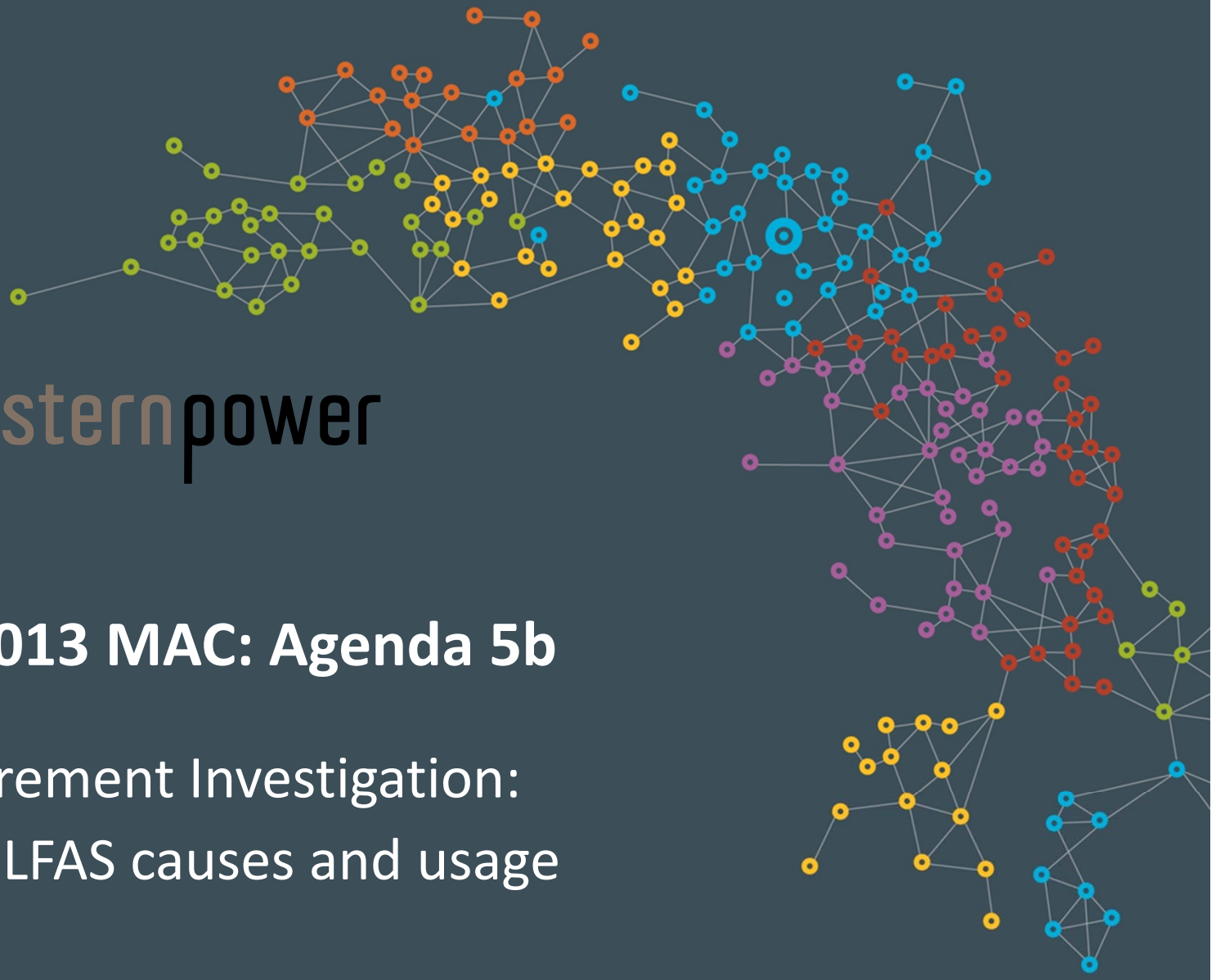


October 2013 MAC: Agenda 5b

LFAS Requirement Investigation: Analysis of LFAS causes and usage

Background

- The IMO and System Management are working together to investigate the LFAS Requirement for the Wholesale Electricity Market (WEM)
- Initial analysis of LFAS causes and usage for March 2013
- Aim to:
  - Assess how much LFAS was used
  - Develop methodologies for forecasting, monitoring and reporting of LFAS usage

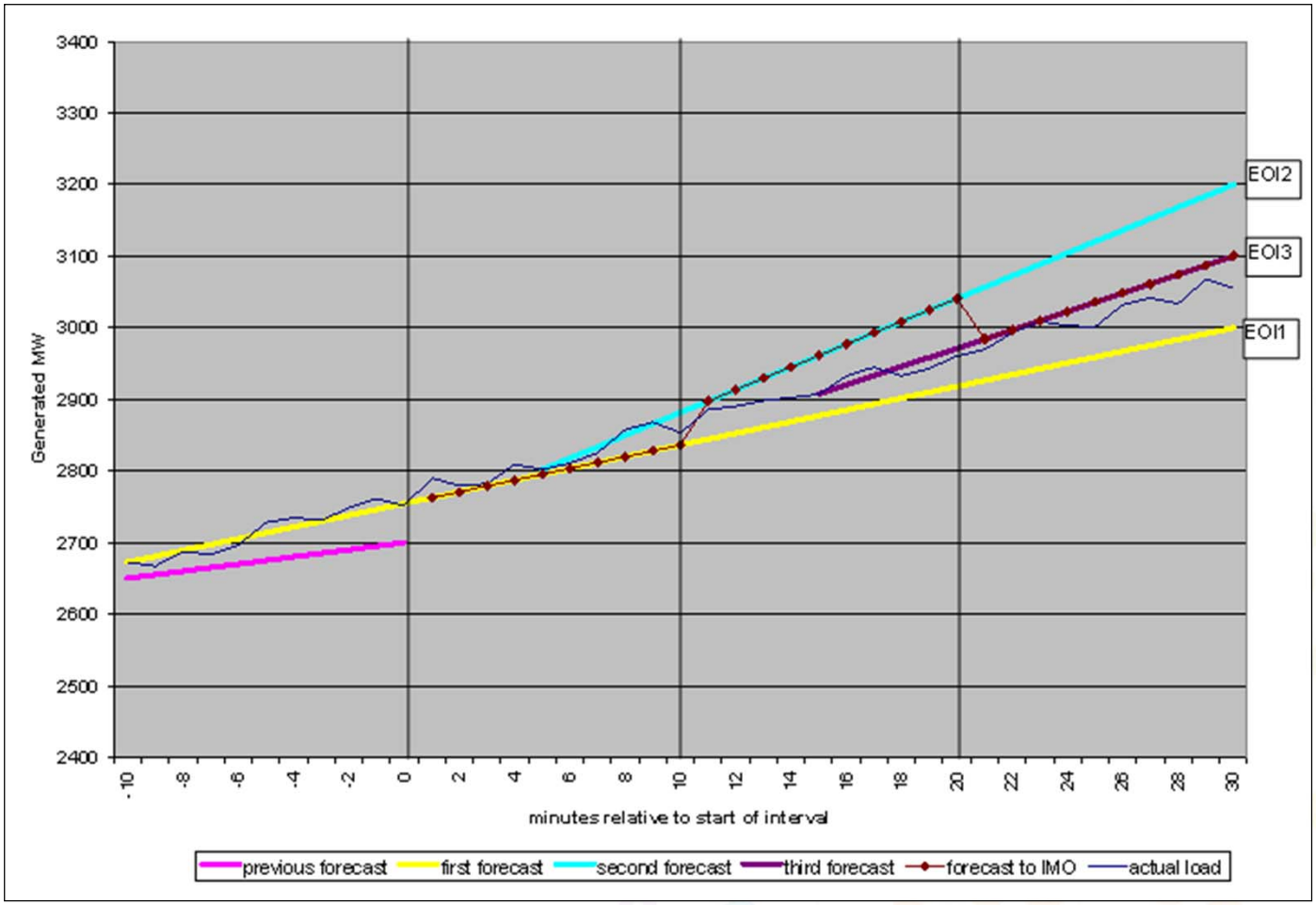
Methodology

- Using historical Dispatch Instruction (DI), forecast generation and actual generation data
- One minute averages
- Four primary causes examined in detail:
  - Variation from system load forecast
  - Variation from non-scheduled generation forecast
  - Deviation of Scheduled Generators from DIs
  - Variations due to dispatch at BMO ramp rates
- Usage = (actual output – DI output) for LFAS providers
- Notional DI for VEBP – five options considered

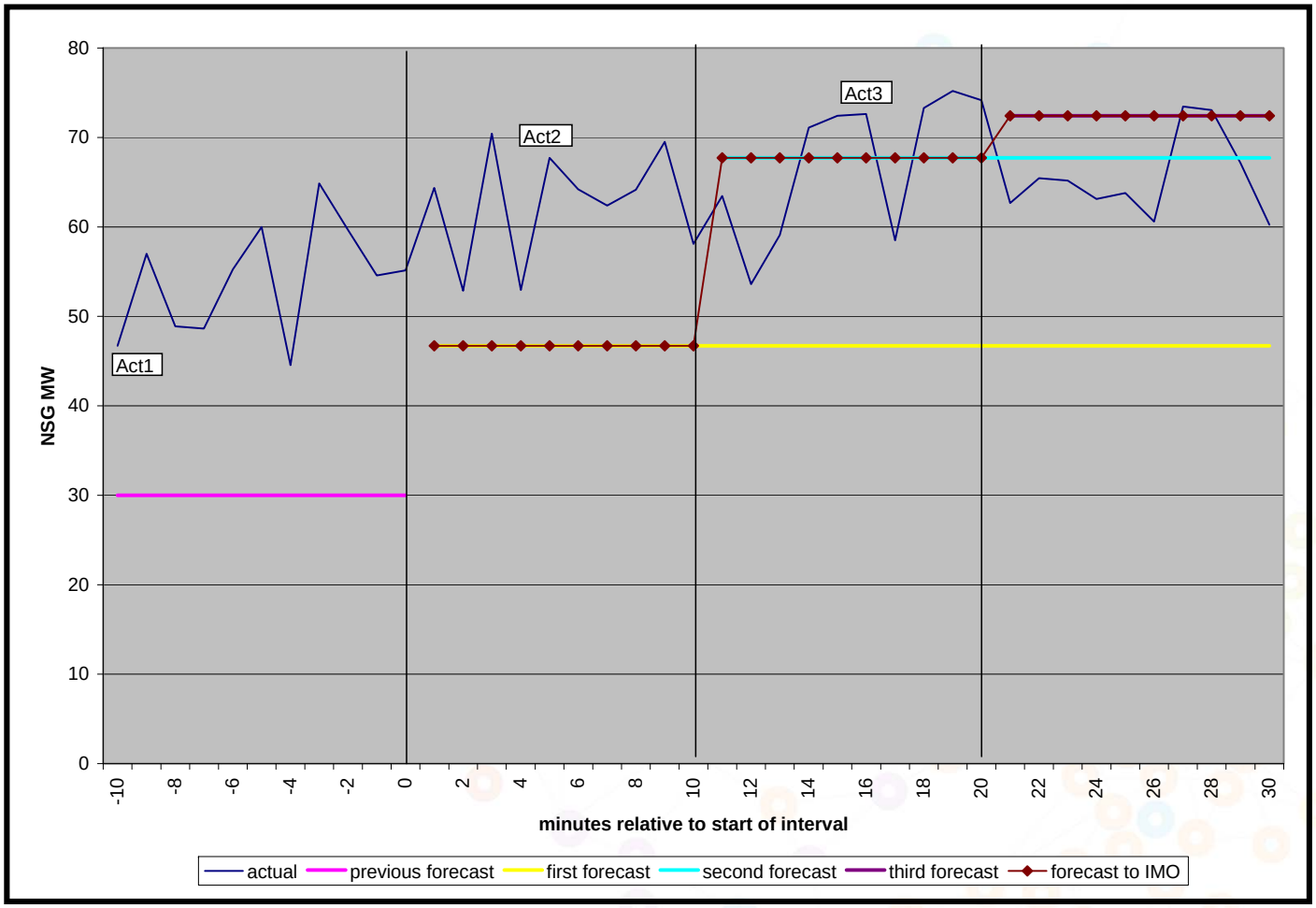
Methodology (continued)

- Exclusion of intervals:
  - two under-frequency load shedding events (SR/LRR)
  - 109 10 minute periods with no load forecast created
  - seven Trading Intervals with spurious load forecasts
- Limitations of analysis:
  - Exaggerates extent of physical VEBP movement
  - One minute averages
  - Depends on assumptions used about Start of Interval positions
  - Analysis for a single month
- Independent verification of results
- Repeating analysis for July 2013

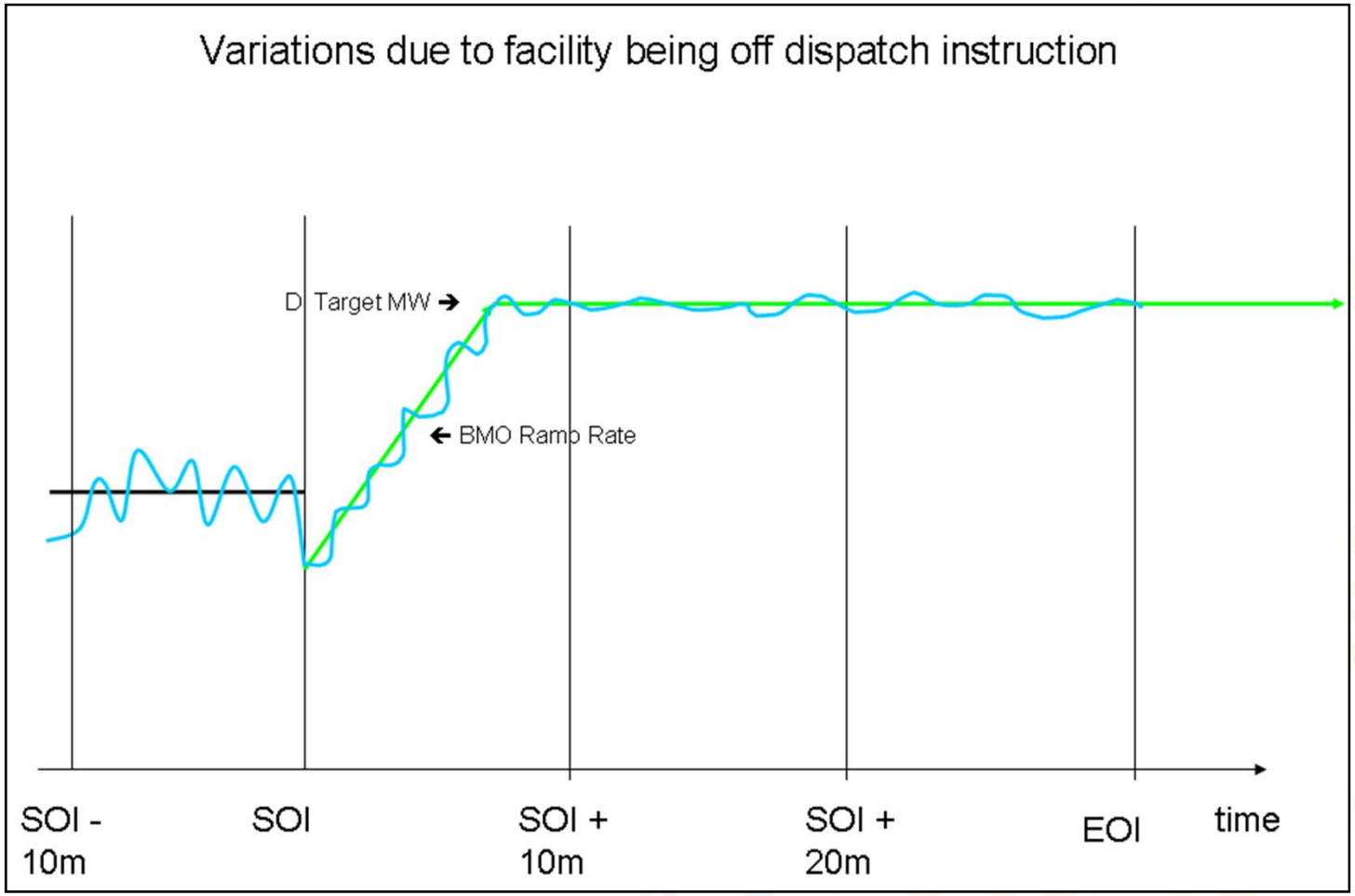
Cause 1: Variation from system load forecast



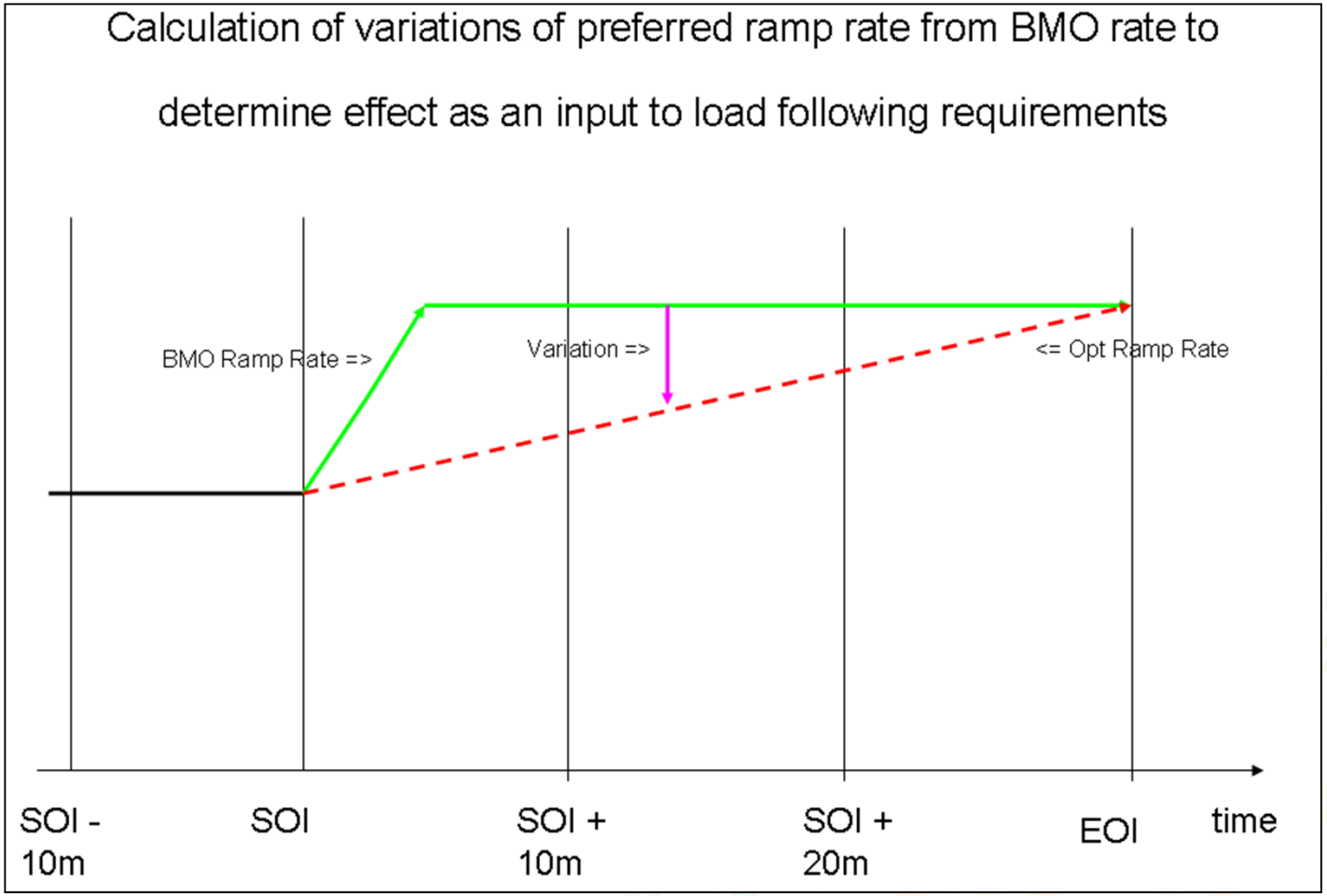
Cause 2: Variation from NSG forecast



Cause 3: Deviation of IPP Scheduled Generators from Dispatch Instructions



Cause 4: Variations due to dispatch at BMO ramp rates



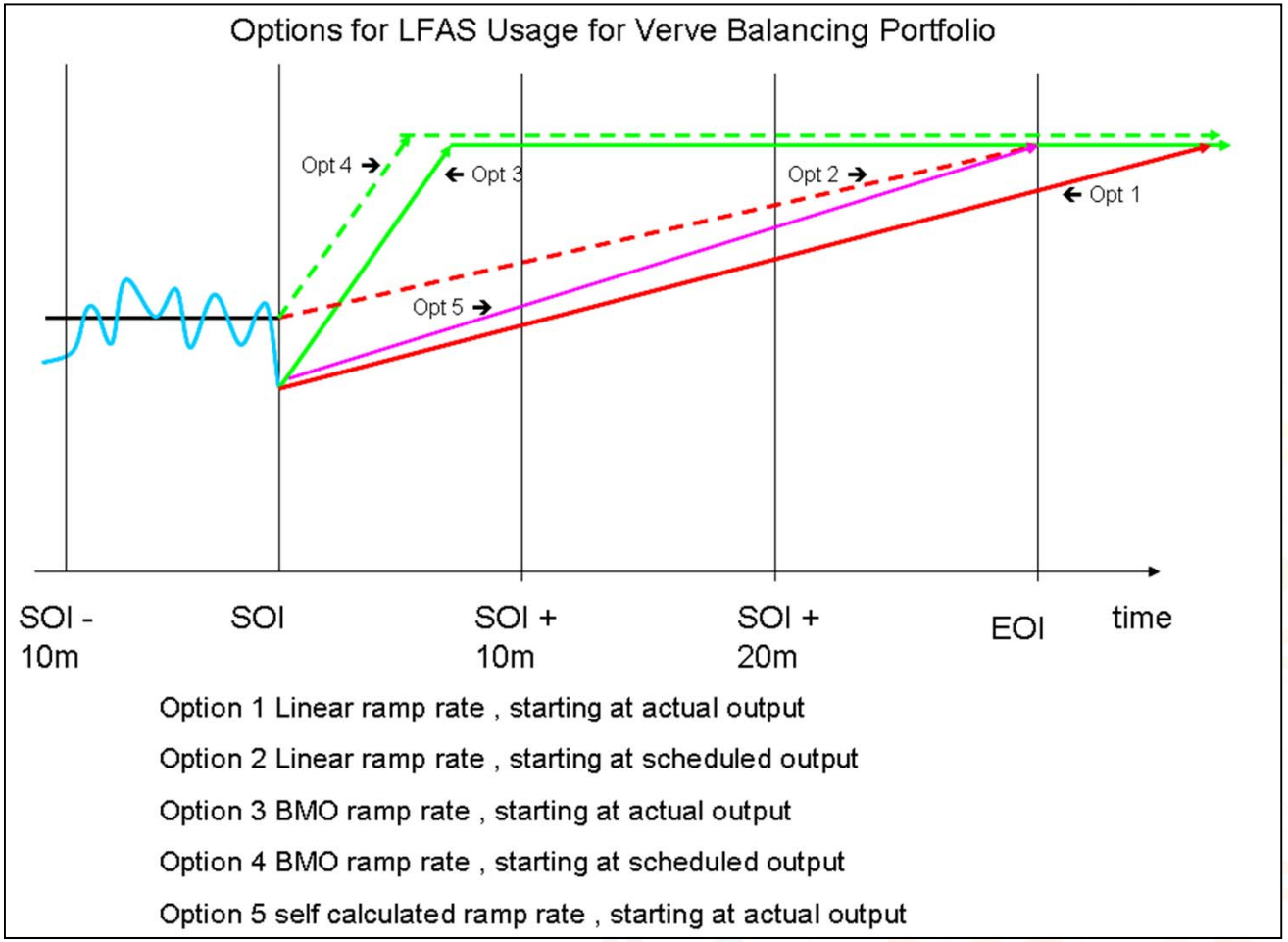
Comparison of LFAS Causes

Percentile	Cause 1 Load	Cause 2 NSG	Total SG	Cause 3 SG dev from DI	Net Excl Ramping	Cause 4 BMO ramping	Net All Causes
0.05%	-77	-89	-96	-30	-92	-74	-103
0.50%	-52	-43	-67	-14	-60	-43	-65
1%	-45	-33	-55	-9	-49	-34	-54
2%	-37	-24	-45	-6	-39	-25	-43
3%	-33	-21	-40	-4	-34	-20	-38
4%	-29	-18	-36	-3	-30	-17	-33
5%	-27	-16	-33	-3	-27	-14	-30
10%	-19	-11	-23	-1	-18	-7	-20
50%	1	0	2	5	8	0	8
90%	22	11	25	16	33	6	35
95%	30	16	34	20	43	14	46
96%	32	18	36	21	46	17	49
97%	35	20	40	23	51	20	53
98%	39	24	45	26	57	24	60
99%	47	29	54	32	69	32	71
99.50%	55	36	65	50	79	43	83
99.95%	83	74	94	69	109	74	116

LFAS Usage

- Measured as difference between actual output of active LFAS providing Facilities and their Dispatch Instruction output
- Notional Dispatch Instructions used for VEBP
- Five options for Dispatch Instruction output based on
  - Different ramp rates
  - Different SOI points
- Results sensitive to DI assumptions

LFAS Usage


Options for LFAS Usage for Verve Balancing Portfolio
Opt 4
Opt 3
Opt 2
Opt 1
Opt 5
SOI - 10m
SOI
SOI + 10m
SOI + 20m
EOI
time
Option 1 Linear ramp rate , starting at actual output
Option 2 Linear ramp rate , starting at scheduled output
Option 3 BMO ramp rate , starting at actual output
Option 4 BMO ramp rate , starting at scheduled output
Option 5 self calculated ramp rate , starting at actual output

LFAS Usage

· · ·	·Option 1 ·Preferred RR ·actual start	·Option 2 ·Preferred RR ·DI start	·Option 3 ·BMO RR ·actual start	·Option 4 ·BMO RR ·DI start	·Option 5 ·Dynamic RR ·actual start
·Average	1	·3	·2	·3	·2
·Percentile	·	·	·	·	·
·0.05%	·-88	·-123	·-118	·-141	·-93
·0.50%	·-62	·-96	·-86	·-100	·-64
·1%	·-52	·-83	·-75	·-90	·-54
·2%	·-42	·-70	·-65	·-77	·-44
·3%	·-37	·-62	·-58	·-69	·-39
·4%	·-34	·-56	·-53	·-63	·-35
·5%	·-31	·-52	·-50	·-59	·-32
·10%	·-23	·-38	·-37	·-44	·-23
·50%	·-2	·3	·2	·4	·-1
·90%	·21	·43	·41	·50	·23
·95%	·31	·57	·54	·65	·34
·96%	·34	·62	·58	·70	·37
·97%	·39	·68	·64	·76	·42
·98%	·45	·77	·71	·84	·48
·99%	·54	·94	·83	·97	·59
·99.50%	·63	·108	·94	·111	·71
·99.95%	·91	·149	·136	·164	·105

Summary – LFAS Causes

- In most periods order of causes was
  - Load variation
  - BMO ramping and NSG forecast variation
  - SG deviations from DIs
- Order varies with confidence level and between upwards and downwards
- Order may be different for other months
- Opportunities exist to reduce LFAS for all causes
- Opportunities exist for sculpting requirement
- Load forecast variation higher than expected
- NSG forecast variation lower than expected
- MFKC does not provide useful measure of current LFAS

Summary – Measurement of LFAS Usage

- Measures do not reflect physical dispatch of VEBP generators to provide LFAS
- Option 2 (linear ramp from scheduled SOI) best representation if all LFAS provided by individual facilities
- Option 2 exaggerates VEBP movement
- Impact of spurious forecast errors increases as more IPP and Stand Alone Facilities in BMO
- Fluctuations of VEBP generators currently absorbed by VEBP

Summary – Reduction of LFAS Requirement

- Need to reduce LFAS Requirement, not just LFAS usage
- Requires:
  - Improved monitoring of LFAS usage
  - Development of sculpting methodologies
  - Changes to System Management systems and procedures
- Some quick wins may be possible, but
- LFAS Gate Closure times may need to be reduced to achieve significant results

Recommendations - MREP

- Consider the following potential changes to the Market Rules
  - Reduction of LFAS Gate Closure period and introduction of rolling gate closure
  - Transition to 10 minute dispatch cycle

Recommendations – by end 2013

- Complete July 2013 analysis
- Consider Sapere's suggestions for enhancement
- Develop monitoring and reporting plan – to commence January 2014
- Prepare scope for 5 year Ancillary Services Review
- Review SM processes for detecting and correcting load forecast errors
- Forecast lead times - 15-20 mins vs 25-40 mins ahead
- Review processes for NSG curtailments
- Review DI processes for Forced Outages or deviations from Commissioning Test Plans

Recommendations – by November 2014

- Develop IT and internal processes to support dynamic setting of the LFAS Requirement
- Develop methodologies and tools to estimate (sculpt) the LFAS Requirement
- Develop system enhancements to detect (or prevent publication of) spurious load forecasts
- Arrangements to reduce excessive ramp up/down behaviour of NSGs in high wind conditions
- Complete the Ancillary Services Review

Recommendations – longer term

- Implement recommendations of Ancillary Services Review
- Implement “causer pays” cost allocation
- Investigate options for more sophisticated wind forecasting tools
- Upgrade RTDE to allow override of default NSG forecasts
- Upgrade RTDE to support optimal ramping of the marginal unit(s)
- Transition to five minute dispatch cycle