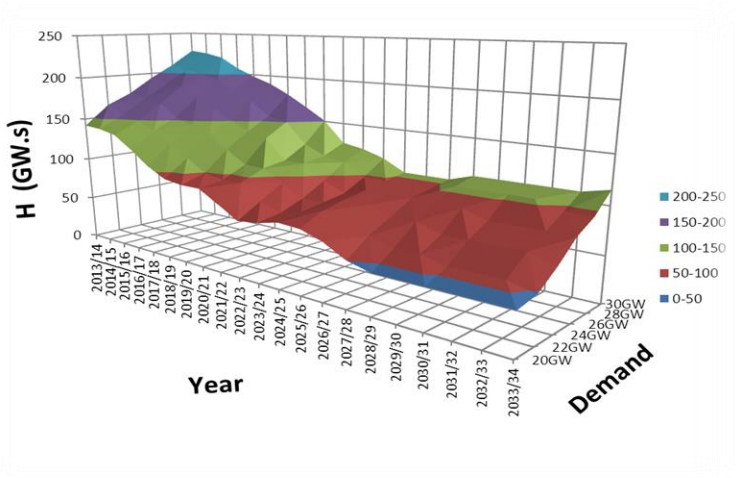
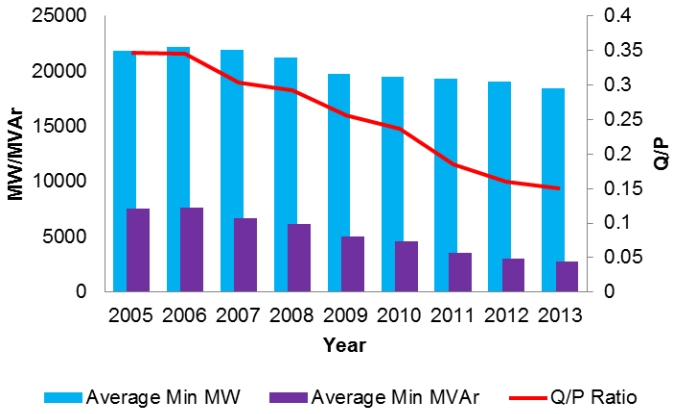
Impact of FES - Examples

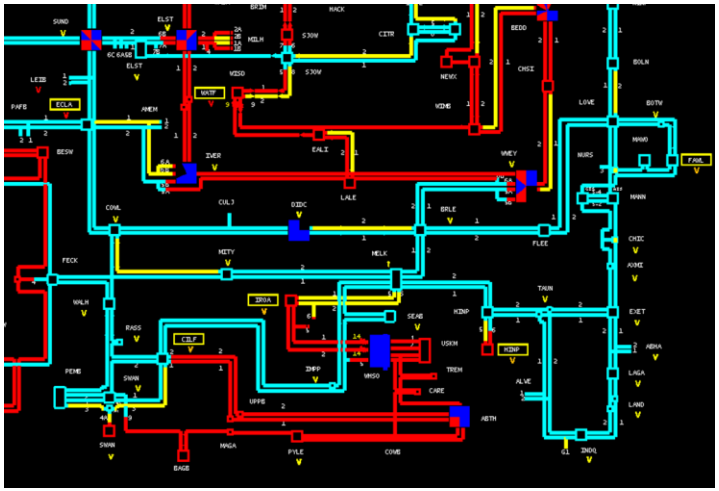
Reduction in System Inertia → Increase in RoCoF





Reduction in Q/P → High Voltage





System Operability Framework

Future Energy Scenarios

Change in Energy Landscape

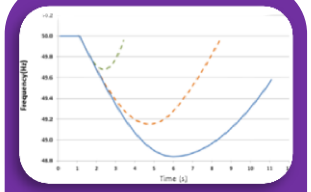
- Generation mix
- Interconnection
- Demand side services

Performance Requirements

Economic, Efficient and Operable System

- Large infeeds (>1800MW)
- System stability
  - Frequency
  - Voltage
  - Rotor angles
- Constraint minimisation
- Market facilitation

Operational Challenges



Reduction in System Strength

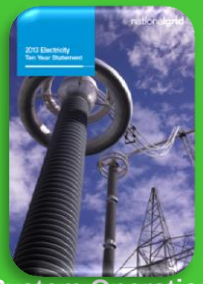
- System inertia
  - RoCoF
  - Primary response
  - System stability
- Short circuit level
  - Power quality
  - Protection
  - HVDC commutation
  - System stability

Operation Solutions & Opportunities

SMART Grid Development

- Rapid response
- Demand side response
- Low load operation of thermal plants
- Dynamic thermal ratings
- System wide controller
- Parallel HVDC links

Electricity Ten Year Statement



System Operation Chapter of ETYS

- Variations in each topic
- Opportunities for stakeholders to provide new services
- Stakeholder feedback

Methodology

FES

Stability Limits

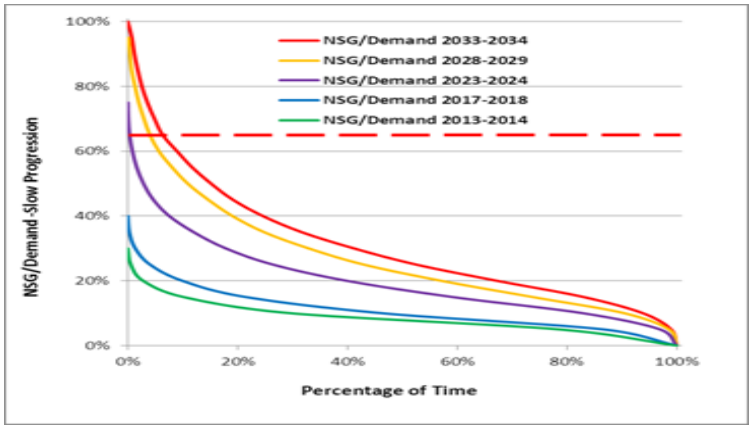
Historic System Behaviour

Network Changes

System Operability Framework

Solutions and Opportunities

Stakeholder Engagement



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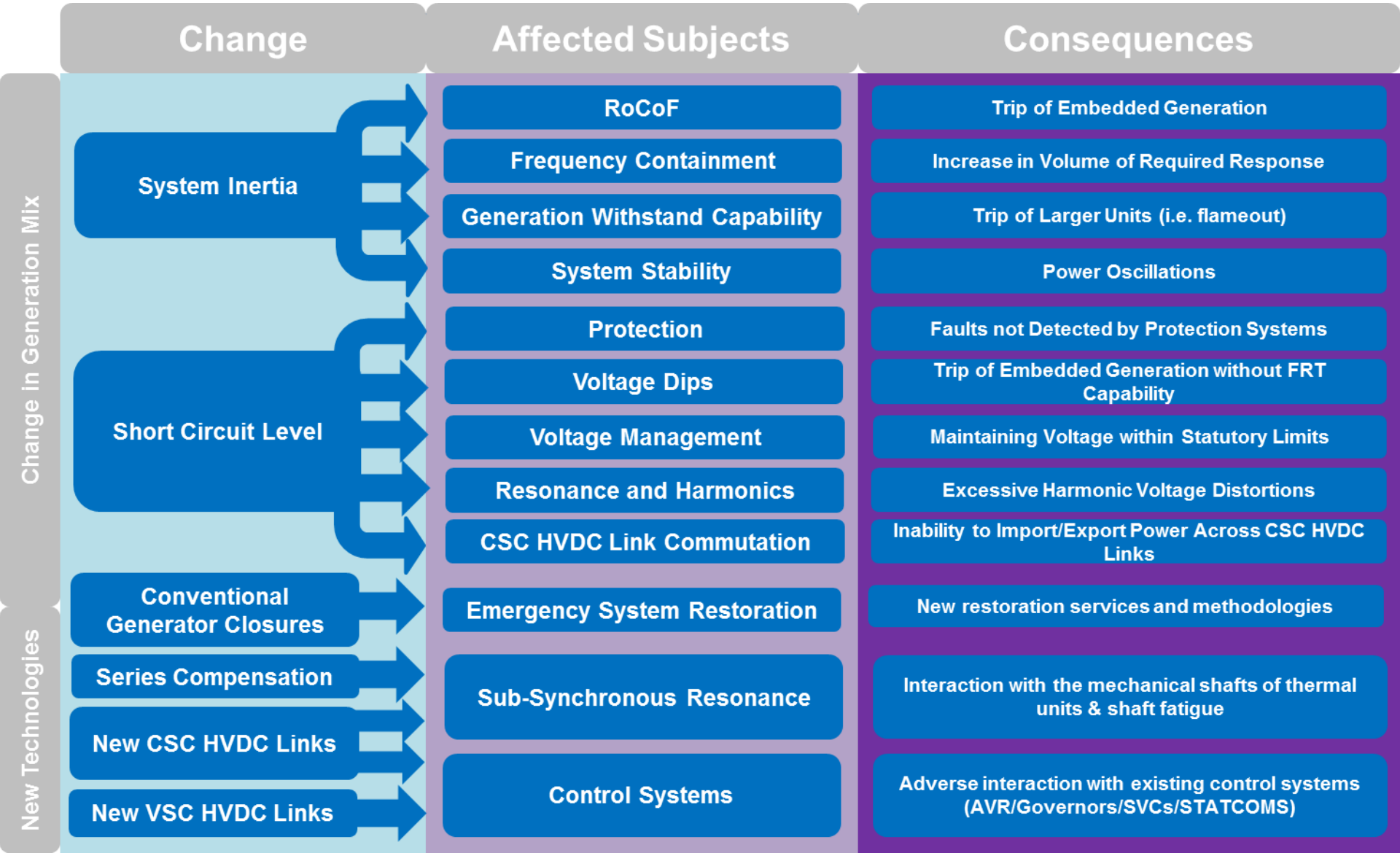
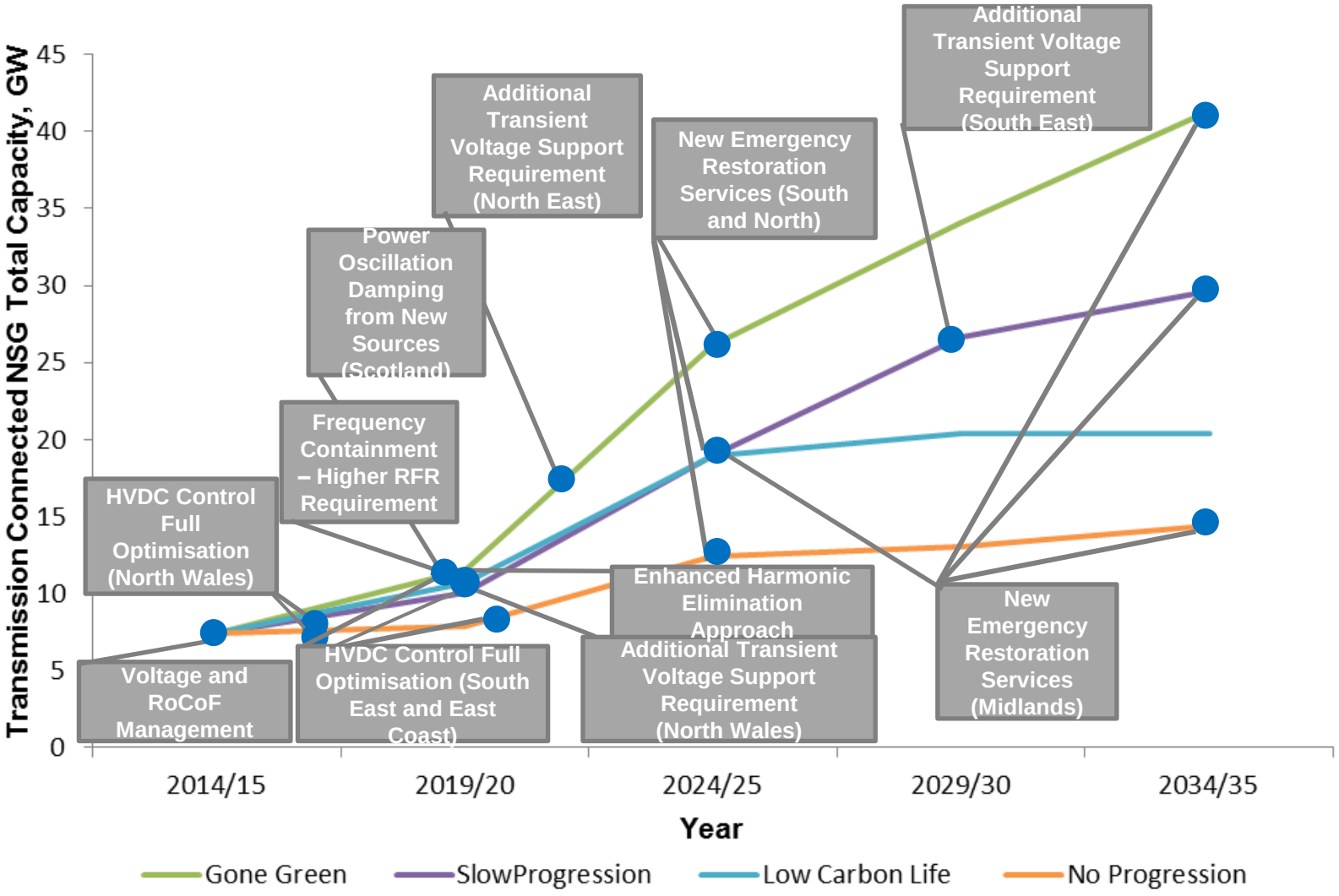
SOF Topics



Highlights of the Results



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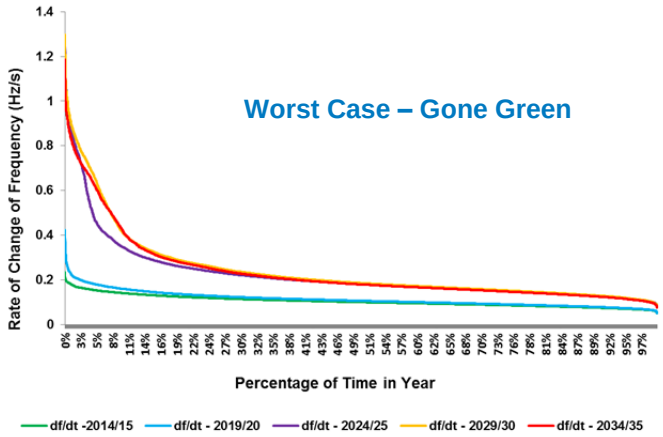
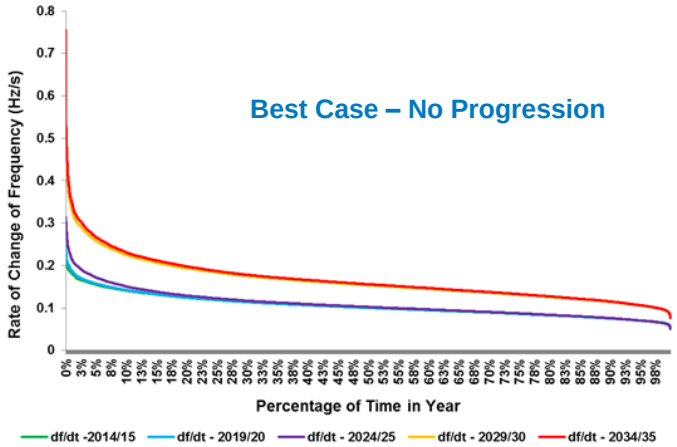
Highlights of the Results

- RoCoF relay setting changes will limit RoCoF as an operability risk, however alternative loss of mains protection approaches must be explored for new connections;
- Frequency containment remains under close review in the short term as in the absence of rapid frequency control measures, it can lead to significant increase in volume of response requirement;
- As NSG/Demand level increases across the system, the system may require additional support (initially in the form of additional leading and lagging reactive power support);
- The large-scale use of new technologies, such as VSC HVDC and series compensation will bring new challenges in terms of control system co-ordination and interaction, however these new devices could provide valuable system support in the future.

Result Focus – System Inertia

- RoCoF





Key Messages

df/dt>0.125Hz	2014/15	2024/25	2034/35
Gone Green	19%	92%	90%
Slow Progression	19%	38%	96%
Low Carbon Life	19%	88%	93%
No Progression	19%	23%	82%

df/dt>0.5Hz	2014/15	2024/25	2034/35
Gone Green	0%	5%	8%
Slow Progression	0%	1%	8%
Low Carbon Life	0%	2%	3%
No Progression	0%	0%	1%

df/dt > 1Hz/s less than 1% of time in all scenarios

Result Focus – System Inertia

- Frequency Containment

Inertia GW.s	GG	SP	LCL	NP	RoCoF (Hz/s)	Time* (to reach 49.2 Hz)	Response Rate (MW/s)
360	2014/15	2014/15	2014/15	2014/15	0.125**	9	**185**
225	2019/20	2024/25	2024/25	2029/30	0.2	4	**400**
205	2024/25	2024/25	2024/25	2029/30	0.22	3.4	**489**
180	2024/25	2024/25	2024/25	2029/30	0.25	2.4	**679**
150	2024/25	2024/25	2024/25	2034/35	0.3	1.2	**1148**

***The above assumes a 2s delay between detection/response activation time**

**** The actions currently taken to protect against RoCoF removes such high df/dt as a challenge for frequency containment.**

Key Messages

Significant increase in fast frequency response requirement once the first 1800MW single infeed connects:

- **Gone Green 2019/20**
- **Slow Progression 2018/19**
- **Low Carbon Life 2020/21**
- **No Progression 2018/19**

Current response rate limit is approx. 400MW/s (cumulative from a number of units), response exceeding this capability will be required:

- **Gone Green (2019/10) – 3% of the time**
- **Slow Progression (2024/25) – 8% of the time**
- **Low Carbon Life (2024/25) – 28% of the time**
- **No Progression (2029/30) – 19% of the time**

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Examples of Potential Solutions

- From a technical point of view, the following services could help manage operability:
  - **Rapid Frequency Response**
  - **Synchronous Compensation**
  - **Demand side response**
  - **Improved services from HVDC Sources**
- One solution may mitigate a number of issues - CBA
- Further work is required to review technical and commercial codes

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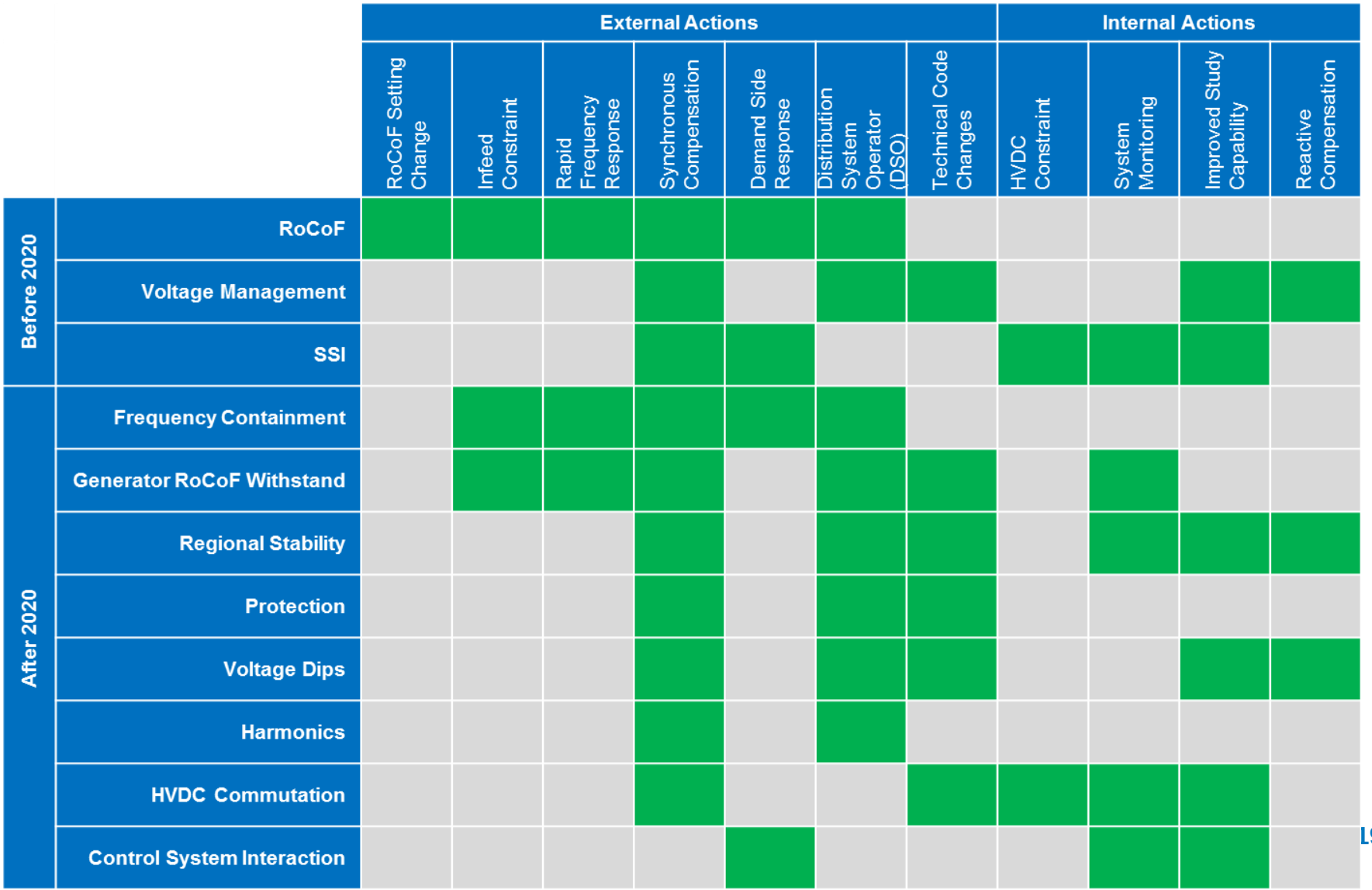
Examples of Potential Solutions



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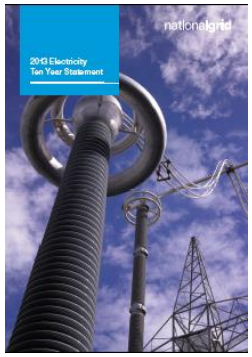
SOF Stakeholders

SOF Timeline

2013 2014

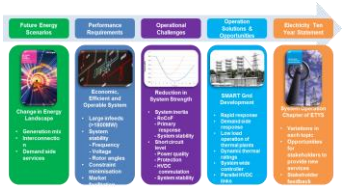
Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov



ETYS 2013 Published

Chapter 5: System Operation

SOF Framework Is developed

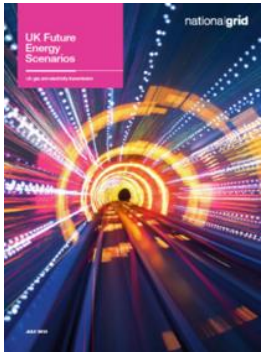


External Feedback and Consultation

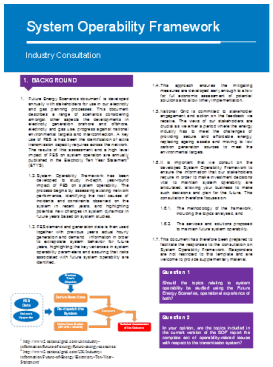
ETYS 2014

ETYS 2014 to be published

Summary of SOF



Launch of FES 2014



SOF Highlights and Consultation

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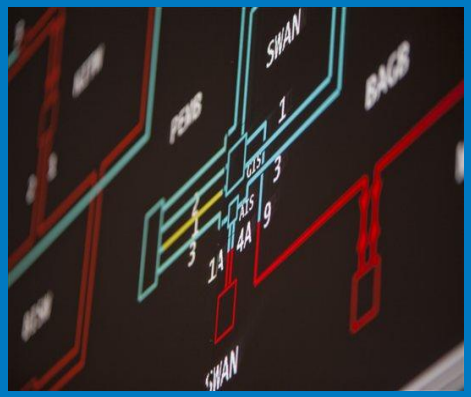
Thank You



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Update: Spread Indexed Constraint Management Contracts

Sarah Hall & Ed Mellish

Constraint Management Pricing

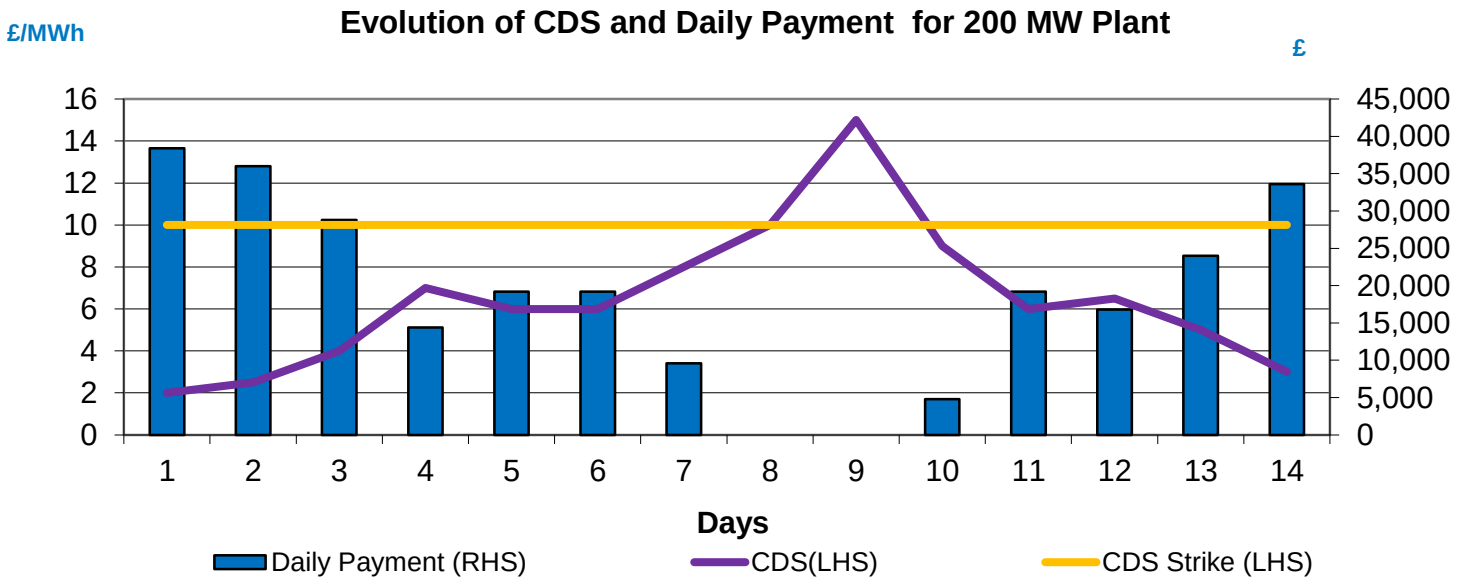
- National Grid is exploring a new type of price structure with payment linked to clean spark/dark spread
  - Share our current thinking
  - Raise awareness of the potential change to the service
  - Understand view of industry participants

Constraint Management Contracts

- National Grid contract generators to maintain output for certain periods of the day
- Services are contracted where there are system requirements, e.g. MVar absorption, import constraint
- Requirements are dependent on plant running and difficult to predict when plant is marginal

Current Pricing Structure	Future Pricing Structure
Fixed £/SP fee	£/MWh “top up” fee
Unhedged service providers are exposed to risk in fluctuation of underlining fuel prices	Risk reduced as clean spread price is taken into account in calculation of fee Increased certainty of income
Consumer pays premium for service to cover risk of fuel price fluctuation	Consumer payment more accurately reflects cost of service
Consumer pays for service even when unit is in merit	Consumer only pays for service when unit is out of merit

Contract Structure



- National Grid and service provider agree on a strike level. National Grid will make payment when CDS/CSS falls below the strike level
- Service provider is guaranteed profit
- National Grid will not make payment when the plants are in the money
- CDS/CSS is calculated based on several index, e.g. API, NBP, EUA, Carbon Support etc
- Payment settled monthly

Questions & Feedback

- We would welcome feedback on this approach from all industry participants
- What can we include in our development of this service to make it easy for providers to participate
  - Timescales?
  - What data is required?

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Update: Commercial Intertrips

Adam Sims

Commercial Intertrip Requirement

National Grid has identified requirements for Commercial Intertrips in the below locations to aid in managing constraints across the Anglo-Scot border and the North West of England:

- **Southern Scotland**
  - Requirement published on the National Grid website for wind farm service providers Griffin, Fallago, Whitlee, Black Law, Crystal Rig and Cairn Uish to indicate their interest in providing a Commercial Intertrip service
  - Providers have expressed an interest with contractual discussions now underway
  - Work of the Intertrip Scheme design is ongoing

- **Heysham Operational Tripping Scheme**
  - Discussions underway with a number of wind farms connecting into Heysham to utilise the existing intertripping scheme outside of Cap 76 conditions under a commercial framework

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Update: Reactive Power Market

Adam Sims

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Current Reactive Power Services

MANDATORY SERVICE

Obligatory Reactive Power Service (ORPS) → **MSA (Mandatory Service Agreement)**

COMMERCIAL SERVICES

Enhanced Reactive Power Service (ERPS) → **Market Tender Mechanism**

Ad-Hoc System Voltage Constraints → **Bilateral Negotiations**

Local Tenders

Reactive Power Market Mechanism

Current State of ERPS:

- **Continues to run every 6 months as per CUSC**
- **No tenders received since 2011**
- **Last Service Review took place in 2009**

System Trends

- Continued trend of MVAr demand decrease across system
- Conventional stations; potential closures

Overall commercial Reactive Power procurement being considered

No guarantee of ERPS Review at this stage

Any thoughts on Reactive Power provision (Mandatory and Commercial) are welcome…

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Update: Frequency Response and REP

Adam Sims

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Response Energy Payment

- Concerns with some wind generators pricing themselves out of the response market
- One reason given is the calculation of the REP, which is supposed to reflect the cost of providing the energy
- REP calculation is predicated on conventional generation, i.e. where a fuel is consumed at a cost
- For low carbon plant the fuel has no cost, therefore the REP calculation is not cost reflective for these sites

Response Energy Payment

- REP calculation is set out in CUSC Section 4
- Based on fixed multipliers to the Market Index Price, depending on direction of response provided
- Potential developments have been discussed at the BSSG over the past year
- National Grid's intention is to raise a CUSC modification proposal at the 26th September Panel

Rapid Frequency Response

- National Grid is currently undertaking a cost/benefit analysis based on the 2014 SOF work
- Due to report to Grid Code Review Panel in November
- A further update will be provided at the next CBSG

Future CBSG Meetings

Adam Sims

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Next CBSG Meeting

- First week of December (1st – 5th)
- If you would like to raise a topic for discussion, please contact adam.sims@nationalgrid.com or jade.clarke@nationalgrid.com

AOB