

Balancing Authority ACE Limit Proof-of-Concept Field Trial

Update Discussion
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Reliability-Based Control Standard Drafting Team

Balancing Authority ACE Limit Proof-of-Concept Field Trial

Eastern Interconnection Field Trial Participation

Participation reflects approximately 67% of the projected 2010 peak load for the Eastern Interconnection

Eastern Interconnection Balancing Authority Participants	2010 Frequency Bias	Region	Reliability Coordinator	Start Date
American Electric Power (CSW)	-103.4	SPP	SPP	September 1, 2005
Associated Electric Cooperative, Inc. (AECI)	-45	SERC	TVA	April 1, 2010
Duke Energy Carolinas (DUK)	-196	SERC	VACS	April 1, 2009
East Kentucky Power Cooperative (EKPC)	-42.73	SERC	TVA	July 6, 2005
Entergy (EES)	-227.1	SERC	ICTE	July 6, 2005
EON-US (LGEE)	-74	SERC	TVA	April 1, 2008
Independent Electricity System Operator (IESO)	-245.8	NPCC	IESO	March 1, 2008
Manitoba Hydro (MHEB)	-43.3	MRO	MISO	July 6, 2005
Midwest Independent Transmission System Operator (MISO)	-1038.6	MRO, RFC, SERC	MISO	January 6, 2009
PJM Interconnection (PJM)	-1358	RFC	PJM	August 1, 2005
Santee Cooper (SC)	-61.52	SERC	VACS	March 1, 2006
Southern Company (SOCO)	-445	SERC	SOCO	October 15, 2005
Tennessee Valley Authority (TVA)	-317.6	SERC	TVA	October 1, 2005

Balancing Authority ACE Limit Proof-of-Concept Field Trial

The Balancing Authority ACE Limit (BAAL) shall not be exceeded for more than 30 consecutive clock-minutes*

	Longest exceedance of the Balancing Authority ACE Limit since starting operation under the Field Trial		March 2010 Performance under BAL-007	
	Max MinCtLow	Max MinCtHigh	Max MinCtLow	Max MinCtHigh
BA01	26	16	5	8
BA02	17	17	17	9
BA03	19	19	6	19
BA04	10	20	8	15
BA05	16	22	6	14
BA06	15	23	5	10
BA07	20	24	10	12
BA08	28	26	17	16
BA09	21	26	7	6
BA10	14	32	5	4
BA11	27	40	21	15
BA12	28	43	6	10

MinCtLow = Count of consecutive clock-minutes BAAL_Low was exceeded

MinCtHigh = Count of consecutive clock-minutes BAAL_High was exceeded

*BAAL being exceeded for more than 30 consecutive clock-minutes would be a violation under the proposed BAL-007 standard.

Clock-Minutes of Actual Frequency <= FTL_Low (59.95 Hz)												
Year	Month	>=1 Min	>=2 Min	>=3 Min	>=4 Min	>=5 Min	>=6 Min	>=7 Min	>=8 Min	>=9 Min	>=10 Min	Max_Duration
2005	7	32	14	7	3	2						5
2005	8	56	36	20	12	8	2	1	1	1	1	10
2005	9	33	20	9	4	2	1	1	1			8
2005	10	43	21	12	5	2	2	1	1	1	1	11
2005	11	58	26	14	5	4	1					6
2005	12	41	18	5	4	2	2	1				7
2006	1	43	20	7	2	2	1					6
2006	2	39	17	4	2	1	1					6
2006	3	50	23	4	2							4
2006	4	58	30	10	5	2						5
2006	5	54	30	15	10	4	4	1	1			8
2006	6	41	22	11	4	1						5
2006	7	34	18	9	4	2	1	1	1	1		9
2006	8	49	26	15	8	3						5
2006	9	39	21	11	4	3	1					6
2006	10	51	26	9	6	2	1					6
2006	11	47	22	10	8	4						5
2006	12	34	14	3	1							4
2007	1	44	21	10	7	3	2	1				7
2007	2	33	13	2	2							3
2007	3	76	39	18	10	3	2	2	1	1	1	15*
2007	4	45	18	7	4	3						5
2007	5	64	32	10	7	3						5
2007	6	47	24	12	6	2	1					6
2007	7	33	19	8	4	2	1					6
2007	8	31	16	9	3	2	1					6
2007	9	41	27	12	6	4	2	2	1			8
2007	10	73	25	15	8	1						5
2007	11	60	23	10	2							4
2007	12	38	13	4	2	1	1					6
2008	1	34	21	11	4	2	1	1	1			8
2008	2	46	27	8	4	1	1	1	1			8
2008	3	55	27	10	7	2	1					6
2008	4	60	28	11	4	3						5
2008	5	63	31	9	3							4
2008	6	34	16	6	4	1						5
2008	7	29	17	9	1	1	1	1				7
2008	8	35	18	5	1	1						5
2008	9	39	20	9	1							4
2008	10	38	18	8	3	1						5
2008	11	13	5	2	1	1						5
2008	12	35	11	3	1							4
2009	1	16	7	3	2							4
2009	2	18	10	5	1							4
2009	3	23	10	4	2	2						5
2009	4	37	14	5	2	1						5
2009	5	31	9	2	1							4
2009	6	28	19	8	2	1						5
2009	7	22	12	2								3
2009	8	20	6									2
2009	9	21	10	2								3
2009	10	44	24	12	5	2	2					6
2009	11	33	12	4								3
2009	12	20	9	3	1	1						5
2010	1	35	14	6	3	2	2					6
2010	2	24	11	4								3
2010	3	65	28	11	3	1	1					6
SUM		2305	1108	454	204	91	36	14	9	4	3	

This chart lists the number of times that the duration of the FTL_{Low} exceedance was greater than or equal to 1 minute, 2 minutes, 3 minutes and so on, with the maximum duration for the month noted in the right column. *The 15-minute duration in March 2007 was for the Monday morning after the change to the new Daylight Saving Time.

Clock-Minutes of Actual Frequency <= FTL_Low (59.95 Hz) and 60 Hz Scheduled Frequency												
Year	Month	>=1 Min	>=2 Min	>=3 Min	>=4 Min	>=5 Min	>=6 Min	>=7 Min	>=8 Min	>=9 Min	>=10 Min	Max_Duration
2005	7	16	8	4	1	1						5
2005	8	39	23	13	9	6	1					6
2005	9	16	9	6	3	2	1	1	1			8
2005	10	22	10	5	2	2	2	1	1	1	1	11
2005	11	26	10	4	1	1	1					6
2005	12	23	8	2	1	1	1					6
2006	1	21	7	2	1	1	1					6
2006	2	39	17	4	2	1	1					6
2006	3	33	15	2	1							4
2006	4	46	25	9	4	2						5
2006	5	33	19	8	5	1	1					6
2006	6	19	9	5	1							4
2006	7	22	11	6	1							4
2006	8	38	22	14	8	3						5
2006	9	30	17	8	2	2	1					6
2006	10	24	14	2	2							4
2006	11	19	8	4	3	1						5
2006	12	10	5	2	1							4
2007	1	14	7	3	2	1	1	1				7
2007	2	22	8	1								3
2007	3	41	17	7	6	2	1	1	1	1	1	15*
2007	4	21	10	4	3	3						5
2007	5	26	10	4	4	2						5
2007	6	18	10	2								3
2007	7	12	5	2	1							4
2007	8	9	6	5	2	2	1					6
2007	9	28	22	10	6	4	2	2	1			8
2007	10	33	14	11	6	1						5
2007	11	14	5	2								3
2007	12	14	5	1	1	1	1					6
2008	1	34	21	11	4	2	1	1	1			8
2008	2	39	21	5	2	1	1	1	1			8
2008	3	38	19	4	3	1						5
2008	4	38	16	6	3	2						5
2008	5	23	12	3	1							4
2008	6	13	6	1	1							4
2008	7	10	5	2								3
2008	8	13	5	1								3
2008	9	25	11	7	1							4
2008	10	19	9	3	2							4
2008	11	6	2	1								3
2008	12	23	7	3	1							4
2009	1	15	6	3	2							4
2009	2	18	10	5	1							4
2009	3	23	10	4	2	2						5
2009	4	37	14	5	2	1						5
2009	5	25	7	2	1							4
2009	6	17	8	3								3
2009	7	14	7	1								3
2009	8	8	2									2
2009	9	13	8	1								3
2009	10	22	12	6	3	1	1					6
2009	11	14	4	1								3
2009	12	12	6	3	1	1						5
2010	1	13	7	2	2	1	1					6
2010	2	11	5									2
2010	3	40	19	7	3	1	1					6
SUM		1291	615	242	114	53	21	8	6	2	2	

This chart lists the number of times that the duration of the FTL_{Low} exceedance was greater than or equal to 1 minute, 2 minutes, 3 minutes and so on, when Scheduled Frequency = 60 Hz, with the maximum duration for the month noted in the right column. *The 15-minute duration in March 2007 was for the Monday morning after the change to the new Daylight Saving Time.

Clock-Minutes of Actual Frequency >= FTL_High (60.05 Hz)												
Year	Month	>=1 Min	>=2 Min	>=3 Min	>=4 Min	>=5 Min	>=6 Min	>=7 Min	>=8 Min	>=9 Min	>=10 Min	Max_Duration
2005	7	11	4	1								3
2005	8	21	7	4	2	1						5
2005	9	21	9	3	2	2	1	1				7
2005	10	23	6	2	1	1						5
2005	11	22	7	4	1	1	1	1				7
2005	12	19	6	2								3
2006	1	27	15	11	6	2						5
2006	2	24	10	7	5							4
2006	3	33	12	4	2	1	1	1	1			8
2006	4	46	22	3	1	1	1	1	1			8
2006	5	39	20	9	4	1						5
2006	6	24	10	7	4	4	3	3	2	1	1	10
2006	7	29	11	8	2							4
2006	8	26	13	10	5	1	1	1	1			8
2006	9	33	14	4	2							4
2006	10	28	14	4	3	2	1	1	1			8
2006	11	22	11	4								3
2006	12	29	12	7	3	2	1					6
2007	1	31	14	5	2	1	1	1				7
2007	2	21	13	4	1							4
2007	3	38	21	10	4	2	1	1	1			8
2007	4	31	15	8	4							4
2007	5	49	20	11	7	4	4	1				7
2007	6	25	14	7	2	1	1	1				7
2007	7	20	12	8	2							4
2007	8	32	14	7	3	2						5
2007	9	16	6	4	2	1						5
2007	10	36	16	4	1	1						5
2007	11	24	7	5	2	1						5
2007	12	38	16	7	2							4
2008	1	24	16	8	1							4
2008	2	24	11	6	3	3	2	1	1			8
2008	3	34	6									2
2008	4	33	12	8	3	3	1					6
2008	5	20	10	6	4	1						5
2008	6	19	10	3	2	1						5
2008	7	12	4	1								3
2008	8	17	6	3	1	1	1					6
2008	9	21	11	6	5	3	3	3	3	2	1	11
2008	10	19	7	1								3
2008	11	9	2	1	1							4
2008	12	8	2	1								3
2009	1	9	6	4								3
2009	2	11	3	1	1	1	1					6
2009	3	11	4	3	2	1	1	1	1	1		9
2009	4	20	6	1								3
2009	5	15	4	2	2	1	1	1	1			8
2009	6	16	8	1								3
2009	7	16	7	2	1	1	1					6
2009	8	10	3									2
2009	9	14	4	1	1							4
2009	10	10	5	3								3
2009	11	21	8	4	1							4
2009	12	15	5	2								3
2010	1	9	6	1								3
2010	2	16	10									2
2010	3	22	9	3	3	2	1					6
SUM		1293	556	246	106	50	29	19	13	4	2	

This chart lists the number of times that the duration of the FTL_{HIGH} exceedance was greater than or equal to 1 minute, 2 minutes, 3 minutes and so on, with the maximum duration for the month noted in the right column.

Frequency Statistics

Eastern Interconnection

Year	Month	Total Minutes FTL_Low at 59.98 Hz SF	Total Minutes FTL_Low at 60 Hz SF	Total FTL_Low Minutes	Percentage Low During TEC	FTL_Low Events	FTL_Low Max Duration	Total Minutes FTL_High at 60.02 Hz SF	Total Minutes FTL_High at 60 Hz SF	Total FTL_High Minutes	Percentage High During TEC	FTL_High Events	FTL_High Max Duration	Total FTL_Low and FTL_High Minutes at 60 Hz SF	Total FTL_Low and FTL_High Minutes
2005	7	28	30	58	48.28%	32	5	0	16	16	0.00%	11	3	46	74
2005	8	47	91	138	34.06%	56	10	0	35	35	0.00%	21	5	126	173
2005	9	32	39	71	45.07%	33	8	0	39	39	0.00%	21	7	78	110
2005	10	42	48	90	46.67%	43	11	0	33	33	0.00%	23	5	81	123
2005	11	65	43	108	60.19%	58	6	0	35	35	0.00%	22	7	78	143
2005	12	37	36	73	50.68%	41	7	0	27	27	0.00%	19	3	63	100
2006	1	42	33	75	56.00%	43	6	0	61	61	0.00%	27	5	94	136
2006	2	0	64	64	0.00%	39	6	2	43	45	4.44%	24	4	107	109
2006	3	28	51	79	35.44%	50	4	17	37	54	31.48%	33	8	88	133
2006	4	19	86	105	18.10%	58	5	0	76	76	0.00%	46	8	162	181
2006	5	52	67	119	43.70%	54	8	0	72	72	0.00%	39	5	139	191
2006	6	45	34	79	56.96%	41	5	0	59	59	0.00%	24	10	93	138
2006	7	31	40	71	43.66%	34	9	0	50	50	0.00%	29	4	90	121
2006	8	16	85	101	15.84%	49	5	0	58	58	0.00%	26	8	143	159
2006	9	19	60	79	24.05%	39	6	0	53	53	0.00%	33	4	113	132
2006	10	53	42	95	55.79%	51	6	0	54	54	0.00%	28	8	96	149
2006	11	56	35	91	61.54%	47	5	1	36	37	2.70%	22	3	71	128
2006	12	34	18	52	65.38%	34	4	0	54	54	0.00%	29	6	72	106
2007	1	59	29	88	67.05%	44	7	0	55	55	0.00%	31	7	84	143
2007	2	17	31	48	35.42%	33	3	0	39	39	0.00%	21	4	70	87
2007	3	75	83	158	47.47%	76	15	0	78	78	0.00%	38	8	161	236
2007	4	36	41	77	46.75%	45	5	0	58	58	0.00%	31	4	99	135
2007	5	70	46	116	60.34%	64	5	0	95	95	0.00%	49	7	141	211
2007	6	62	30	92	67.39%	47	6	0	51	51	0.00%	25	7	81	143
2007	7	47	20	67	70.15%	33	6	0	39	39	0.00%	20	4	59	106
2007	8	37	25	62	59.68%	31	6	1	55	56	1.79%	32	5	80	118
2007	9	20	75	95	21.05%	41	8	0	27	27	0.00%	16	5	102	122
2007	10	57	65	122	46.72%	73	5	1	56	57	1.75%	36	5	121	179
2007	11	74	21	95	77.89%	60	4	0	34	34	0.00%	24	5	55	129
2007	12	37	22	59	62.71%	38	6	0	61	61	0.00%	38	4	83	120
2008	1	0	75	75	0.00%	34	8	0	48	48	0.00%	24	4	123	123
2008	2	18	71	89	20.22%	46	8	0	51	51	0.00%	24	8	122	140
2008	3	37	65	102	36.27%	55	6	0	40	40	0.00%	34	2	105	142
2008	4	41	65	106	38.68%	60	5	0	59	59	0.00%	33	6	124	165
2008	5	67	39	106	63.21%	63	4	0	40	40	0.00%	20	5	79	146
2008	6	40	21	61	65.57%	34	5	0	35	35	0.00%	19	5	56	96
2008	7	42	17	59	71.19%	29	7	0	17	17	0.00%	12	3	34	76
2008	8	41	19	60	68.33%	35	5	0	29	29	0.00%	17	6	48	89
2008	9	25	44	69	36.23%	39	4	0	55	55	0.00%	21	11	99	124
2008	10	35	33	68	51.47%	38	5	0	27	27	0.00%	19	3	60	95
2008	11	13	9	22	59.09%	13	5	0	13	13	0.00%	9	4	22	35
2008	12	16	34	50	32.00%	35	4	0	11	11	0.00%	8	3	45	61
2009	1	2	26	28	7.14%	16	4	0	19	19	0.00%	9	3	45	47
2009	2	0	34	34	0.00%	18	4	0	18	18	0.00%	11	6	52	52
2009	3	0	41	41	0.00%	23	5	0	25	25	0.00%	11	9	66	66
2009	4	0	59	59	0.00%	37	5	0	27	27	0.00%	20	3	86	86
2009	5	8	35	43	18.60%	31	4	0	27	27	0.00%	15	8	62	70
2009	6	30	28	58	51.72%	28	5	0	25	25	0.00%	16	3	53	83
2009	7	14	22	36	38.89%	22	3	0	28	28	0.00%	16	6	50	64
2009	8	16	10	26	61.54%	20	2	0	13	13	0.00%	10	2	23	39
2009	9	11	22	33	33.33%	21	3	0	20	20	0.00%	14	4	42	53
2009	10	44	45	89	49.44%	44	6	0	18	18	0.00%	10	3	63	107
2009	11	30	19	49	61.22%	33	3	0	34	34	0.00%	21	4	53	83
2009	12	11	23	34	32.35%	20	5	0	22	22	0.00%	15	3	45	56
2010	1	36	26	62	58.06%	35	6	0	16	16	0.00%	9	3	42	78
2010	2	23	16	39	58.97%	24	3	0	26	26	0.00%	16	2	42	65
2010	3	38	71	109	34.86%	65	6	0	40	40	0.00%	22	6	111	149

This chart is a summary of frequency-related statistics gathered since the start of the Field Trial. Of particular interest is the drop in operation outside of the FTL bounds, trending lower in the latter part of 2008 with November 2008 having the least number of clock-minutes of operation outside the FTL bounds, followed by August 2009, over the dataset.

Frequency Statistics

Eastern Interconnection

Year	Month	Total Minutes FTL_Low at 59.98 Hz SF	Total Minutes FTL_Low at 60 Hz SF	Total FTL_Low Minutes	Percentage Low During TEC	FTL_Low Events	FTL_Low Max Duration	Total Minutes FTL_High at 60.02 Hz SF	Total Minutes FTL_High at 60 Hz SF	Total FTL_High Minutes	Percentage High During TEC	FTL_High Events	FTL_High Max Duration	Total FTL_Low and FTL_High Minutes at 60 Hz SF	Total FTL_Low and FTL_High Minutes
2008	7	28	70	98	48.28%	50	5	0	98	98	0.00%	11	3	28	74
2008	8	47	91	138	66.67%	53	5	0	138	138	0.00%	11	3	47	173
2008	9	32	36	68	32.78%	33	3	0	68	68	0.00%	11	3	32	113
2008	10	42	48	90	43.89%	43	4	0	90	90	0.00%	11	3	42	135
2008	11	59	43	102	48.97%	55	5	0	102	102	0.00%	11	3	59	149
2008	12	37	36	73	34.76%	37	3	0	73	73	0.00%	11	3	37	110
2008	1	42	33	75	35.58%	34	3	0	75	75	0.00%	11	3	42	138
2008	2	0	64	64	30.48%	34	3	0	64	64	0.00%	11	3	0	108
2008	3	23	51	74	34.91%	34	3	0	74	74	0.00%	11	3	23	133
2008	4	19	96	115	54.81%	34	3	0	115	115	0.00%	11	3	19	134
2008	5	52	97	149	70.53%	34	3	0	149	149	0.00%	11	3	52	181
2008	6	49	34	83	39.07%	34	3	0	83	83	0.00%	11	3	49	132
2008	7	31	40	71	33.72%	34	3	0	71	71	0.00%	11	3	31	132
2008	8	19	60	79	37.25%	34	3	0	79	79	0.00%	11	3	19	118
2008	9	53	45	98	46.43%	34	3	0	98	98	0.00%	11	3	53	151
2008	10	55	45	100	47.62%	34	3	0	100	100	0.00%	11	3	55	155
2008	11	66	39	105	49.52%	34	3	0	105	105	0.00%	11	3	66	161
2008	12	34	16	50	23.81%	34	3	0	50	50	0.00%	11	3	34	108
2008	1	39	24	63	29.76%	34	3	0	63	63	0.00%	11	3	39	117
2008	2	17	31	48	22.86%	34	3	0	48	48	0.00%	11	3	17	105
2008	3	79	63	142	66.90%	34	3	0	142	142	0.00%	11	3	79	181
2008	4	36	41	77	36.23%	34	3	0	77	77	0.00%	11	3	36	117
2008	5	22	61	83	39.05%	34	3	0	83	83	0.00%	11	3	22	115
2008	6	51	30	81	38.14%	34	3	0	81	81	0.00%	11	3	51	132
2008	7	47	20	67	31.43%	34	3	0	67	67	0.00%	11	3	47	114
2008	8	37	20	57	26.83%	34	3	0	57	57	0.00%	11	3	37	104
2008	9	50	20	70	32.78%	34	3	0	70	70	0.00%	11	3	50	123
2008	10	47	20	67	31.43%	34	3	0	67	67	0.00%	11	3	47	114
2008	11	37	20	57	26.83%	34	3	0	57	57	0.00%	11	3	37	104
2008	12	50	20	70	32.78%	34	3	0	70	70	0.00%	11	3	50	123
2009	1	74	21	95	44.95%	34	3	0	95	95	0.00%	11	3	74	146
2009	2	31	34	65	30.95%	34	3	0	65	65	0.00%	11	3	31	106
2009	3	0	34	34	15.95%	34	3	0	34	34	0.00%	11	3	0	68
2009	4	19	21	40	18.87%	34	3	0	40	40	0.00%	11	3	19	78
2009	5	37	66	103	48.51%	34	3	0	103	103	0.00%	11	3	37	140
2009	6	41	0	41	19.52%	34	3	0	41	41	0.00%	11	3	41	82
2009	7	41	59	100	47.62%	34	3	0	100	100	0.00%	11	3	41	141
2009	8	8	35	43	20.48%	34	3	0	43	43	0.00%	11	3	8	51
2009	9	42	16	58	27.38%	34	3	0	58	58	0.00%	11	3	42	100
2009	10	41	19	60	28.57%	34	3	0	60	60	0.00%	11	3	41	101
2009	11	29	44	73	34.43%	34	3	0	73	73	0.00%	11	3	29	102
2009	12	39	20	59	27.78%	34	3	0	59	59	0.00%	11	3	39	98
2010	1	14	48	62	29.05%	34	3	0	62	62	0.00%	11	3	14	76
2010	2	16	26	42	19.76%	34	3	0	42	42	0.00%	11	3	16	58
2010	3	44	71	115	53.52%	34	3	0	115	115	0.00%	11	3	44	159
2010	4	30	48	78	36.76%	34	3	0	78	78	0.00%	11	3	30	108
2010	5	14	34	48	22.86%	34	3	0	48	48	0.00%	11	3	14	76
2010	6	36	60	96	45.24%	34	3	0	96	96	0.00%	11	3	36	132
2010	7	19	38	57	26.83%	34	3	0	57	57	0.00%	11	3	19	76
2010	8	44	23	67	31.43%	34	3	0	67	67	0.00%	11	3	44	111
2010	9	30	16	46	21.76%	34	3	0	46	46	0.00%	11	3	30	66
2010	10	14	38	52	24.44%	34	3	0	52	52	0.00%	11	3	14	66
2010	11	36	26	62	29.05%	34	3	0	62	62	0.00%	11	3	36	98
2010	12	38	16	54	25.19%	34	3	0	54	54	0.00%	11	3	38	94
2010	1	39	26	65	30.95%	34	3	0	65	65	0.00%	11	3	39	104
2010	2	44	23	67	31.43%	34	3	0	67	67	0.00%	11	3	44	111
2010	3	30	16	46	21.76%	34	3	0	46	46	0.00%	11	3	30	66
2010	4	14	38	52	24.44%	34	3	0	52	52	0.00%	11	3	14	66
2010	5	36	26	62	29.05%	34	3	0	62	62	0.00%	11	3	36	98
2010	6	44	23	67	31.43%	34	3	0	67	67	0.00%	11	3	44	111
2010	7	30	16	46	21.76%	34	3	0	46	46	0.00%	11	3	30	66
2010	8	14	38	52	24.44%	34	3	0	52	52	0.00%	11	3	14	66
2010	9	36	26	62	29.05%	34	3	0	62	62	0.00%	11	3	36	98
2010	10	44	23	67	31.43%	34	3	0	67	67	0.00%	11	3	44	111
2010	11	30	16	46	21.76%	34	3	0	46	46	0.00%	11	3	30	66
2010	12	14	38	52	24.44%	34	3	0	52	52	0.00%	11	3	14	66
2010	1	36	26	62	29.05%	34	3	0	62	62	0.00%	11	3	36	98
2010	2	44	23	67	31.43%	34	3	0	67	67	0.00%	11	3	44	111
2010	3	30	16	46	21.76%	34	3	0	46	46	0.00%	11	3	30	66
2010	4	14	38	52	24.44%	34	3	0	52	52	0.00%	11	3	14	66
2010	5	36	26	62	29.05%	34	3	0	62	62	0.00%	11	3	36	98
2010	6	44	23	67	31.43%	34	3	0	67	67	0.00%	11	3	44	111
2010	7	30	16	46	21.76%	34	3	0	46	46	0.00%	11	3	30	66
2010	8	14	38	52	24.44%	34	3	0	52	52	0.00%	11	3	14	66
2010	9	36	26	62	29.05%	34	3	0	62	62	0.00%	11	3	36	98
2010	10	44	23	67	31.43%	34	3	0	67	67	0.00%	11	3	44	111
2010	11	30	16	46	21.76%	34	3	0	46	46	0.00%	11	3	30	66
2010	12	14	38	52	24.44%	34	3	0	52	52	0.00%	11	3	14	66
2010	1	36	26	62	29.05%	34	3	0	62	62	0.00%	11	3	36	98
2010	2	44	23	67	31.43%	34	3	0	67	67	0.00%	11	3	44	111
2010	3	30	16	46	21.76%	34	3	0	46	46	0.00%	11	3	30	66
2010	4	14	38	52	24.44%	34	3	0	52	52	0.00%	11	3	14	66
2010	5	36	26	62	29.05%	34	3	0	62	62	0.00%	11	3	36	98
2010	6	44	23	67	31.43%	34	3	0	67	67	0.00%	11	3	44	111
2010	7	30	16	46	21.76%	34	3	0	46	46	0.00%	11	3	30	66
2010	8	14	38	52	24.44%	34	3	0	52	52	0.00%	11	3	14	66
2010	9	36	26	62	29.05%	34	3	0	62	62	0.00%	11	3	36	98
2010	10	44	23	67	31.43%	34	3	0	67	67	0.00%	11	3	44	111
2010	11	30	16	46	21.76%	34	3	0	46	46	0.00%	11	3	30	66
2010	12	14	38	52	24.44%	34	3	0	52	52	0.00%	11	3	14	66
2010	1	36	26	62	29.05%	34	3	0	62	62	0.00%	11	3	36	98
2010	2	44	23	67	31.43%	34	3	0	67	67	0.00%	11	3	44	111
2010	3	30	16	46	21.76%	34	3	0	46	46	0.00%	11	3	30	66
2010	4	14	38	52	24.44%	34	3	0	52	52	0.00%	11	3	14	66
2010	5	36	26	62	29.05%	34	3	0	62	62	0.00%	11	3	36	98
2010	6	44	23	67	31.43%	34	3	0	67	67	0.00%	11	3	44	111
2010	7	30	16	46	21.76%	34	3	0	46	46	0.00%	11	3	30	66
2010	8	14	38	52	24.44%	34	3	0	52	52	0.00%	11	3	14	66
2010	9	36	26	62	29.05%	34	3	0	62	62	0.00%	11	3	36	98
2010	10	44	23	67	31.43%	34									

Frequency Statistics

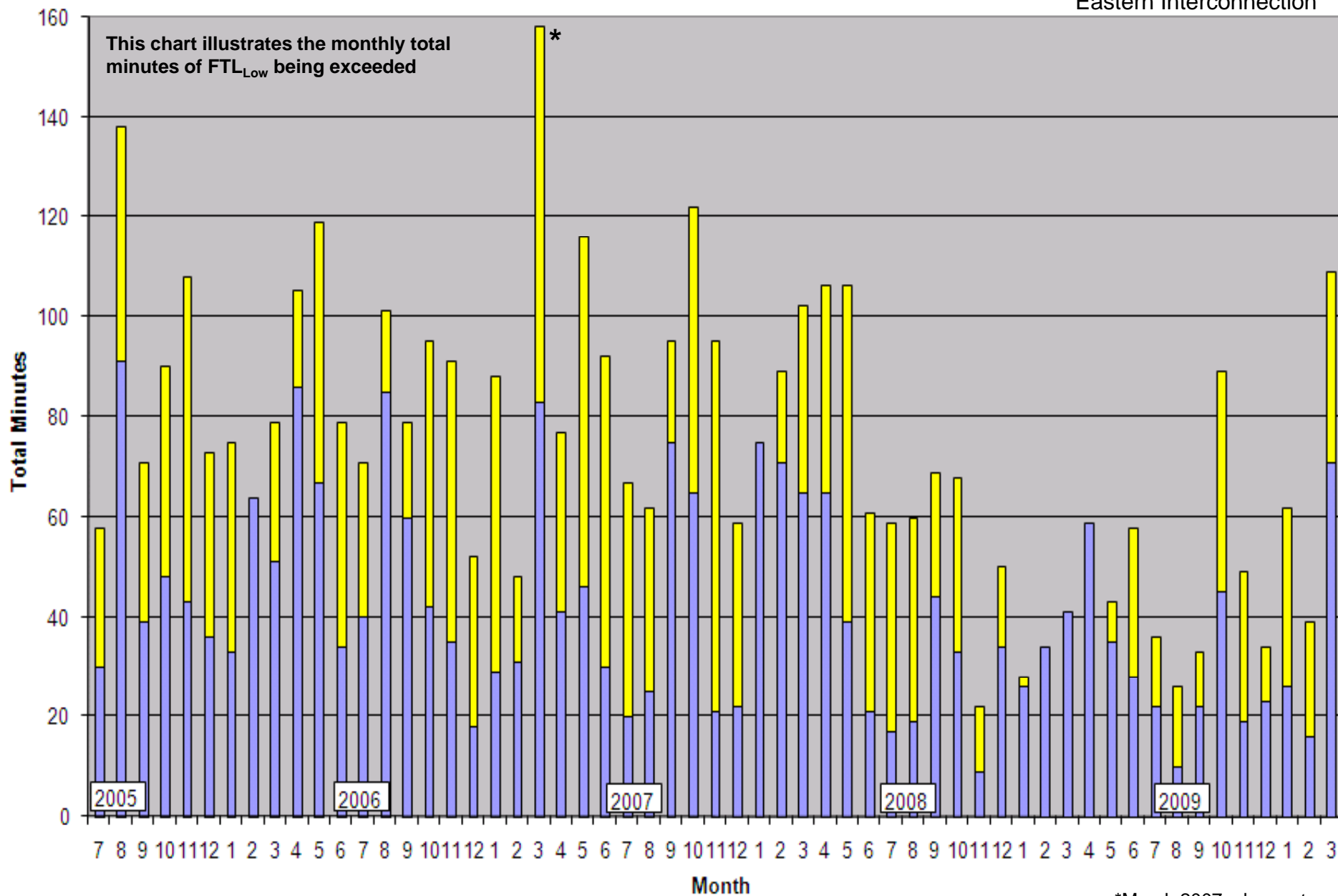
Eastern Interconnection

Year	Month	Total Minutes FTL_Low at 60 Hz SF	Total Minutes FTL_High at 60 Hz SF	Total FTL_Low Minutes	Percentage Low During TEC	FTL_Low Max Duration	Total Minutes FTL_High at 60 Hz SF	Total FTL_High Minutes	Percentage High During TEC	FTL_High Max Duration	Total FTL_Low and FTL_High Minutes at 60 Hz SF	Total FTL_Low and FTL_High Minutes
2008	1	0	48	48	0.00%	24	24	4	123	123	123	123
2008	2	0	51	51	0.00%	24	24	8	122	140	140	140
2008	3	0	40	40	0.00%	34	34	2	105	142	142	142
2008	4	0	59	59	0.00%	33	33	6	124	165	165	165
2008	5	0	40	40	0.00%	20	20	5	79	146	146	146
2008	6	0	35	35	0.00%	19	19	5	56	96	96	96
2008	7	0	17	17	0.00%	12	12	3	34	76	76	76
2008	8	0	29	29	0.00%	17	17	6	48	89	89	89
2008	9	0	55	55	0.00%	21	21	11	99	124	124	124
2008	10	0	27	27	0.00%	19	19	3	60	95	95	95
2008	11	0	13	13	0.00%	9	9	4	22	35	35	35
2008	12	0	11	11	0.00%	8	8	3	45	61	61	61
2009	1	0	19	19	0.00%	9	9	3	45	47	47	47
2009	2	0	18	18	0.00%	11	11	6	52	52	52	52
2009	3	0	25	25	0.00%	11	11	9	66	66	66	66
2009	4	0	27	27	0.00%	20	20	3	86	86	86	86
2009	5	0	27	27	0.00%	15	15	8	62	70	70	70
2009	6	0	25	25	0.00%	16	16	3	53	83	83	83
2009	7	0	28	28	0.00%	16	16	6	50	64	64	64
2009	8	0	13	13	0.00%	10	10	2	23	39	39	39
2009	9	0	20	20	0.00%	14	14	4	42	53	53	53
2009	10	0	18	18	0.00%	10	10	3	63	107	107	107
2009	11	0	34	34	0.00%	21	21	4	53	83	83	83
2009	12	0	22	22	0.00%	15	15	3	45	56	56	56
2010	1	0	16	16	0.00%	9	9	3	42	78	78	78
2010	2	0	26	26	0.00%	16	16	2	42	65	65	65
2010	3	0	40	40	0.00%	22	22	6	111	149	149	149

This chart is a summary of frequency-related statistics gathered since the start of the Field Trial. Of particular interest is the drop in operation outside of the FTL bounds, trending lower in the latter part of 2008 with November 2008 having the least number of clock-minutes of operation outside the FTL bounds, followed by August 2009, over the dataset.

Total Minutes Exceeding Low FTL

Eastern Interconnection

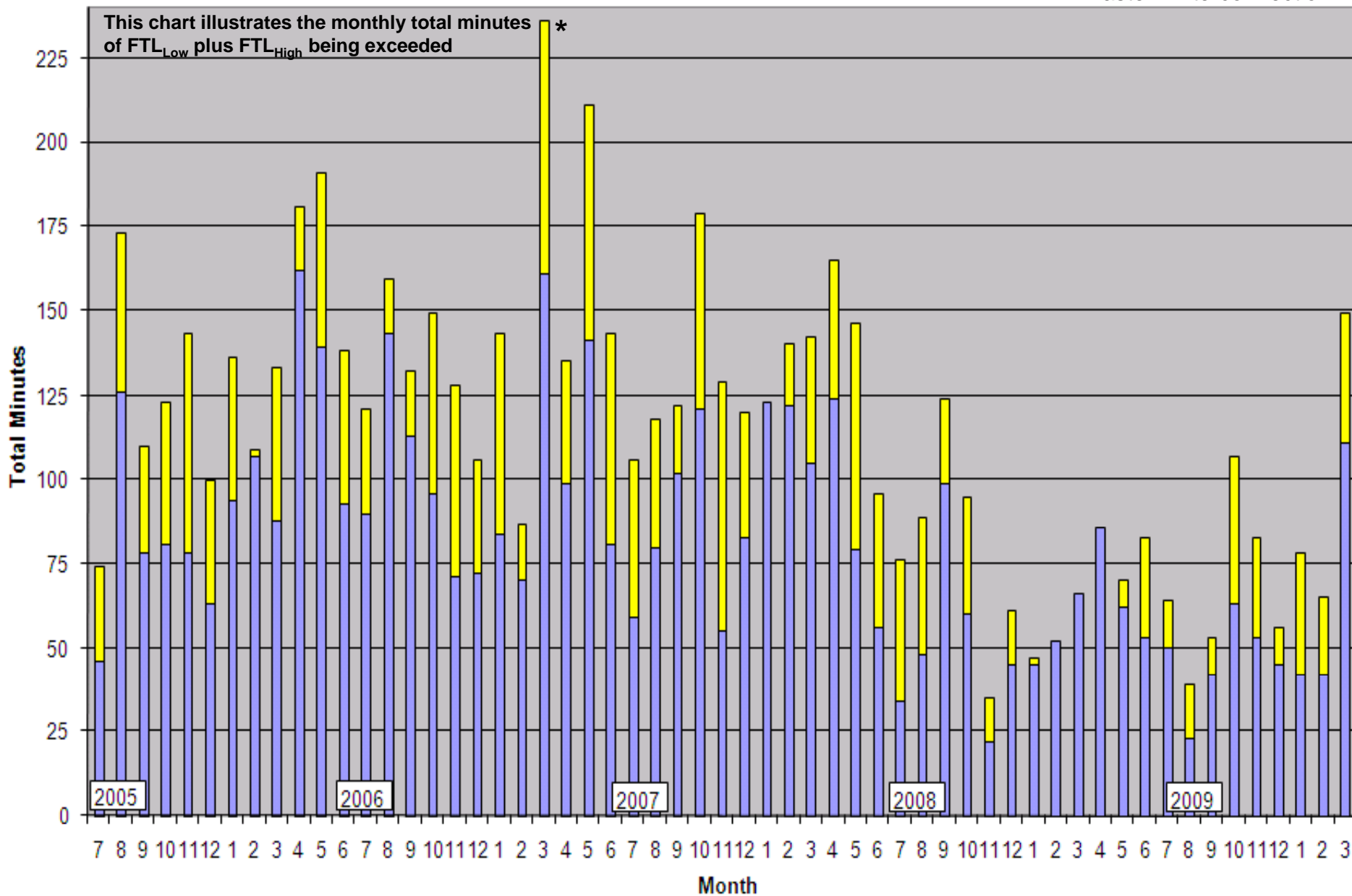


■ Total Minutes at 60 Hz
 ■ Addition Minutes During Time-Error Corrections

*March 2007- change to the new Daylight Saving Time.

Total Clock-Minutes less than Low FTL or greater than High FTL

Eastern Interconnection



*March 2007- change to the new Daylight Saving Time.

■ Total Minutes at 60 Hz ■ Addition Minutes During Time-Error Corrections

Balancing Authority ACE Limit Proof-of-Concept Field Trial

Project 2007-18 Reliability-Based Control

Dates in this presentation:

Low Frequency Trigger Limit (FTL_{Low}) exceedance on March 18, 2010, ending 7:07 EDT: 6 consecutive clock-minutes¹

High Frequency Trigger Limit (FTL_{High}) exceedance on March 30, 2010, ending 19:06 EDT: 6 consecutive clock-minutes

High Frequency Trigger Limit (FTL_{High}) exceedance on March 31, 2010, ending 23:54 EDT: 5 consecutive clock-minutes

Balancing Authority ACE Limit Low ($BAAL_{Low}$) exceedance on March 5, 2010, ending 21:39 EST: 21 consecutive clock-minutes, 59.98 Hz Scheduled Freq.

Balancing Authority ACE Limit High ($BAAL_{High}$) exceedance on March 10, 2010, ending 0:37 EST: 19 consecutive clock-minutes

¹ Under draft BAL-008, a proposed FTL_{Low} violation would occur when the actual frequency is lower than FTL_{Low} for more than 30 consecutive clock-minutes and a proposed FTL_{High} violation would occur when the actual frequency is greater than FTL_{High} for more than 30 consecutive clock-minutes. Under draft BAL-007, a proposed $BAAL_{Low}$ violation would occur when the ACE is lower than $BAAL_{Low}$ for more than 30 consecutive clock-minutes and a proposed $BAAL_{High}$ violation would occur when the ACE is greater than $BAAL_{High}$ for more than 30 consecutive clock-minutes.

Balancing Authority ACE Limit Proof-of-Concept Field Trial

Project 2007-18 Reliability-Based Control

Date	Time	TimeZone	FreqError	ActualFreq	SchedFreq	AQC	FQC	MinCtLow	MinCtHigh
03/03/10	20:00	EST	-0.0246	59.9554	59.98	0	0	16	0
03/03/10	20:01	EST	-0.01817	59.96183	59.98	0	0	17	0
03/03/10	20:02	EST	-0.01967	59.96033	59.98	0	0	18	0
03/03/10	20:03	EST	-0.01707	59.96293	59.98	0	0	19	0
03/05/10	21:34	EST	-0.00562	59.97438	59.98	0	0	16	0
03/05/10	21:35	EST	-0.00089	59.97911	59.98	0	0	17	0
03/05/10	21:36	EST	-0.00023	59.97977	59.98	0	0	18	0
03/05/10	21:37	EST	-0.00417	59.97583	59.98	0	0	19	0
03/05/10	21:38	EST	-0.00314	59.97686	59.98	0	0	20	0
03/05/10	21:39	EST	0.002517	59.98251	59.98	0	0	21	0
03/08/10	18:36	EST	-0.01082	59.96918	59.98	0	0	16	0
03/08/10	18:37	EST	-0.01532	59.96468	59.98	0	0	17	0
03/08/10	19:23	EST	-0.014	59.966	59.98	0	0	16	0
03/08/10	19:24	EST	-0.003	59.977	59.98	0	0	17	0
03/09/10	18:07	EST	0.03	60.03	60	0	0	0	16
03/10/10	0:34	EST	0.0328	60.0328	60	0	0	0	16
03/10/10	0:35	EST	0.030467	60.03047	60	0	0	0	17
03/10/10	0:36	EST	0.028067	60.02807	60	0	0	0	18
03/10/10	0:37	EST	0.027267	60.02727	60	0	0	0	19
03/31/10	20:14	EST	-0.00701	59.97299	59.98	0	0	16	0
03/31/10	20:15	EST	0.00373	59.98373	59.98	0	0	17	0
03/31/10	20:16	EST	0.00702	59.98702	59.98	0	0	18	0
03/31/10	20:17	EST	-0.00037	59.97963	59.98	0	0	19	0

3/18/2010 7:01-7:07 EDT

6 minute duration below FTL_{Low}

Clock-Minute Average Frequency

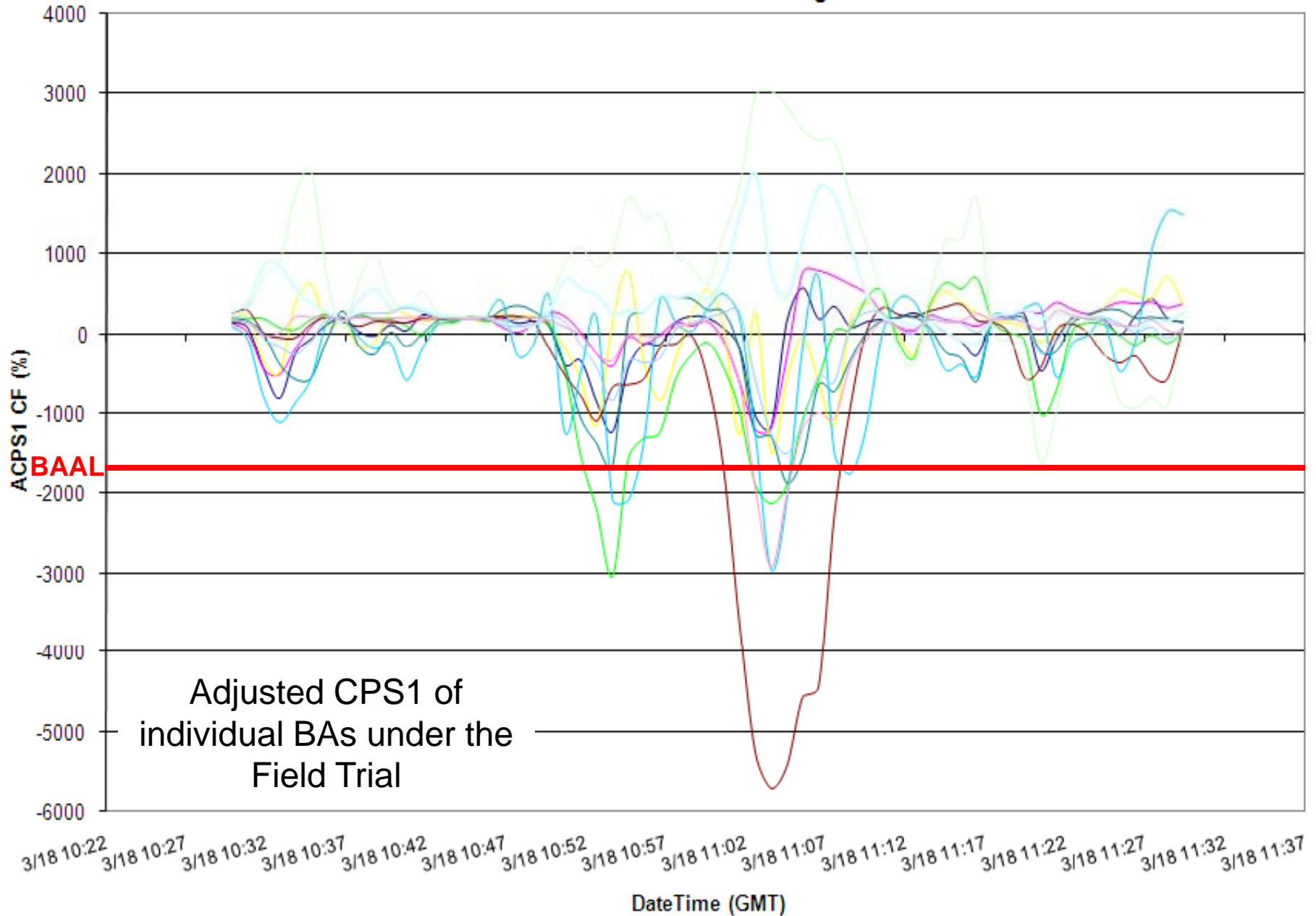


Clock-minute Actual Frequency of Participants

3/18/2010 7:01-7:07 EDT

6 minute duration below FTL_{Low}

ACPS1 Clock-Minute Averages

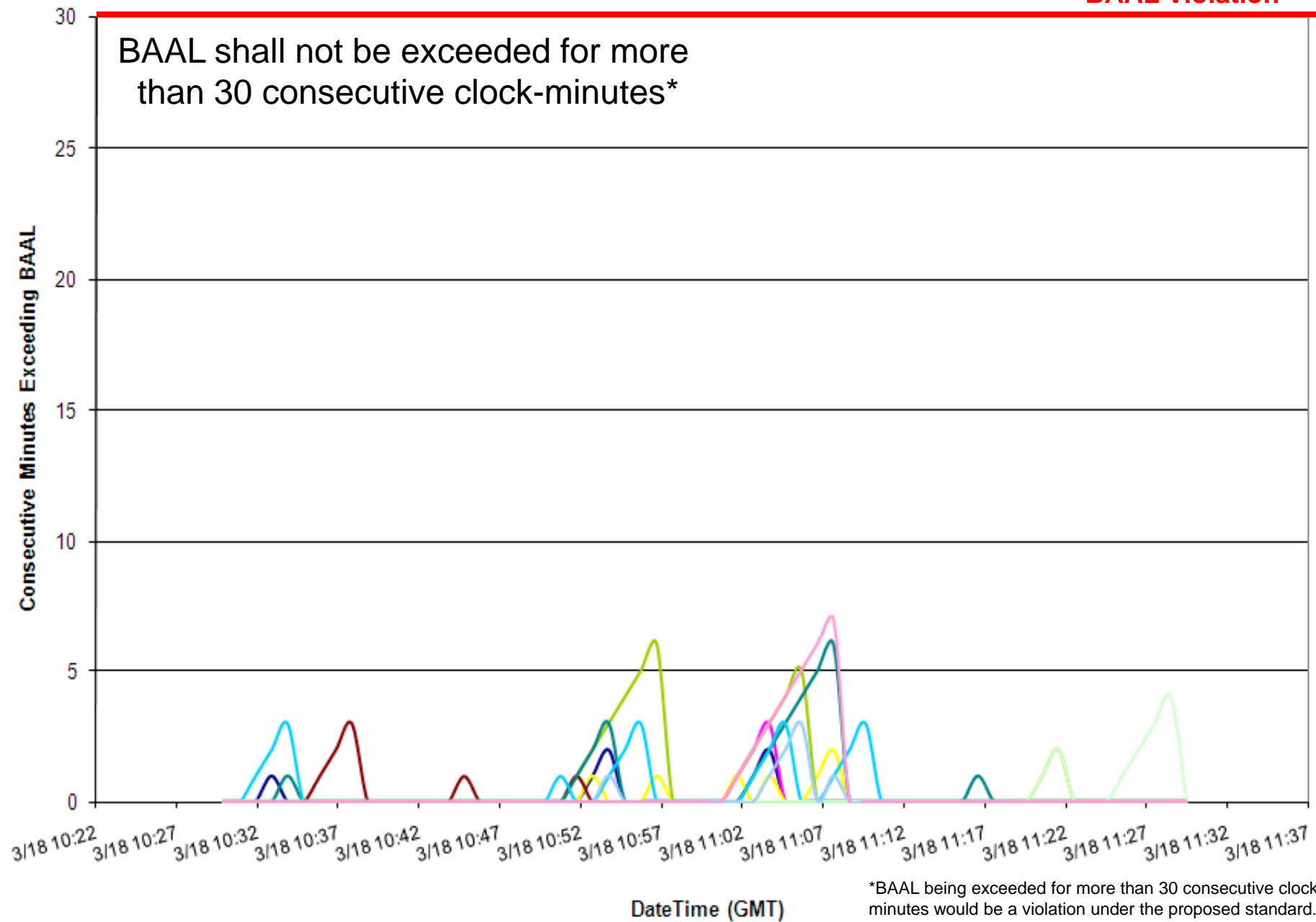


3/18/2010 7:01-7:07 EDT

6 minute duration below FTL_{Low}

Consecutive Minutes Exceeding BAAL

BAAL Violation*

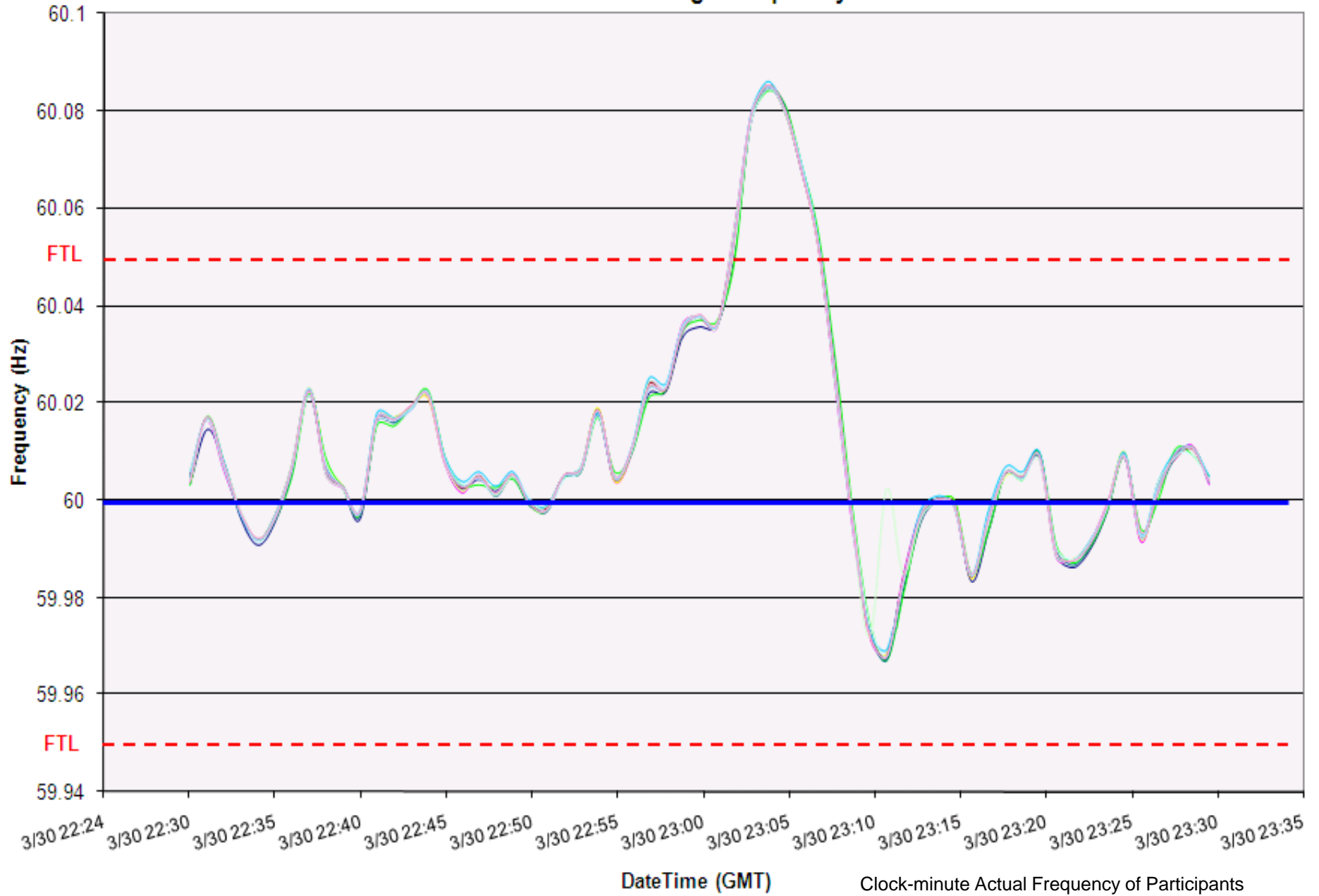


*BAAL being exceeded for more than 30 consecutive clock-minutes would be a violation under the proposed standard.

3/30/2010 19:00-19:06 EDT

6 minute duration above FTL_{High}

Clock-Minute Average Frequency

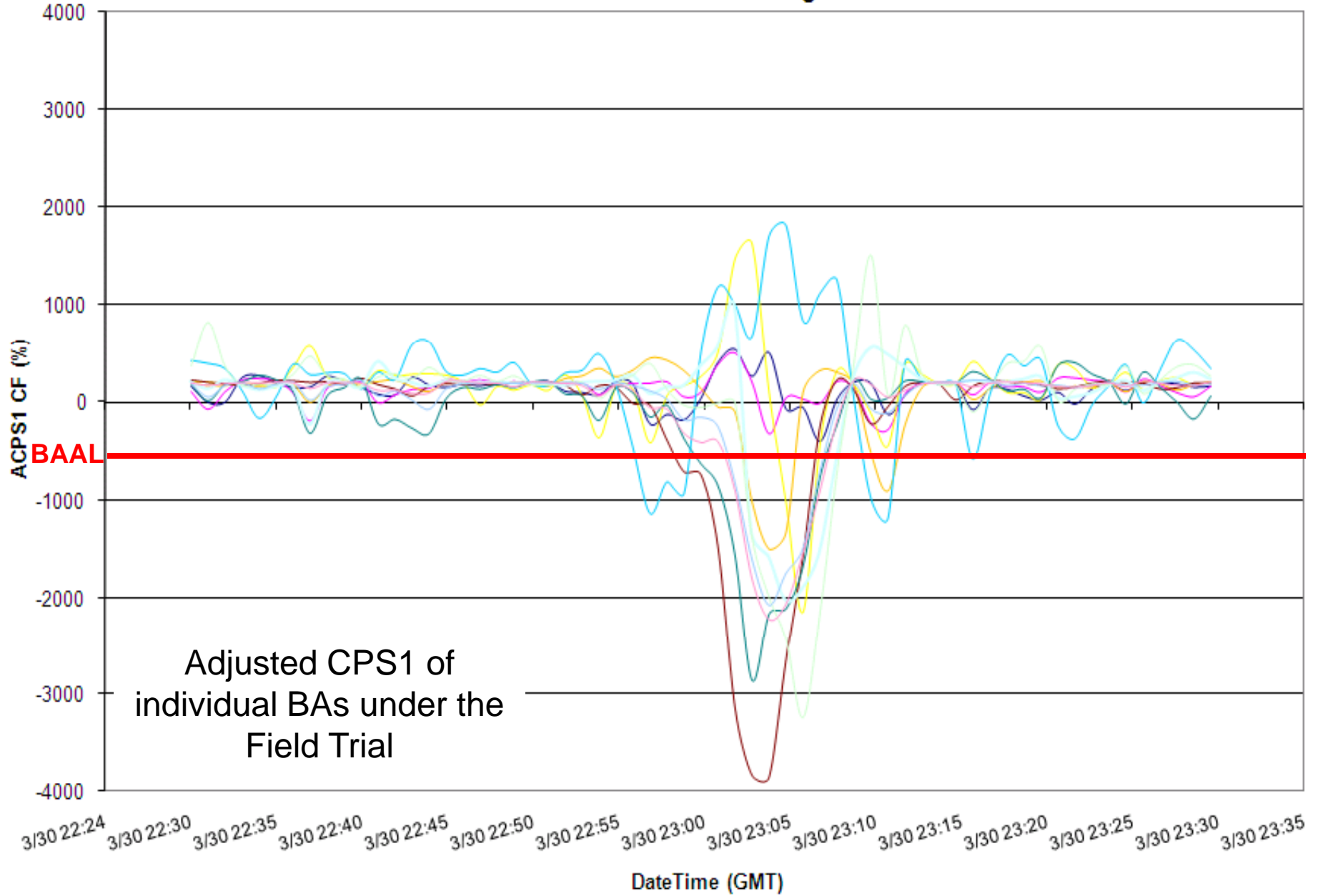


Clock-minute Actual Frequency of Participants

3/30/2010 19:00-19:06 EDT

6 minute duration above FTL_{High}

ACPS1 Clock-Minute Averages

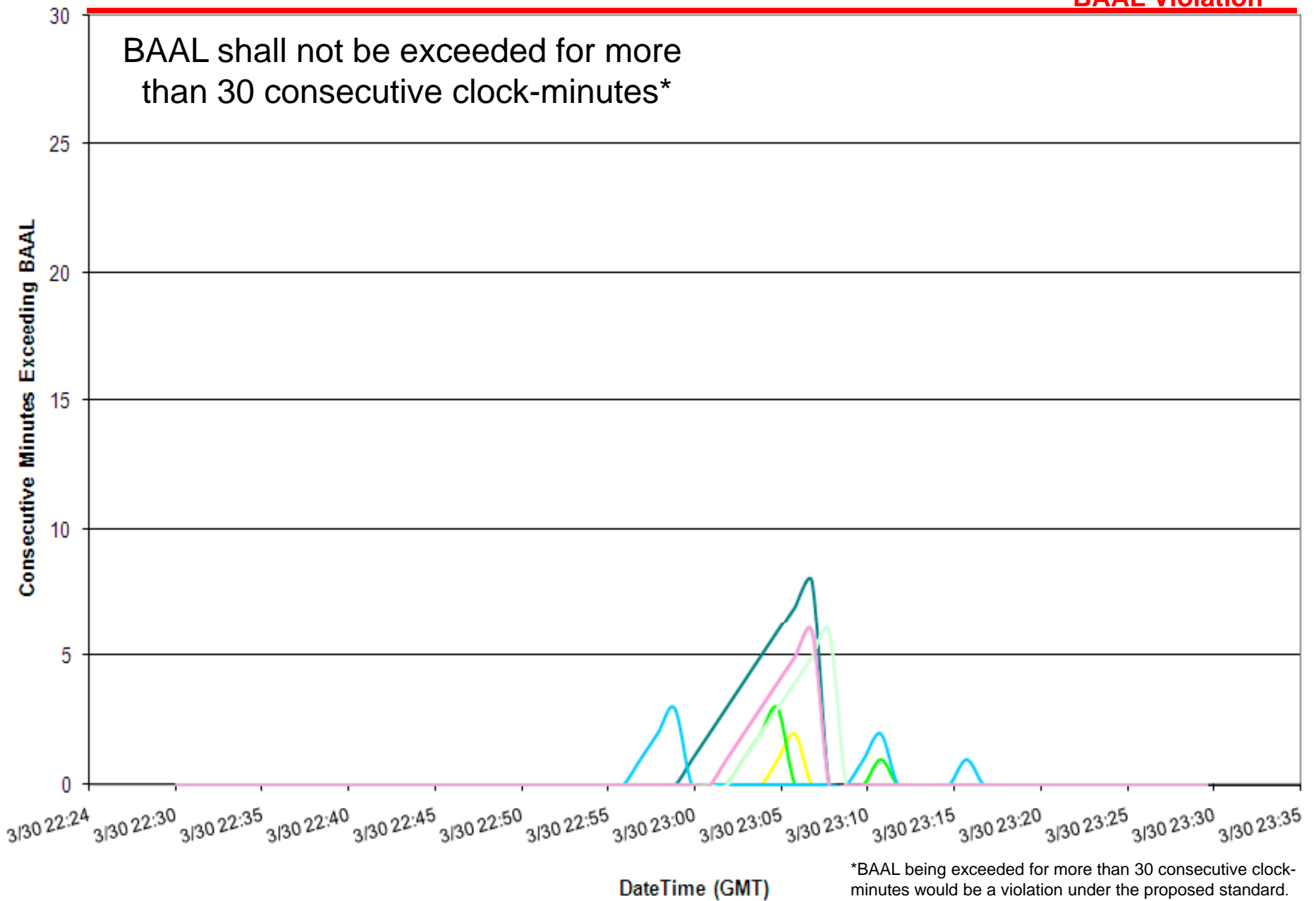


3/30/2010 19:00-19:06 EDT

6 minute duration above FTL_{High}

Consecutive Minutes Exceeding BAAL

BAAL Violation*



3/31/2010 23:49-23:54 EDT

5 minute duration above FTL_{High}

Clock-Minute Average Frequency

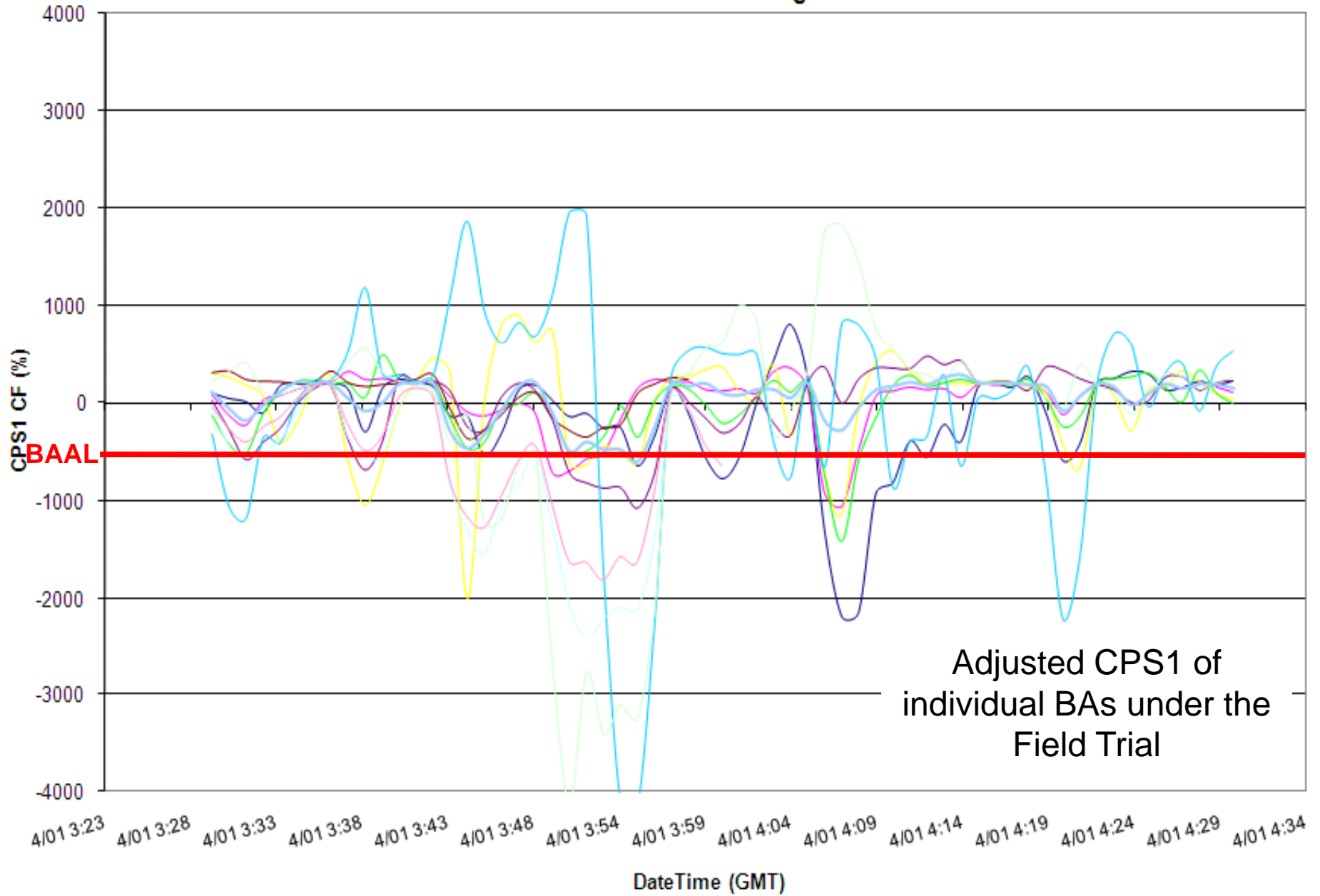


Clock-minute Actual Frequency of Participants

3/31/2010 23:49-23:54 EDT

5 minute duration above FTL_{High}

ACPS1 One-Minute Averages

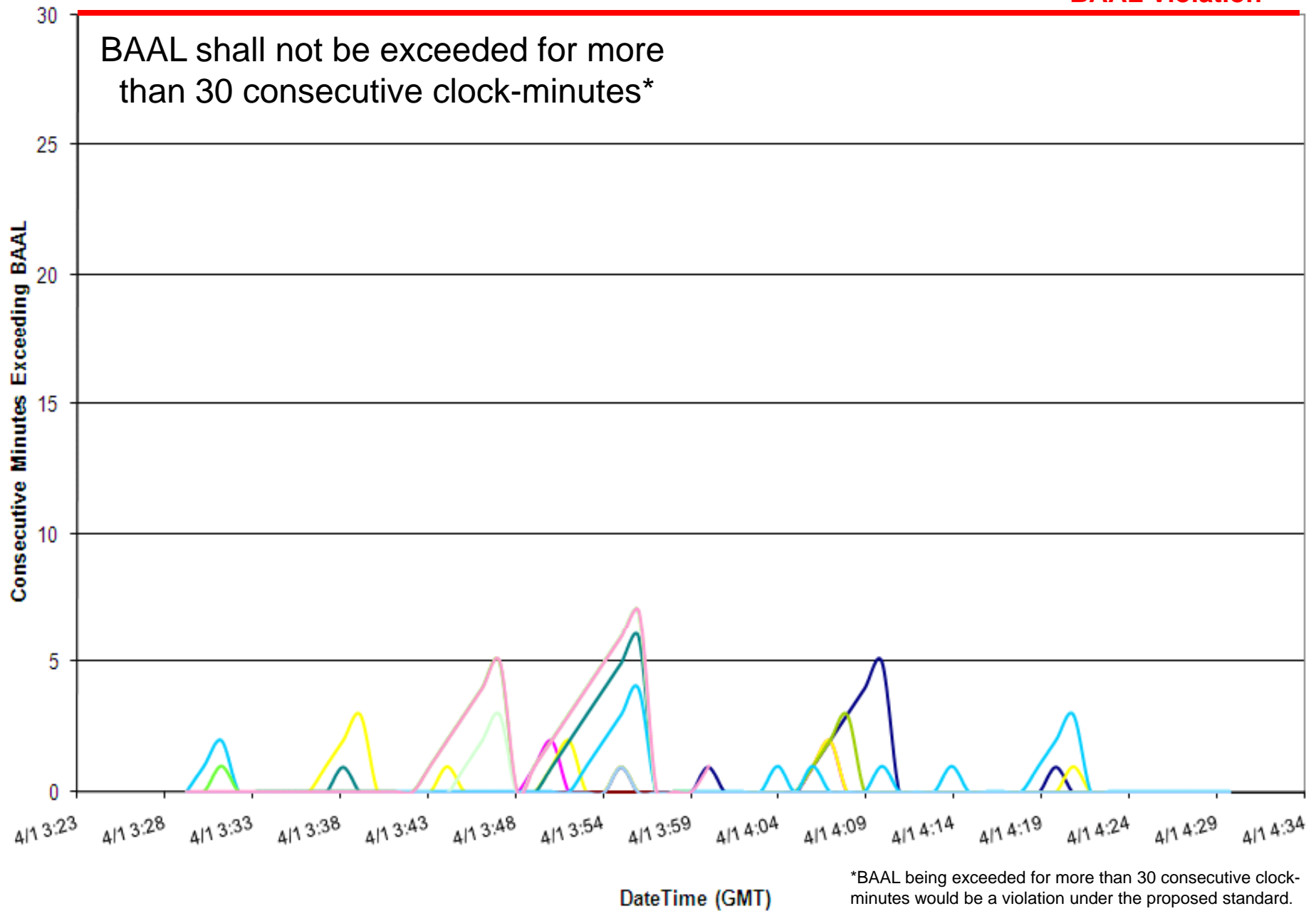


3/31/2010 23:49-23:54 EDT

5 minute duration above FTL_{High}

Consecutive Minutes Exceeding BAAL

BAAL Violation*

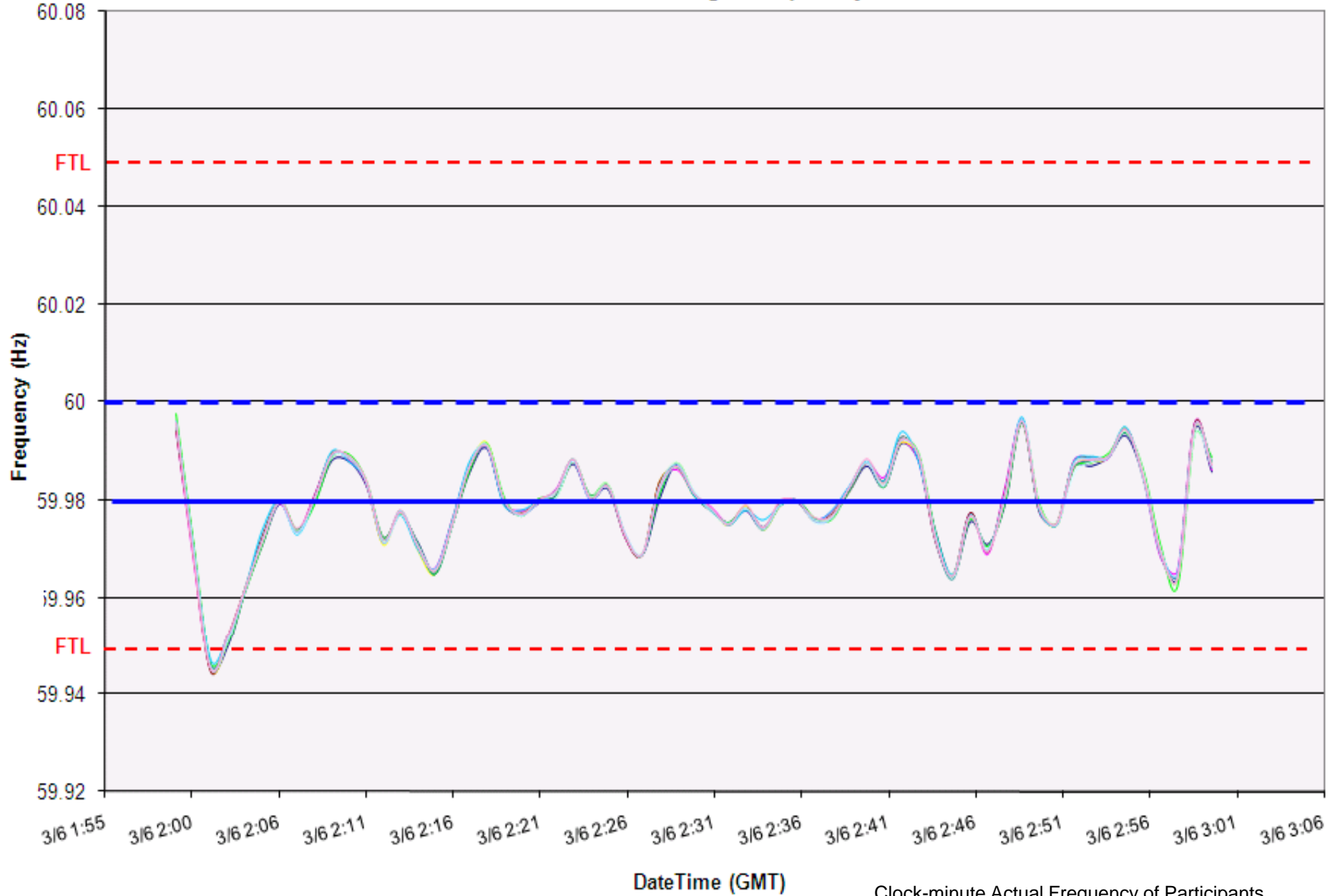


3/06/2010 21:18-21:39 EST

21-minute duration below BAAL_{Low} during

59.98 Hz TEC

Clock-Minute Average Frequency

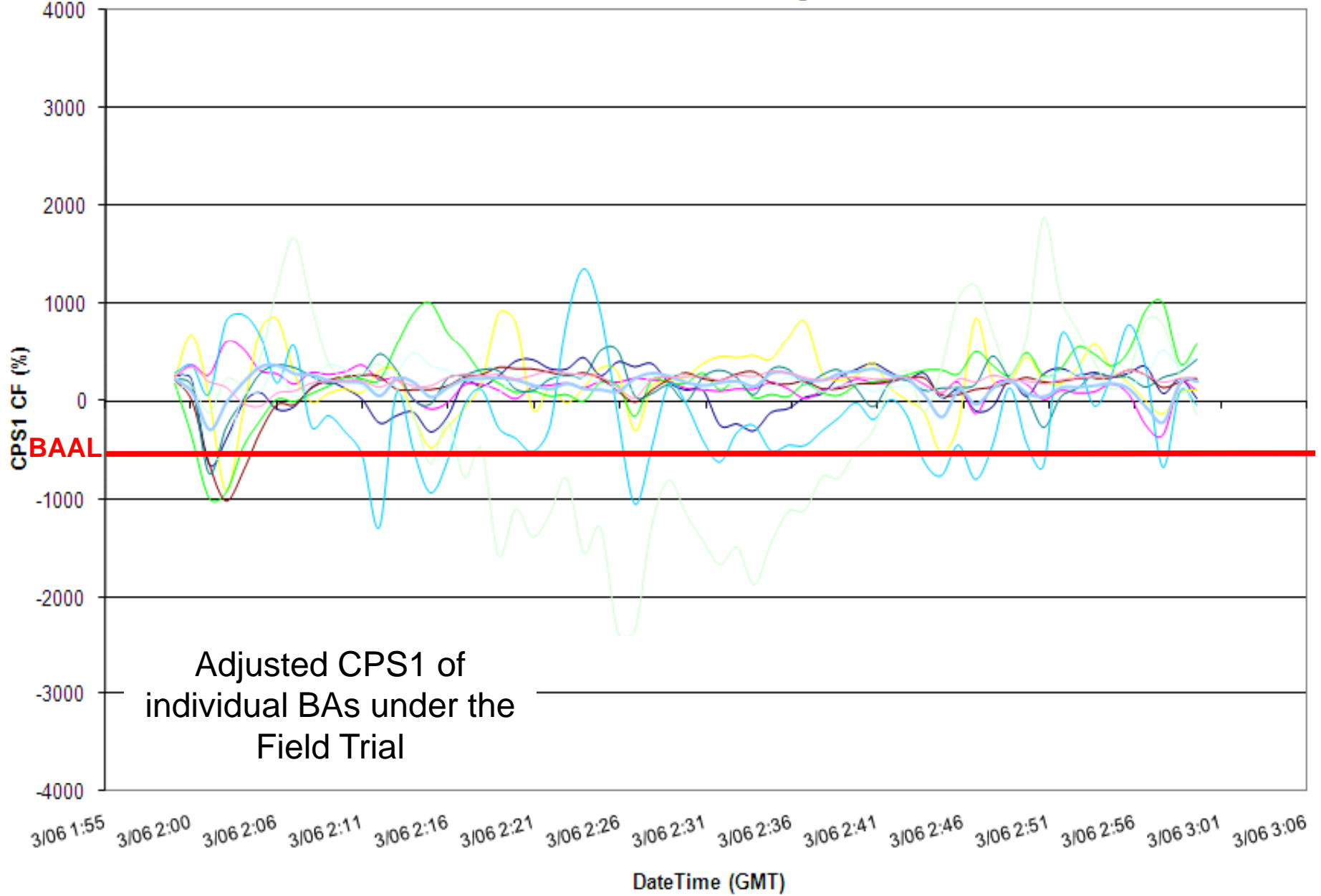


Clock-minute Actual Frequency of Participants

3/06/2010 21:18-21:39 EST

21-minute duration below BAAL_{Low} during
59.98 Hz TEC

ACPS1 One-Minute Averages

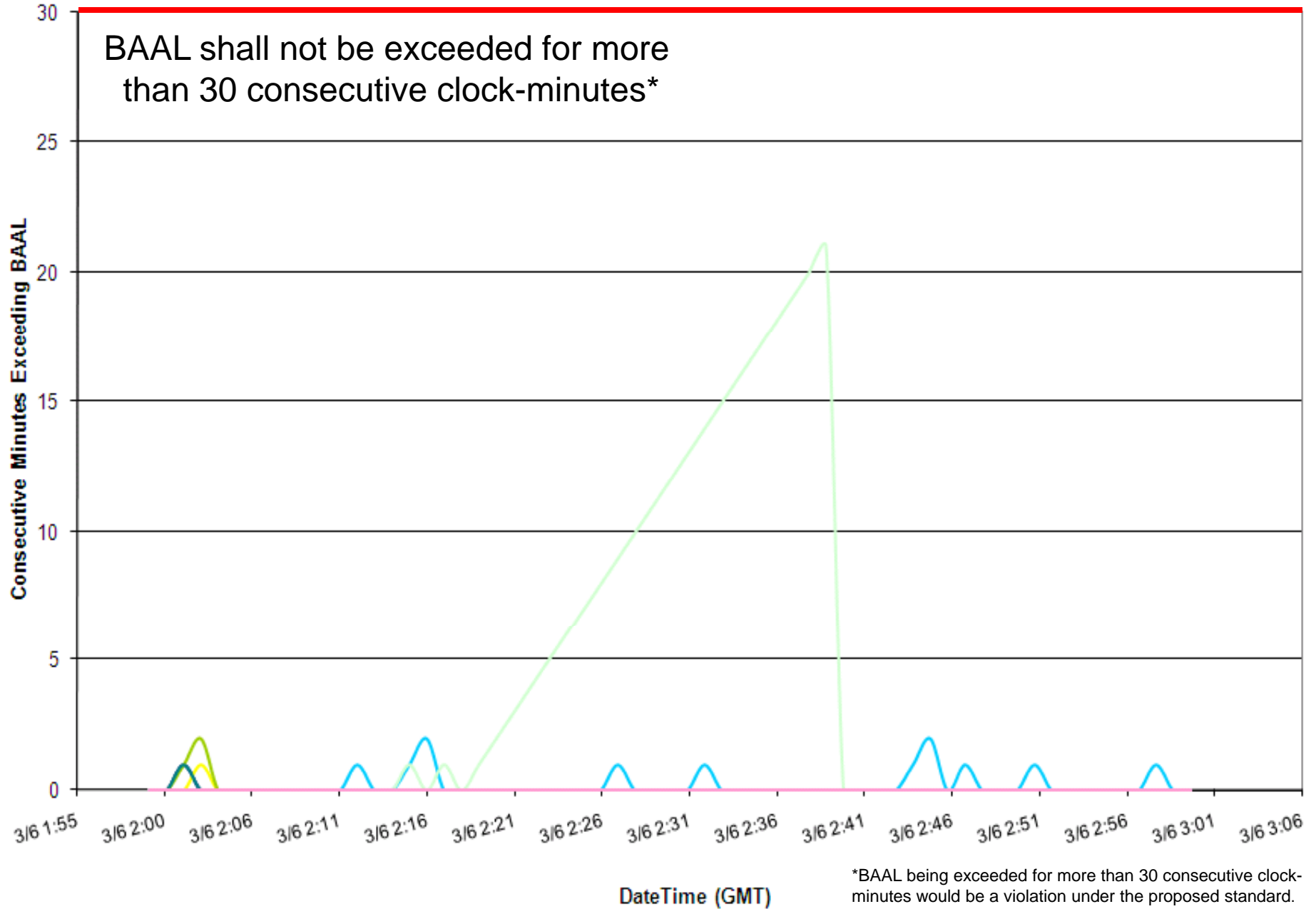


3/06/2010 21:18-21:39 EST

21-minute duration below $BAAL_{Low}$ during
59.98 Hz TEC

Consecutive Minutes Exceeding BAAL

BAAL Violation*



3/10/2010 00:18-00:37 EST

19-minute duration above BAAL_{High}

Clock-Minute Average Frequency

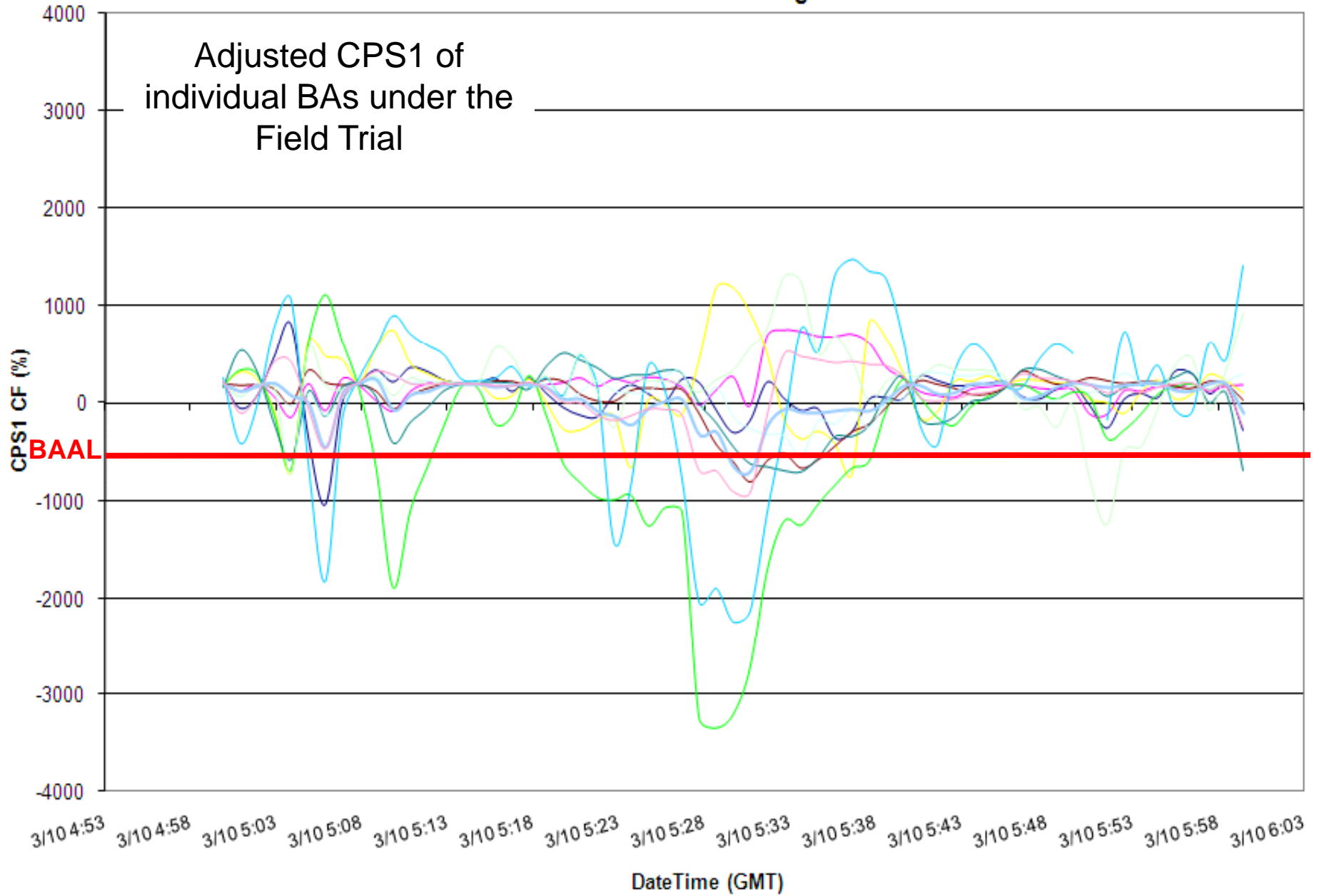


Clock-minute Actual Frequency of Participants

3/10/2010 00:18-00:37 EST

19-minute duration above BAAL_{High}

ACPS1 One-Minute Averages

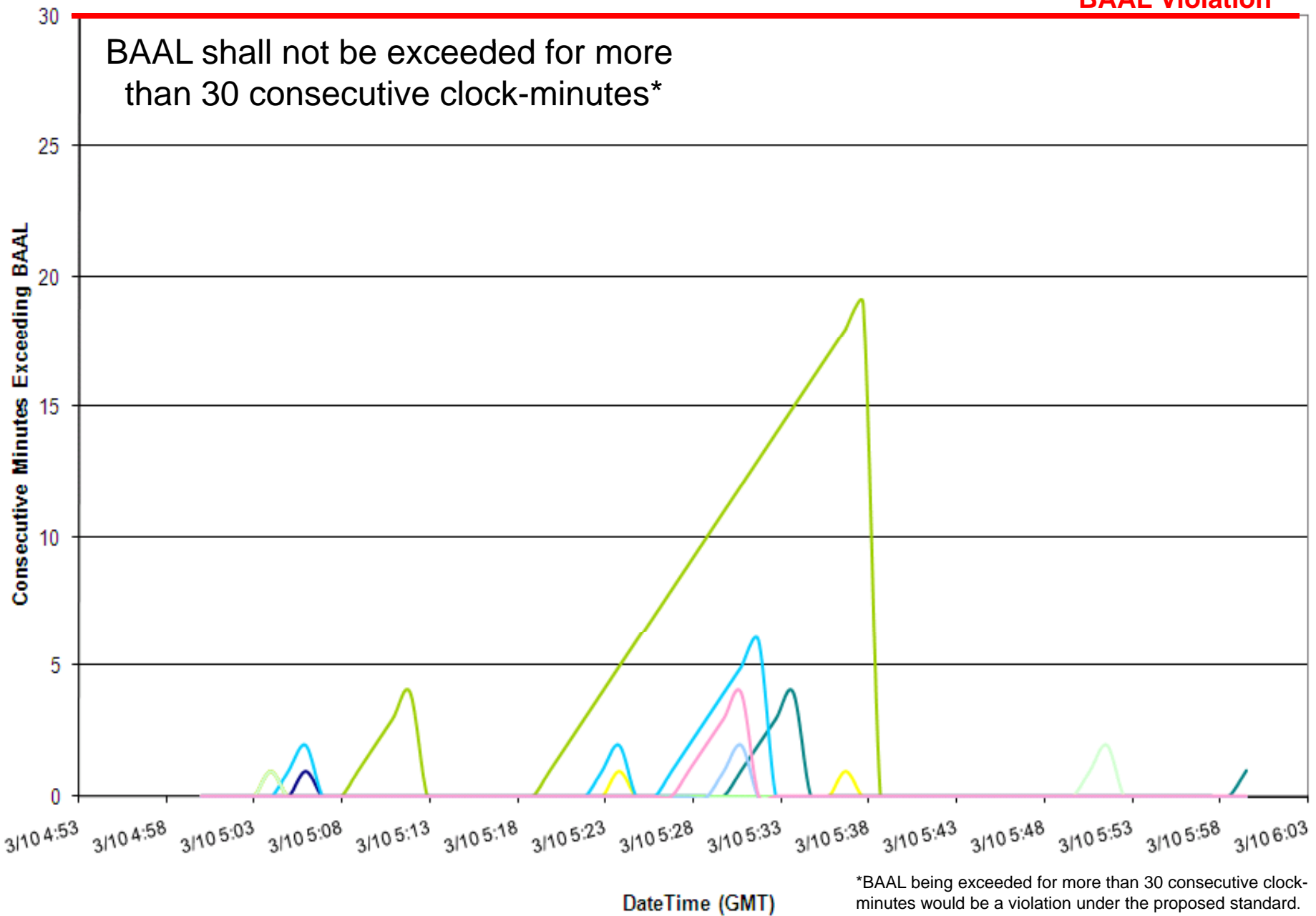


3/10/2010 00:18-00:37 EST

19-minute duration above BAAL_{High}

Consecutive Minutes Exceeding BAAL

BAAL Violation*



*BAAL being exceeded for more than 30 consecutive clock-minutes would be a violation under the proposed standard.

Project 2007-18 Reliability-Based Control - examples of ACE exceeding the BAAL

Project 2007-18 Reliability-Based Control Proof-of-Concept Field Trial

Monthly Review of ACE Exceeding the Balancing Authority ACE Limit

On a monthly basis, each Balancing Authority will review its performance for the prior month and identify any periods where the ACE exceeded the low BAAL ("BAAL_{Low}") or the high BAAL ("BAAL_{High}") for more than ten consecutive clock-minutes. To help the RBCSDT gain a better understanding of the circumstances that all Balancing Authorities may be faced while operating under BAL-007, each Balancing Authority will provide a brief explanation of the circumstances related to any periods where the duration of consecutive clock-minutes exceeded twenty minutes. In the event that no period exceeded twenty minutes in the prior month, but the longest duration exceeded ten minutes, the Balancing Authority will provide a brief explanation of the circumstances related to that longest-duration event.

Clock-minute of ACE exceeding the BAAL (mm/dd/yy hh:mm)	Clock-minute of ACE returning within the BAAL (mm/dd/yy hh:mm)	TimeZone	Total duration of ACE exceeding the BAAL (minutes)	Event associated with a DCS-Reportable Event? (0=No, 1=Yes)	Event associated with a resource loss other than a DCS-Reportable Event? (0=No, 1=Yes)	Brief explanation of circumstances and notable actions taken if applicable
3/5/10 21:18	3/5/10 21:39	EDT	0:21	0	0	A BAAL low event occurred during a time error correction when an industrial customer began running a second furnace. Efforts were made to avoid a 10 minute BAAL event. The generation of one unit was gradually increased to full output and the coal units were loaded to their high control limits. The circumstances impacting recovery included a decreasing load and the imminent reduction of load of an industrial customer.
3/8/10 18:21	3/8/10 18:38	EST	0:17	0	0	Evening runback was stronger than anticipated. Pump storage units were brought online to return ACE to normal range.
3/8/10 19:08	3/8/10 19:25	EST	0:17	0	0	Generation wasn't able to keep up with climbing load toward evening peak. Operator dispatched hydro unit to return ACE to acceptable levels.
3/10/10 0:18	3/10/10 0:37	EST	0:19	0	1	Two units were performing ramping tests - operator on duty used less than optimal judgment in performing testing simultaneously
3/11/10 23:51	3/12/10 0:01	EDT	0:10	0	0	High ACE caused by load dropping out quicker than expected. No notable actions were taken to recover other than normal operating procedures.
3/22/10 17:59	3/22/10 18:13	CDT	0:14	0	0	BA was ramping out 500MW's of interchange and ramping in Hydro ~500MW's. The BAs nonconforming load steel load ~ 500mws went to zero during ramp period and did not return until 21 minutes latter. Recovered with a reduction of flexible scheduled hydro and fossil.
3/22/10 22:44	3/22/10 22:59	EDT	0:15	0	0	High interconnection frequency lowered the BAAL High Limit as our ACE was increasing. No notable actions were taken to recover other than the normal operating procedures

Balancing Authority ACE Limit Proof-of-Concept Field Trial

Discussion

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