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Supplemental Balancing Reserve

From Forecasting to Despatch

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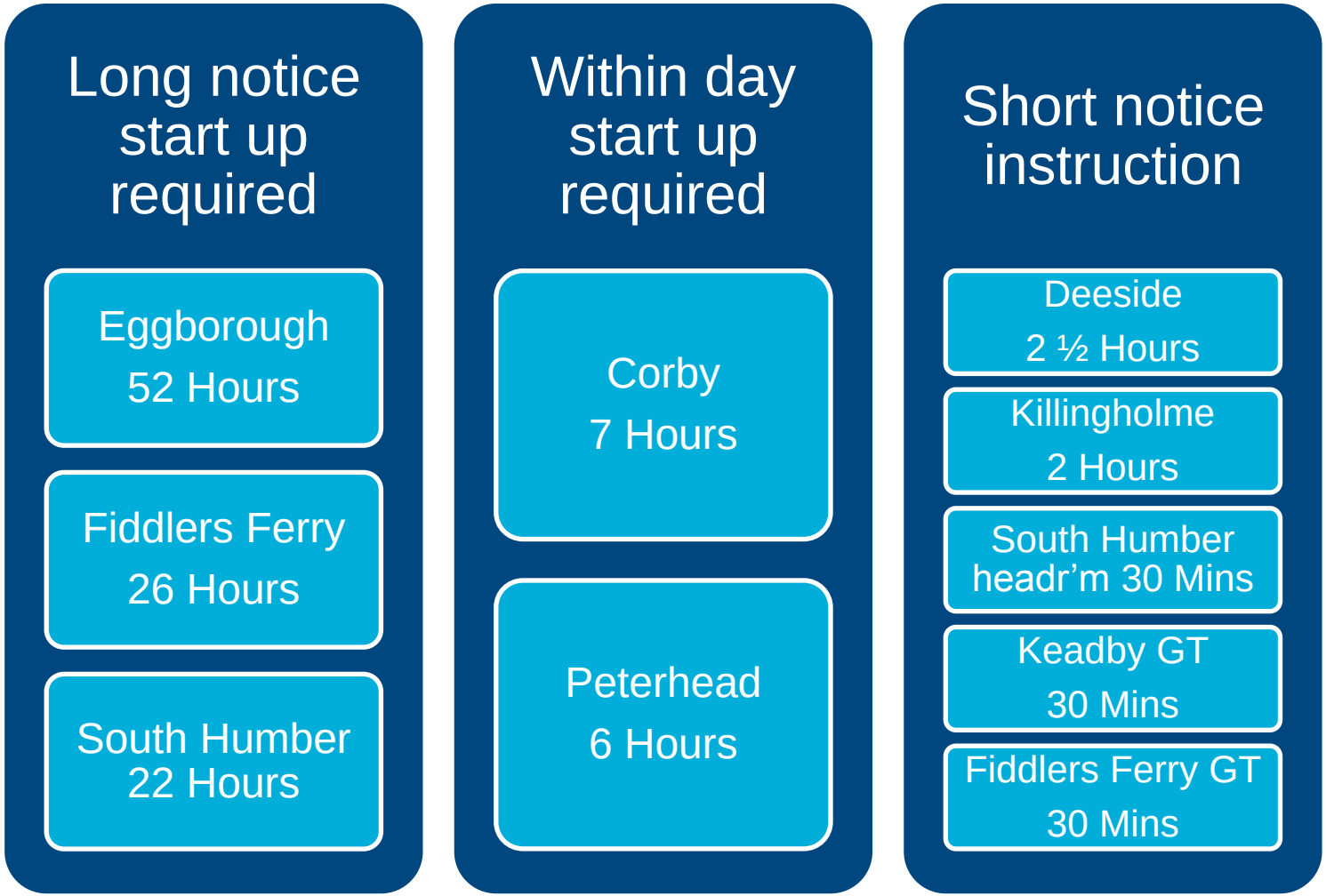
Control Implementation Manager

SBR Units Contracted



Total run up time = Notice to deviate from zero plus total ramp to Max Export Limit

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SBR: Operational Principles

Only utilised when **all** market based actions exhausted (excluding 900MW regulating reserve)

Market will **always** be informed before respective stations are

EMN will be issued prior to a dispatch (i.e. synchronisation) except in exceptional circumstances

Plant dispatched in economic order (utilisation price and duration required), not convenience (i.e. warm plant not used instead of cheaper cold plant)

Minimal plant dispatched to maximum output rather than multiple plant dispatched to lower levels

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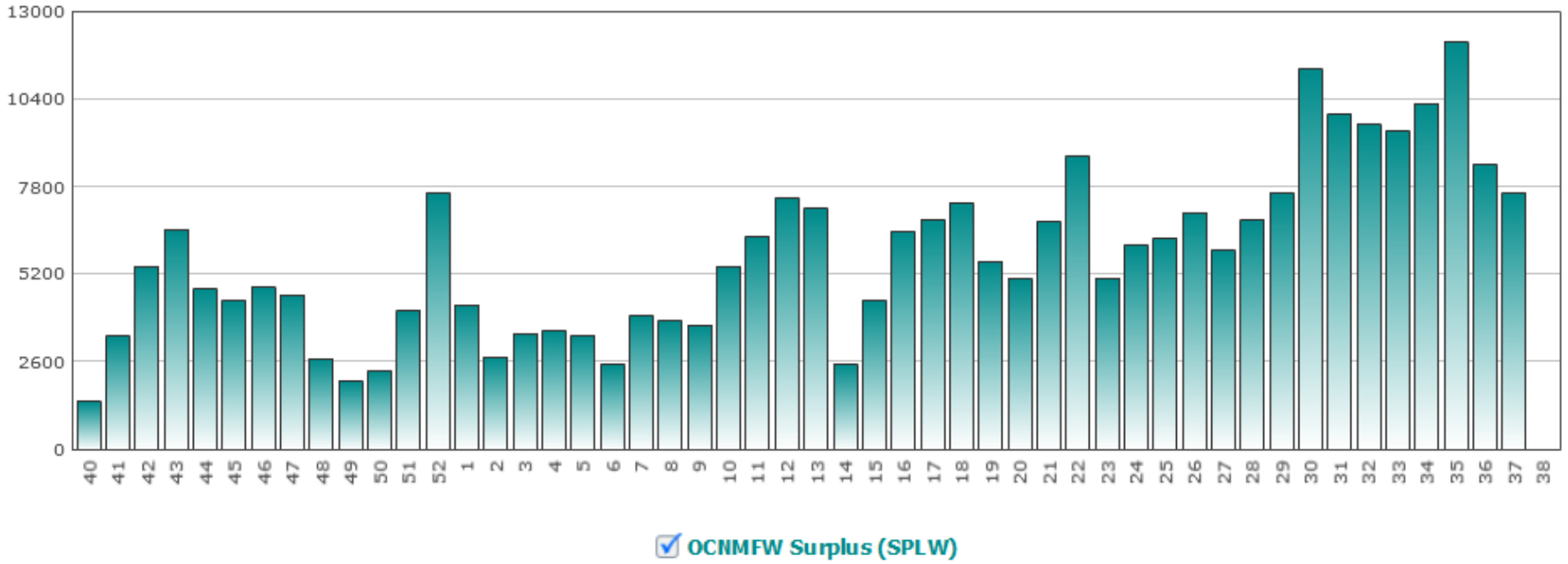
Supplemental Balancing Reserve Information

- Plant Dynamics
- BMU Identifiers
- Price Information
- Dispatch Processes

Available on National Grid SBR Webpages

Projected Margin Information

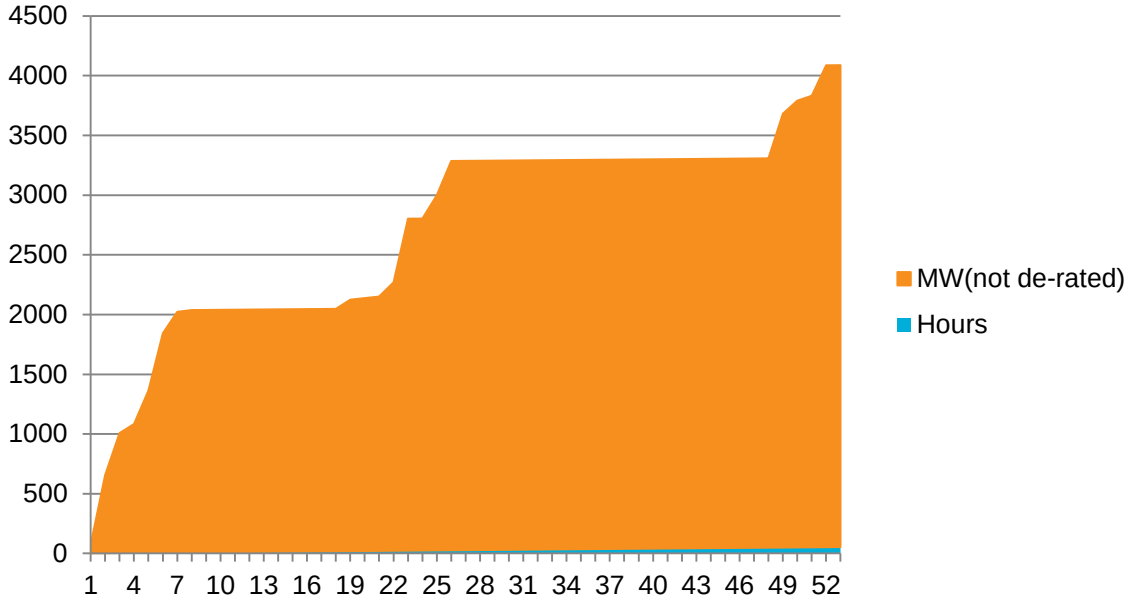
www.bmreports.com



Please note: published surpluses include the forecast level for wind generation in short term time scales up to 14 days ahead and then at a seasonally dependant load factor for 2-52 weeks ahead. Hydro is at full output useable so is therefore dependent on there being sufficient sources of water for this level to be achieved.

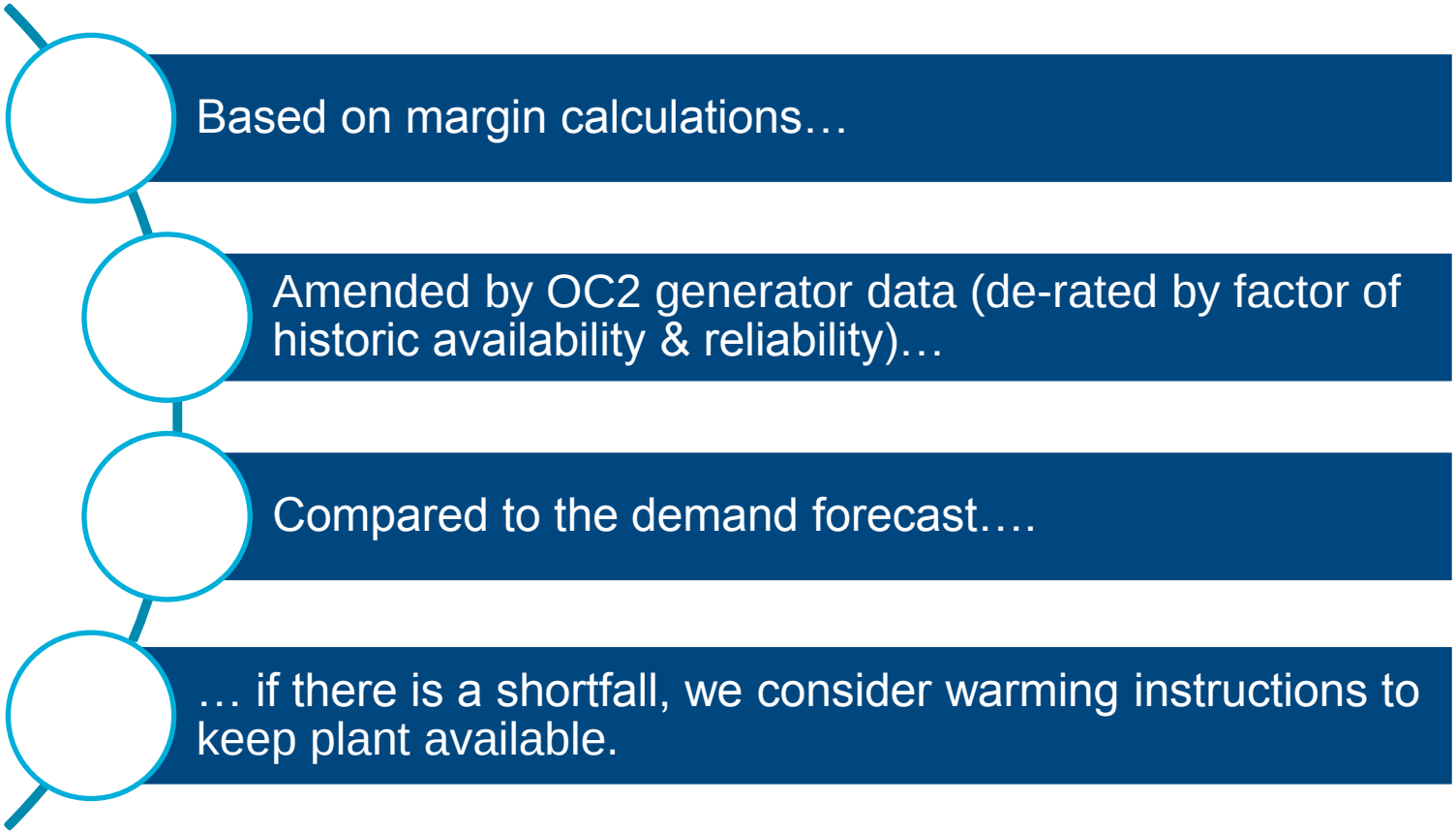
OC2 data submitted under the Grid Code provides information to the market and is the basis for our decision making

SBR start up and dispatch comparison



SBR Start Up 'Warming'		SBR Dispatch
De-rated generation < Demand	**Trigger**	All available plant and operating reserve (excl 900MW) exhausted in plan
To industry via SONAR	**Publication**	To industry via BMRS
Up to 52 hours	**Lead Time**	Max 6 hours, min 30 mins
To industry via SONAR (Warning message is on BMRS)	**Stand down**	Not applicable

Long Notice Start Up Instruction



Industry and National Grid will be basing decisions on OC2 data - therefore its accuracy is critical.

Long Notice Start Up Instruction: Example 1

- **D-2**: updated wind & energy forecasts are compared to OC2 generator data &, margin calculated

D-2 : Decision made to Warm EGGB units

D-2 c. 15:00 : Warming instructions issued to station

- **D-2** : BMRS Warming message(s) issued
- **D-2** : SONAR message(s) issued

- **D-2**, 15:00 to D 13:20 : Margin calculations are rerun every SP & if margin improves, plant may be stood down

D 13:20: EGGB changes NDZ to 85 minutes & BOAs issued. 15:00 units synchronized

Long Notice Start Up Instruction: Example 2

- **D-1**: updated wind & energy forecasts are compared to OC2 generator data &, margin calculated

D-1 : Decision made to Warm FIDL (& SHBA) units

D-1 14:00 : Warming instructions issued to station

- **D-1** : BMRS Warming message(s) issued
- **D-1** : SONAR message(s) issued

- **D-1** 14:00 to D 13:50 : Margin calculations are rerun every SP & if margin improves, plant may be stood down

D 13:50: FIDL changes NDZ to 5 minutes & BOAs issued. 15:00 units synchronized.

Short Notice Start Up Instruction

- D-1, 11:00 → D: Based on System Operating Plan (updated at 4 hour intervals) with Generator Data from the BM
- Compared to the latest demand forecasts & operating margins (weather, generator availability, interconnector updates)
- If the shortfall is between 500MW & 700MW, the Control Room will consider issuing Warming instructions so to keep plant available.
- A Grid Code System Warning (e.g. EMN) will be issued ahead of any SBR plant being despatched.

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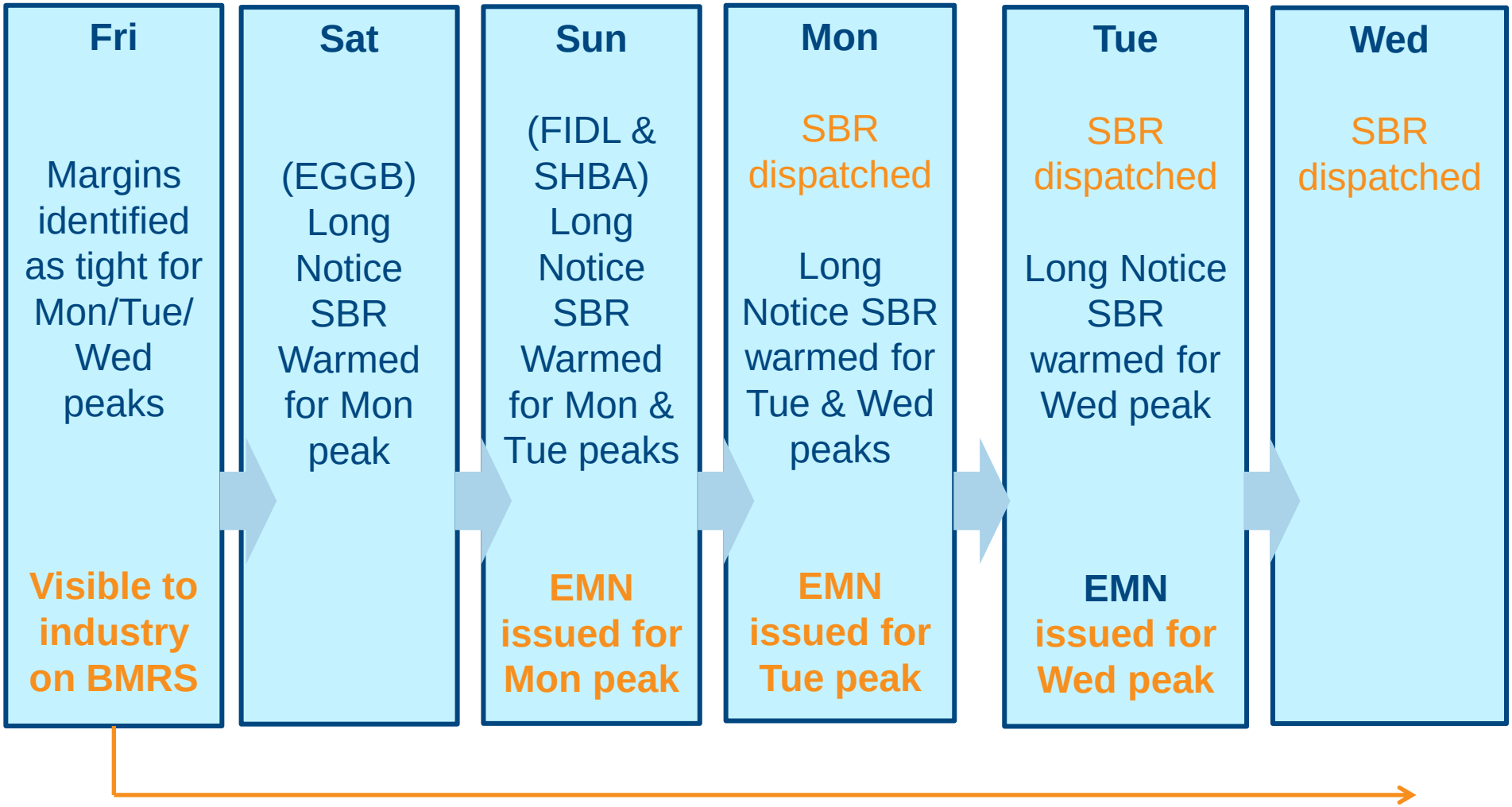
Dispatch: An Alternative View



SBR Utilisation – Example Costs, Impact on BSUoS and imbalance prices

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Scenario	Number of Days NISM Warning Issued	Number of Days SBR Required	Average Volume of SBR Required (when needed)	Maximum SBR Volume Required	Estimated Cost of SBR Utilisation for Winter '16	MW Shortfall (after all SBR utilised) Priced at VoLL £3,000/MWh for 45 mins	**Total SBR Utilisation and MW Shortfall Valued at VoLL**
Normal Weather [1]	0	0	0	0	0	0	**0**
Normal Weather [2]	15	0	0	0	0	0	**0**
Winter 2010/11 Weather Conditions [1]	15	10	2,363	4,906	£11,063,130	£6,191,122	**£17,254,252**
Winter 2010/11 Weather Conditions [2]	24	19	2,189	6,056	£19,446,761	£14,374,503	**£33,821,264**
Winter 2012/13 Weather Conditions [1]	16	8	1,804	3,345	£7,702,350	£0	**£7,702,350**
Winter 2012/13 Weather Conditions [2]	20	18	1,609	4,495	£13,649,952	£4,164,025	**£17,813,977**

[1] - 2.0 GW CDM, 2.5 GW Mainland Europe Import, Flat Irish Interconnector, ~ 89% de-rating for all thermal generation, includes short-term OR

[2] - 1.6 GW CDM, 2.5 GW Mainland Europe Import, 750 MW Ireland Export, ~ 89% de-rating for all thermal generation, includes short-term OR

Scenario	Total BM Start-up Costs (SBR Only)	SBR SU by HH (4 Settlement Periods)	BMSU BPA (Tagged as System)	BSUoS Charging Volume by HH (MWh)	SBR SU Impact on HH BSUoS Charge (£/MWh)	Impact of DSBR/SBR Utilisation on HH BSUoS Charge (£/MWh)	Total Impact of SBR on HH BSUoS Charge (£/MWh)	System Imbalance Price if NIV Negative (System Long)	System Imbalance Price if NIV Positive (System Short)
Warming of Plant, no NISM or Dispatch of SBR	£185,136	£46,284	£0.00	51,500	£0.90	£0.00	£0.90	£48.00	£573.89
No Warming, Dispatch of SBR Within Day	£0	£0	£0.00	51,500	£0.00	£4.51	£4.51	Unlikely but £60.00	£3,000.00
Warming of Plant, NISM & SBR Plant Used	£0	£0	£0.00	51,500	£0.00	£9.89	£9.89	Not Possible	£3,000.00

The Financial Impact of SBR

Testing Costs

- Are recovered on the day they are incurred
- Are reconciled over period 01 Nov. to 28 Feb. (via RF invoice, issued c.14 months later

Availability Fees

- Are recovered on a daily basis from 01 Nov. to 28 Feb
- Estimated to be £935,000 per day (£114million for the contract duration)

Utilisation Fees

- Are subject to Ofgem approval on each occasion
- Noting this, are sought to be recovered on the day they are incurred
- SBR volume is set to £3,000/MWh & this sets cash out for that SP

Please note CMP262, in Modification Process at the moment….

Key Messages – Operating SBR

- Long Notice SBR Warming decisions will be made based on OC2 data. Accuracy of this data is vital.
- Operational messages will continue to appear on BMRS & the market is informed prior to any SBR instruction.
- A Grid Code System Warning (e.g. EMN) will be issued prior to any dispatch (unless exceptional circumstances).
- SBR is instructed after all other market based actions, but before emergency services