

RoCoF and VS Costs and Potential Savings

March 2017 Update

Background

- Forecast RoCoF costs were presented in September 2016 based on 2016 datasets
 - Forecast was based on a conservative despatch solution
 - The solution assumed that 100% of specified reserve requirement was met from conventionally despatchable generation
 - Workgroup feedback was it would be useful to see the results of a less conservative despatch solution to make the impact of the assumption clearer – results based on a 72% solution is included in this pack
 - A forecast of Vector Shift related costs is now also required

Vector Shift

- The sequence, timing, rate and volume of distributed generation shutdown due to vector shift is not clear
- Review of the Langage-Landulph incident suggests
 1. Shutdown occurs very quickly
 2. Trigger may be the fault or fault clearance
 3. There is a risk that vector shift tripping is coincident with major infeed tripping meaning there is a risk of a larger instantaneous loss than previously thought
- The following cost forecasts illustrate the cost of catering non-coincident vector shift risks only

Vector Shift



Forecast RoCoF Costs

100%

Forecast Balancing Costs (0.125Hzs⁻¹ RoCoF Limit) £m

2016 FES	Action	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	Post 2019/20 TOTAL
No Progression	Trades	35.52	41.70	45.96	49.19	80.63	84.32	89.04	95.31	108.53	155.79	662.82
	Syncs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
	TOTAL	35.52	41.70	45.96	49.19	80.63	84.32	89.04	95.32	108.53	155.79	662.83
Slow Progression	Trades	39.05	44.68	50.87	51.36	83.63	95.09	112.25	123.81	132.60	192.84	791.58
	Syncs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07
	TOTAL	39.05	44.68	50.87	51.36	83.63	95.09	112.25	123.82	132.60	192.91	791.66
Gone Green	Trades	40.84	46.34	52.67	61.59	103.24	103.75	111.96	120.40	130.05	147.50	778.49
	Syncs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.06
	TOTAL	40.84	46.34	52.67	61.59	103.24	103.75	111.96	120.40	130.12	147.50	778.55
Consumer Power	Trades	40.12	47.49	52.61	61.27	101.83	106.45	119.69	134.35	140.05	185.00	848.63
	Syncs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.02	0.10
	TOTAL	40.12	47.49	52.61	61.27	101.83	106.45	119.69	134.35	140.13	185.01	848.73
Average across Scenarios	Trades	38.88	45.05	50.53	55.85	92.33	97.40	108.23	118.47	127.81	170.28	770.38
	Syncs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.02	0.06
	TOTAL	38.88	45.05	50.53	55.85	92.33	97.40	108.23	118.47	127.85	170.30	770.44

72%

Forecast Balancing Costs (0.125Hzs⁻¹ RoCoF Limit) £m

2016 FES	Action	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	Post 2019/20 TOTAL
No Progression	Trades	51.27	59.72	72.06	73.16	116.43	121.79	120.34	130.95	150.89	217.53	931.09
	Syncs	0.90	2.91	12.55	18.13	26.67	38.87	29.84	49.26	127.71	141.94	432.43
	TOTAL	52.16	62.64	84.61	91.29	143.10	160.66	150.18	180.22	278.60	359.47	1,363.52
Slow Progression	Trades	57.49	65.56	78.08	79.04	128.56	147.69	170.27	178.12	179.14	244.46	1,127.28
	Syncs	1.78	4.04	14.40	17.93	30.66	50.79	89.06	120.95	144.50	171.25	625.13
	TOTAL	59.26	69.59	92.47	96.96	159.22	198.48	259.33	299.07	323.63	415.71	1,752.41
Gone Green	Trades	61.39	69.33	84.89	100.07	172.20	170.55	167.90	174.29	178.85	230.17	1,194.02
	Syncs	3.17	6.77	26.03	46.27	64.94	64.84	87.86	122.83	154.40	100.20	641.34
	TOTAL	64.55	76.10	110.91	146.34	237.14	235.39	255.76	297.12	333.24	330.37	1,835.37
Consumer Power	Trades	60.88	70.93	85.87	99.86	171.41	175.40	177.37	179.68	186.07	249.05	1,238.85
	Syncs	2.42	8.01	28.75	44.87	58.61	55.63	97.54	132.28	154.90	164.16	707.99
	TOTAL	63.30	78.94	114.62	144.73	230.02	231.03	274.91	311.96	340.97	413.21	1,946.83
Average across Scenarios	Trades	57.75	66.38	80.22	88.03	147.15	153.86	158.97	165.76	173.74	235.30	1,122.81
	Syncs	2.06	5.43	20.43	31.80	45.22	52.53	76.08	106.33	145.38	144.39	601.72
	TOTAL	59.82	71.82	100.65	119.83	192.37	206.39	235.05	272.09	319.11	379.69	1,724.54

Forecast RoCoF Costs plus VS

100%

Forecast Balancing Costs (0.125Hzs⁻¹ RoCoF Limit) £m

2016 FES	Action	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	Post 2019/20 TOTAL
No Progression	Trades	35.52	41.69	45.93	49.17	80.57	84.26	88.95	94.98	107.96	154.69	660.59
	Syncs	0.00	0.01	0.06	0.05	0.06	0.12	0.18	0.56	1.27	1.84	4.07
	TOTAL	35.52	41.71	45.99	49.22	80.62	84.38	89.13	95.54	109.23	156.53	664.66
Slow Progression	Trades	39.03	44.66	50.83	51.34	83.57	95.04	111.97	123.28	132.37	192.34	789.90
	Syncs	0.02	0.04	0.10	0.03	0.07	0.11	0.76	1.75	1.68	3.15	7.53
	TOTAL	39.05	44.69	50.93	51.36	83.63	95.14	112.73	125.03	134.04	195.49	797.43
Gone Green	Trades	40.83	46.31	52.62	61.54	103.17	103.75	111.84	120.17	129.87	147.42	777.75
	Syncs	0.03	0.05	0.06	0.15	0.23	0.15	0.36	0.76	1.27	0.34	3.26
	TOTAL	40.86	46.36	52.69	61.69	103.41	103.89	112.19	120.93	131.13	147.76	781.01
Consumer Power	Trades	40.10	47.45	52.56	61.21	101.80	106.44	119.54	134.03	140.00	184.79	847.81
	Syncs	0.02	0.07	0.09	0.13	0.14	0.10	0.55	1.36	1.55	1.86	5.68
	TOTAL	40.13	47.51	52.65	61.35	101.93	106.54	120.10	135.39	141.55	186.65	853.49
Average across Scenarios	Trades	38.87	45.03	50.49	55.82	92.28	97.37	108.07	118.11	127.55	169.81	769.01
	Syncs	0.02	0.04	0.08	0.09	0.12	0.12	0.46	1.11	1.44	1.80	5.13
	TOTAL	38.89	45.07	50.56	55.90	92.40	97.49	108.54	119.22	128.99	171.61	774.15

72%

Forecast Balancing Costs (0.125Hzs⁻¹ RoCoF Limit) £m

2016 FES	Action	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	Post 2019/20 TOTAL
No Progression	Trades	51.18	59.32	71.40	72.22	115.09	120.09	118.22	128.17	146.82	212.41	913.02
	Syncs	1.07	4.00	14.66	21.35	29.80	43.64	35.72	58.21	149.00	171.28	509.00
	TOTAL	52.25	63.32	86.06	93.57	144.89	163.74	153.94	186.39	295.81	383.68	1,422.03
Slow Progression	Trades	56.98	64.77	76.62	77.49	125.50	144.91	168.12	175.29	177.38	240.48	1,109.18
	Syncs	3.29	6.81	20.21	24.77	39.42	65.23	115.90	153.39	176.70	217.23	792.64
	TOTAL	60.27	71.58	96.82	102.26	164.92	210.14	284.02	328.68	354.08	457.71	1,901.82
Gone Green	Trades	60.73	68.12	82.87	97.90	170.82	169.40	166.23	171.75	176.98	227.10	1,180.18
	Syncs	5.21	11.35	35.66	64.84	90.00	89.24	114.44	157.29	193.72	134.97	844.51
	TOTAL	65.94	79.47	118.54	162.75	260.82	258.63	280.67	329.04	370.71	362.07	2,024.69
Consumer Power	Trades	60.30	69.66	83.66	97.71	170.03	174.41	175.78	176.10	183.74	245.33	1,223.10
	Syncs	4.10	12.98	39.46	63.19	83.59	81.67	130.44	173.75	202.18	229.92	964.74
	TOTAL	64.40	82.64	123.12	160.90	253.62	256.08	306.21	349.85	385.92	475.25	2,187.84
Average across Scenarios	Trades	57.30	65.47	78.64	86.33	145.36	152.20	157.09	162.83	171.23	231.33	1,106.37
	Syncs	3.42	8.78	27.50	43.54	60.70	69.94	99.12	135.66	180.40	188.35	777.72
	TOTAL	60.72	74.25	106.13	129.87	206.06	222.15	256.21	298.49	351.63	419.68	1,884.09

Next Steps

- Agree CBA approach wrt despatch solution
- Confirm conclusions for Vector Shift sequence, timing and rate
- Complete cost forecast