

# **Balancing Authority ACE Limit Proof-of-Concept Field Trial Project 2010-14**

WECC Update Discussion  
November 30, 2010

**DISCUSSION STARTING AT 3:30 PM EDT**

Doug Hils – Duke Energy

Balancing Authority Reliability-based Control Standard Drafting Team  
(BARCSDT)

# Balancing Authority ACE Limit Proof-of-Concept Field Trial

## Western Interconnection Field Trial Participation

Western Interconnection Balancing Authority Participants	2010 Frequency Bias	WECC Region	Reliability Coordinator	Start Date
Alberta Electric System Operator (AESO)	-125	NWPP	WECC	March 1, 2010
Arizona Public Service Company (AZPS)	-74.5	AZNMSNV	WECC	March 1, 2010
Bonneville Power Administration (BPAT)	-157.3	NWPP	WECC	March 1, 2010
British Columbia Transmission Corporation (BCTC)	-118	NWPP	WECC	April 1, 2010
California Independent System Operator (CISO)	-485	CAMX	WECC	March 1, 2010
El Paso Electric Company (EPE)	-19	AZNMSNV	WECC	March 1, 2010
NaturEner Power Watch , LLC(GWA)	-2.1	NWPP	WECC	March 1, 2010
Idaho Power Company (IPCO)	-40	NWPP	WECC	March 1, 2010
Los Angeles Department of Water and Power (LDWP)	-62.3	CAMX	WECC	March 1, 2010
Nevada Power Company (NEVP)	-62.29	AZNMSNV	WECC	March 1, 2010
PacifiCorp East (PACE)	-77	NWPP	WECC	March 1, 2010
PacifiCorp West (PACW)	-45	NWPP	WECC	March 1, 2010
Portland General Electric (PGE)	-50	NWPP	WECC	April 1, 2010
Public Service Company of Colorado (PSCO)	-80	RMPA	WECC	March 1, 2010
Public Utility District No.1 of Chelan County(CHPD)	-12	NWPP	WECC	March 1, 2010
Public Utility District No.1 of Douglas County (DOPD)	-7	NWPP	WECC	April 1, 2010
Public Utility District No.2 of Grant County (GCPD)	-25	NWPP	WECC	March 1, 2010
Seattle City Light (SCL)	-40	NWPP	WECC	March 1, 2010
Sacramento Municipal Utility District (SMUD)	-45.18	NWPP	WECC	March 1, 2010
Salt River Project (SRP)	-65.2	AZNMSNV	WECC	May 1, 2010
Sierra Pacific Power Company (SPPC)	-20.04	NWPP	WECC	March 1, 2010
Tucson Electric Power (TEPC)	-30.4	AZNMSNV	WECC	March 1, 2010
Turlock Irrigation District (TIDC)	-6.7	NWPP	WECC	March 1, 2010
Western Area Power Administration – Rocky Mountain Region (WACM)	-55	RMPA	WECC	March 1, 2010
Western Area Power Administration- Desert Southwest Region (WALC)	-54.8	AZNMSNV	WECC	March 1, 2010

## Clock-Minute Frequency Below 59.932 Hz $FTL_{Low}$ or Above 60.068 Hz $FTL_{High}$

PrevailingTime	PTimeZone	FreqError	ActualFreq	SchedFreq
10/21/10 3:59	PDT	-0.0796	59.9204	60.00
10/26/10 5:49	PDT	-0.1158	59.8842	60.00
10/26/10 5:50	PDT	-0.0942	59.9058	60.00
PrevailingTime	PTimeZone	FreqError	ActualFreq	SchedFreq
10/16/10 11:50	PDT	0.0707	60.0707	60.00
10/20/10 23:47	PDT	0.0481	60.0681	60.02
10/20/10 23:49	PDT	0.0501	60.0701	60.02

Oct 21 – Loss of two resources - 943 MW and 250 MW

Oct 26 – Loss of two resources in Northwest – 1024 MW

# 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\*

BA Number	Performance Since Entering the Field Trial				Current Month Statistics														
	BAAL <sub>Low</sub>		BAAL <sub>High</sub>		ATL <sub>Low</sub>		ATL <sub>High</sub>		BAAL <sub>Low</sub> or ATL <sub>Low</sub>		BAAL <sub>High</sub> or ATL <sub>High</sub>								
	Max	MinCtLow	Max	MinCtHigh	Max	MinCtLow2	Max	MinCtHigh2	Max	LowLimitCt	Max	HighLimitCt							
BA05	44		34		58		49		29		27		29		33		29		37
BA06	13		11		13		15		10		20		14		16		14		20
BA07	21		22		29		41		15		17		26		34		26		34
BA08	13		17		19		34		12		13		27		16		30		16
BA09	11		9		15		55		1		5		7		55		7		55
BA11	10		14		16		7		4		5		3		0		4		5
BA12	10		11		14		17		6		1		5		2		6		2
BA13	6		27		12		45		4		2		3		2		4		2
BA14	7		31		6		55		6		5		0		0		6		5
BA15	5		7		7		5		1		1		1		0		1		1
BA16	12		13		25		34		4		13		8		18		8		18
BA18	7		13		25		15		2		1		4		3		4		3
BA19	11		16		30		34		10		12		10		14		10		14
BA22	4		5		15		14		3		6		8		12		8		12
BA23	9		9		13		27		10		3		10		9		10		9
BA25	15		6		21		14		4		13		5		16		5		16
BA26	13		23		43		41		8		7		19		41		19		41
BA27	23		22		16		15		3		3		11		8		11		8
BA28	9		17		38		39		9		26		19		39		19		39
BA29	17		9		16		16		4		6		5		15		5		15
BA30	19		18		47		39		16		14		15		15		16		15
BA31	20		16		29		28		15		13		18		17		18		17
BA33	26		13		28		58		3		6		14		33		14		33
BA34	13		9		23		29		12		9		23		23		23		23
BA36	9		16		23		25		12		9		11		20		12		20

MinCtLow = Count of consecutive clock-minutes BAAL<sub>Low</sub> was exceeded  
 MinCtHigh = Count of consecutive clock-minutes BAAL<sub>High</sub> was exceeded  
 MinCtLow2 = Count of consecutive clock-minutes ATL<sub>Low</sub> was exceeded  
 MinCtHigh2 = Count of consecutive clock-minutes ATL<sub>High</sub> was exceeded

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

# Statistics of 30-minute bounds being exceeded:

Date	Time	TimeZone	ActualFreq	SchedFreq	MinCtLow	MinCtHigh	MinCtLow2	MinCtHigh2	DateTimeMST
10/17/10	18:25	MDT	59.9701	60.00	0	0	0	30	10/17/2010 17:25
10/17/10	18:26	MDT	59.9710	60.00	0	0	0	31	10/17/2010 17:26
10/17/10	18:27	MDT	59.9723	60.00	0	0	0	32	10/17/2010 17:27
10/17/10	18:28	MDT	59.9644	60.00	0	0	0	33	10/17/2010 17:28
10/11/10	8:35	MST	59.9956	60.00	0	0	0	30	10/11/2010 8:35
10/11/10	8:36	MST	59.9981	60.00	0	0	0	31	10/11/2010 8:36
10/11/10	8:37	MST	60.0005	60.00	0	0	0	32	10/11/2010 8:37
10/11/10	8:38	MST	59.9931	60.00	0	0	0	33	10/11/2010 8:38
10/11/10	8:39	MST	60.0019	60.00	0	0	0	34	10/11/2010 8:39
10/15/10	6:20	MST	59.9754	60.00	0	0	0	30	10/15/2010 6:20
10/22/10	23:13	MST	59.9930	60.00	0	0	0	30	10/22/2010 23:13
10/22/10	23:14	MST	59.9910	60.00	0	0	0	31	10/22/2010 23:14
10/30/10	1:15	PDT	60.0167	60.00	0	0	0	<b>30</b>	10/30/2010 1:15
10/30/10	1:16	PDT	60.0091	60.00	0	0	0	<b>31</b>	10/30/2010 1:16
10/30/10	1:17	PDT	60.0055	60.00	0	0	0	<b>32</b>	10/30/2010 1:17
10/30/10	1:18	PDT	59.9955	60.00	0	0	0	<b>33</b>	10/30/2010 1:18
10/30/10	1:19	PDT	59.9949	60.00	0	0	0	<b>34</b>	10/30/2010 1:19
10/30/10	1:20	PDT	59.9880	60.00	0	0	0	<b>35</b>	10/30/2010 1:20
10/30/10	1:21	PDT	59.9981	60.00	0	0	0	<b>36</b>	10/30/2010 1:21
10/30/10	1:22	PDT	60.0168	60.00	0	0	0	<b>37</b>	10/30/2010 1:22
10/30/10	1:23	PDT	60.0104	60.00	0	0	0	<b>38</b>	10/30/2010 1:23
10/30/10	1:24	PDT	60.0049	60.00	0	0	0	<b>39</b>	10/30/2010 1:24
10/30/10	1:25	PDT	60.0003	60.00	0	0	0	<b>40</b>	10/30/2010 1:25
10/30/10	1:26	PDT	60.0074	60.00	0	0	0	<b>41</b>	10/30/2010 1:26
10/30/10	1:27	PDT	60.0150	60.00	0	0	0	<b>42</b>	10/30/2010 1:27
10/30/10	1:28	PDT	60.0034	60.00	0	0	0	<b>43</b>	10/30/2010 1:28
10/30/10	1:29	PDT	60.0167	60.00	0	0	0	<b>44</b>	10/30/2010 1:29
10/30/10	1:30	PDT	60.0123	60.00	0	0	0	<b>45</b>	10/30/2010 1:30
10/30/10	1:31	PDT	60.0041	60.00	0	0	0	<b>46</b>	10/30/2010 1:31
10/30/10	1:32	PDT	59.9798	60.00	0	0	0	<b>47</b>	10/30/2010 1:32
10/30/10	1:33	PDT	59.9794	60.00	0	0	0	<b>48</b>	10/30/2010 1:33
10/30/10	1:34	PDT	59.9915	60.00	0	0	0	<b>49</b>	10/30/2010 1:34
10/30/10	1:35	PDT	59.9946	60.00	0	0	0	<b>50</b>	10/30/2010 1:35
10/30/10	1:36	PDT	60.0029	60.00	0	0	0	<b>51</b>	10/30/2010 1:36
10/30/10	1:37	PDT	59.9980	60.00	0	0	0	<b>52</b>	10/30/2010 1:37
10/30/10	1:38	PDT	59.9953	60.00	0	0	0	<b>53</b>	10/30/2010 1:38
10/30/10	1:39	PDT	60.0113	60.00	0	0	0	<b>54</b>	10/30/2010 1:39
10/30/10	1:40	PDT	60.0176	60.00	0	0	0	<b>55</b>	10/30/2010 1:40

# Statistics of 30-minute bounds being exceeded:

Date	Time	TimeZone	ActualFreq	SchedFreq	MinCtLow	MinCtHigh	MinCtLow2	MinCtHigh2	DateTimeMST
10/23/10	12:29	PDT	60.0063	60.00	0	0	0	30	10/23/2010 12:29
10/23/10	12:30	PDT	60.0087	60.00	0	0	0	31	10/23/2010 12:30
10/23/10	12:31	PDT	60.0113	60.00	0	0	0	32	10/23/2010 12:31
10/23/10	12:32	PDT	60.0047	60.00	0	0	0	33	10/23/2010 12:32
10/23/10	12:33	PDT	60.0002	60.00	0	0	0	34	10/23/2010 12:33
10/23/10	12:34	PDT	60.0013	60.00	0	0	0	35	10/23/2010 12:34
10/23/10	12:35	PDT	59.9979	60.00	0	0	0	36	10/23/2010 12:35
10/23/10	12:36	PDT	59.9961	60.00	0	0	0	37	10/23/2010 12:36
10/23/10	12:37	PDT	60.0011	60.00	0	0	0	38	10/23/2010 12:37
10/23/10	12:38	PDT	60.0040	60.00	0	0	0	39	10/23/2010 12:38
10/23/10	12:39	PDT	60.0057	60.00	0	0	0	40	10/23/2010 12:39
10/23/10	12:40	PDT	60.0011	60.00	0	0	0	41	10/23/2010 12:40
10/16/10	12:03	PDT	60.0453	60.00	0	21	0	30	10/16/2010 12:03
10/16/10	12:04	PDT	60.0449	60.00	0	22	0	31	10/16/2010 12:04
10/16/10	12:05	PDT	60.0503	60.00	0	23	0	32	10/16/2010 12:05
10/16/10	12:06	PDT	60.0505	60.00	0	24	0	33	10/16/2010 12:06
10/16/10	12:07	PDT	60.0516	60.00	0	25	0	34	10/16/2010 12:07
10/16/10	12:08	PDT	60.0442	60.00	0	26	0	35	10/16/2010 12:08
10/16/10	12:09	PDT	60.0268	60.00	0	0	0	36	10/16/2010 12:09
10/16/10	12:10	PDT	60.0295	60.00	0	0	0	37	10/16/2010 12:10
10/16/10	12:11	PDT	60.0291	60.00	0	0	0	38	10/16/2010 12:11
10/16/10	12:12	PDT	60.0173	60.00	0	0	0	39	10/16/2010 12:12
10/26/10	19:27	PDT	60.0393	60.00	0	0	0	30	10/26/2010 19:27
10/26/10	19:28	PDT	60.0422	60.00	0	1	0	31	10/26/2010 19:28
10/26/10	19:29	PDT	60.0401	60.00	0	0	0	32	10/26/2010 19:29
10/26/10	19:30	PDT	60.0357	60.00	0	0	0	33	10/26/2010 19:30
10/28/10	8:03	PDT	60.0347	60.00	0	16	0	30	10/28/2010 8:03
10/28/10	8:04	PDT	60.0265	60.00	0	0	0	31	10/28/2010 8:04
10/28/10	8:05	PDT	60.0097	60.00	0	0	0	32	10/28/2010 8:05
10/28/10	8:06	PDT	59.9991	60.00	0	0	0	33	10/28/2010 8:06
10/16/10	7:11	MST	60.0063	60.00	0	0	0	30	10/16/2010 7:11
10/16/10	7:12	MST	60.0102	60.00	0	0	0	31	10/16/2010 7:12
10/16/10	7:13	MST	60.0022	60.00	0	0	0	32	10/16/2010 7:13
10/16/10	7:14	MST	60.0063	60.00	0	0	0	33	10/16/2010 7:14

## Dates in this presentation:

Clock-minute Frequency greater than  $FTL_{High}$  on October 16, 2010,  
ending 11:50 PDT: One clock-minute<sup>1</sup>

Clock-minute Frequency greater than  $FTL_{High}$  on October 20, 2010,  
ending 23:49 PDT: 2 consecutive clock-minutes. 60.02 Hz Scheduled Frequency

Clock-minute Frequency less than  $FTL_{Low}$  on October 21, 2010,  
ending 3:59 PDT: One clock-minute

Clock-minute ACE more positive than the  $ATL_{High}$  on October 23, 2010,  
ending 12:40 PDT: 41 consecutive clock-minutes<sup>2</sup>

Clock-minute Frequency less than  $FTL_{Low}$  on October 26, 2010,  
ending 5:50 PDT: 2 consecutive clock-minutes

Clock-minute ACE more positive than the  $ATL_{High}$  on October 30, 2010,  
ending 1:40 PDT: 55 consecutive clock-minutes

<sup>1</sup> 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.

<sup>2</sup> 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.

10/16/2010 11:50 PDT

1 minute duration above  $FTL_{High}$

### Clock-Minute Average Frequency



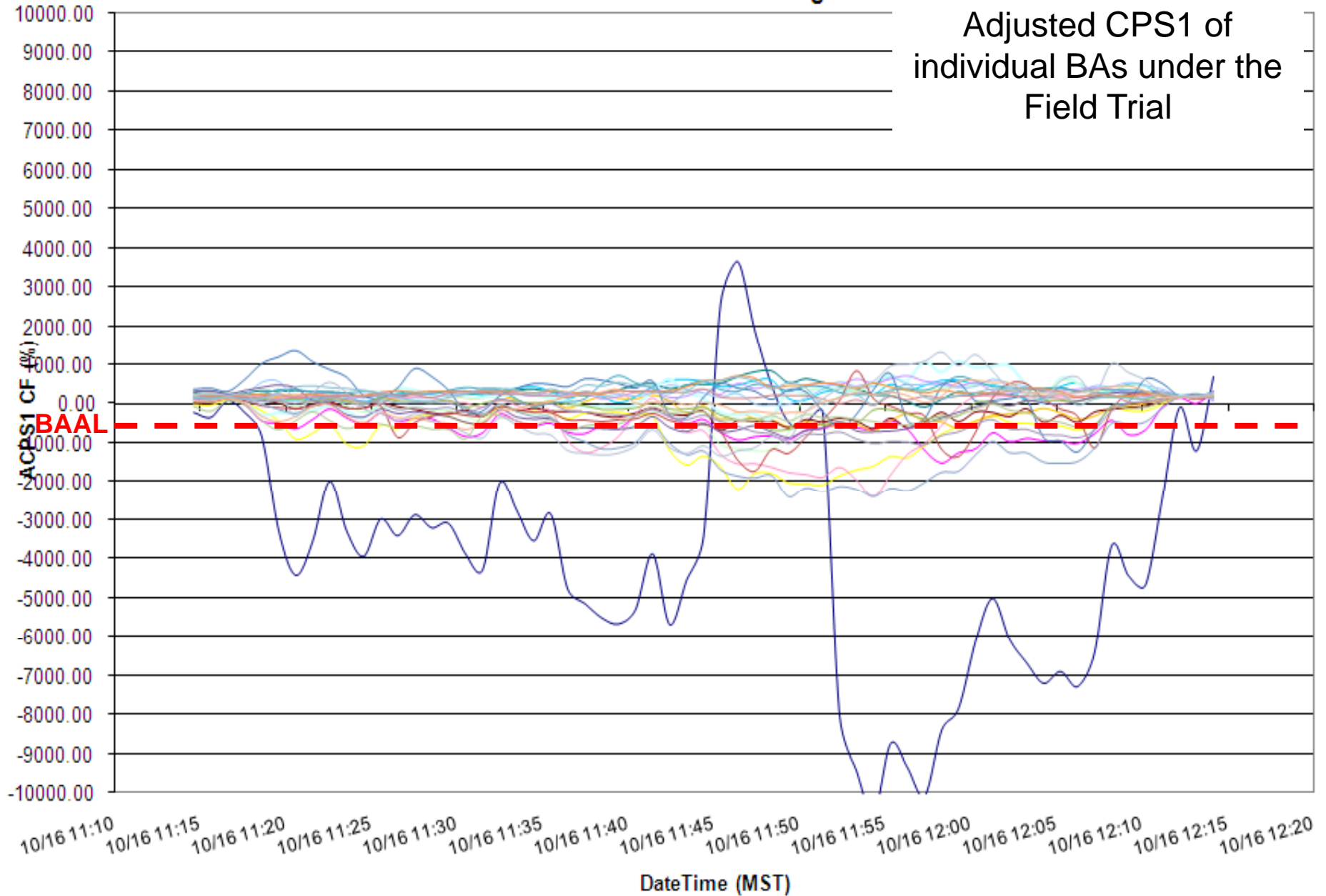
Clock-minute Actual Frequency of Participants

10/16/2010 11:50 PDT

1 minute duration above FTL<sub>High</sub>

### ACPS1 Clock-Minute Averages

Adjusted CPS1 of individual BAs under the Field Trial

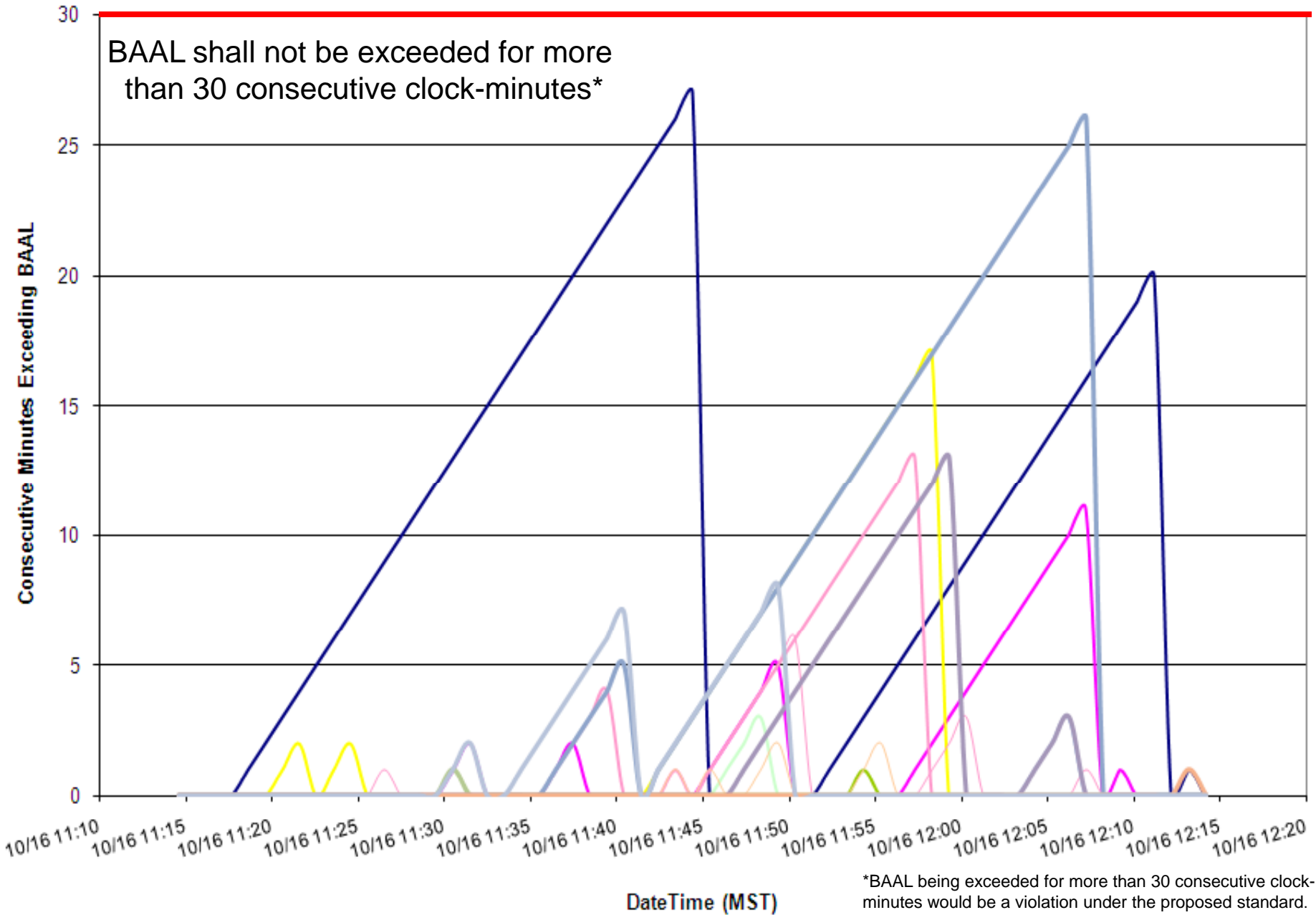


10/16/2010 11:50 PDT

1 minute duration above FTL<sub>High</sub>

### Consecutive Minutes Exceeding BAAL

**BAAL Violation\***

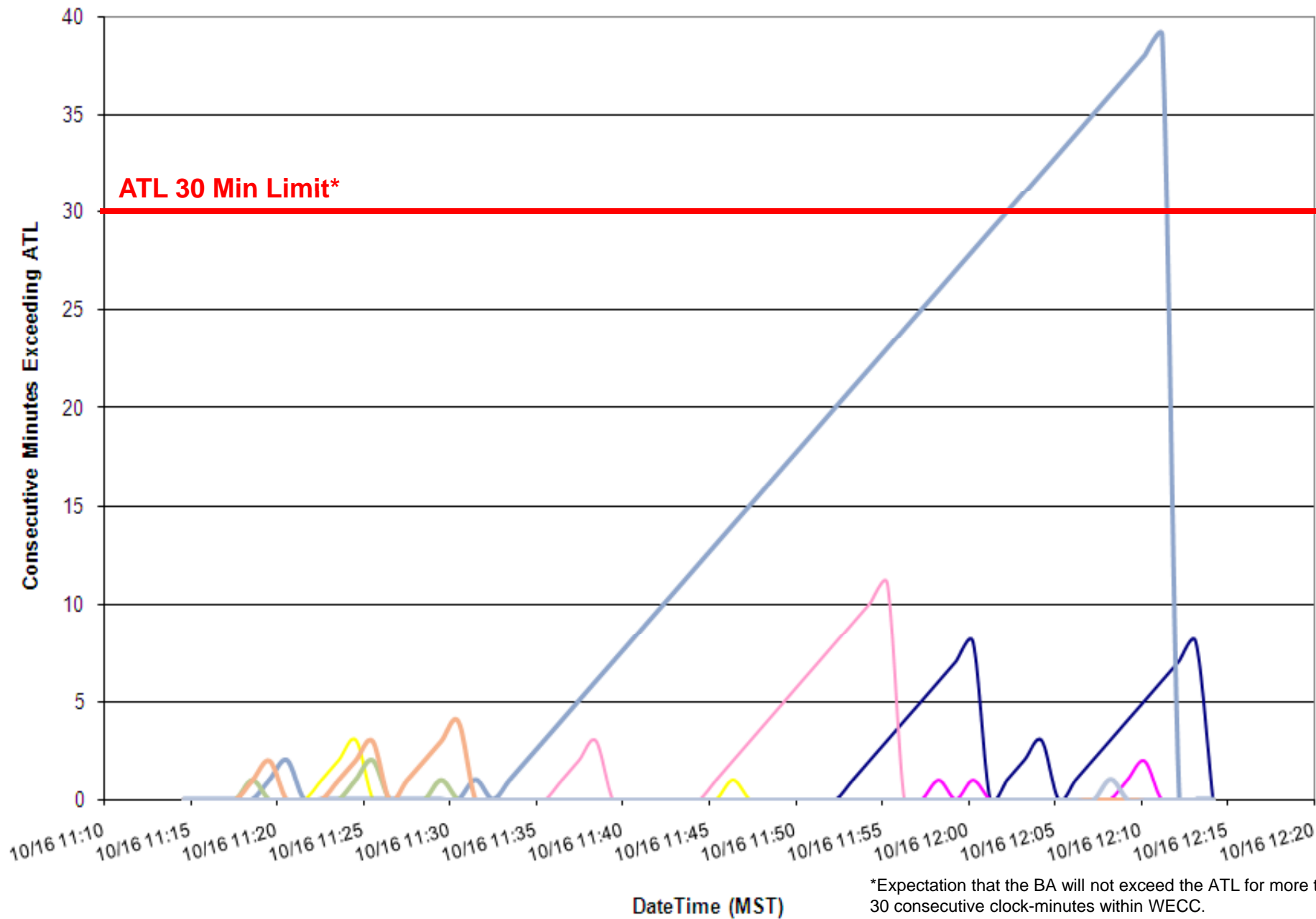


\*BAAL being exceeded for more than 30 consecutive clock-minutes would be a violation under the proposed standard.

10/16/2010 11:50 PDT

1 minute duration above FTL<sub>High</sub>

### Consecutive Minutes Exceeding ATL

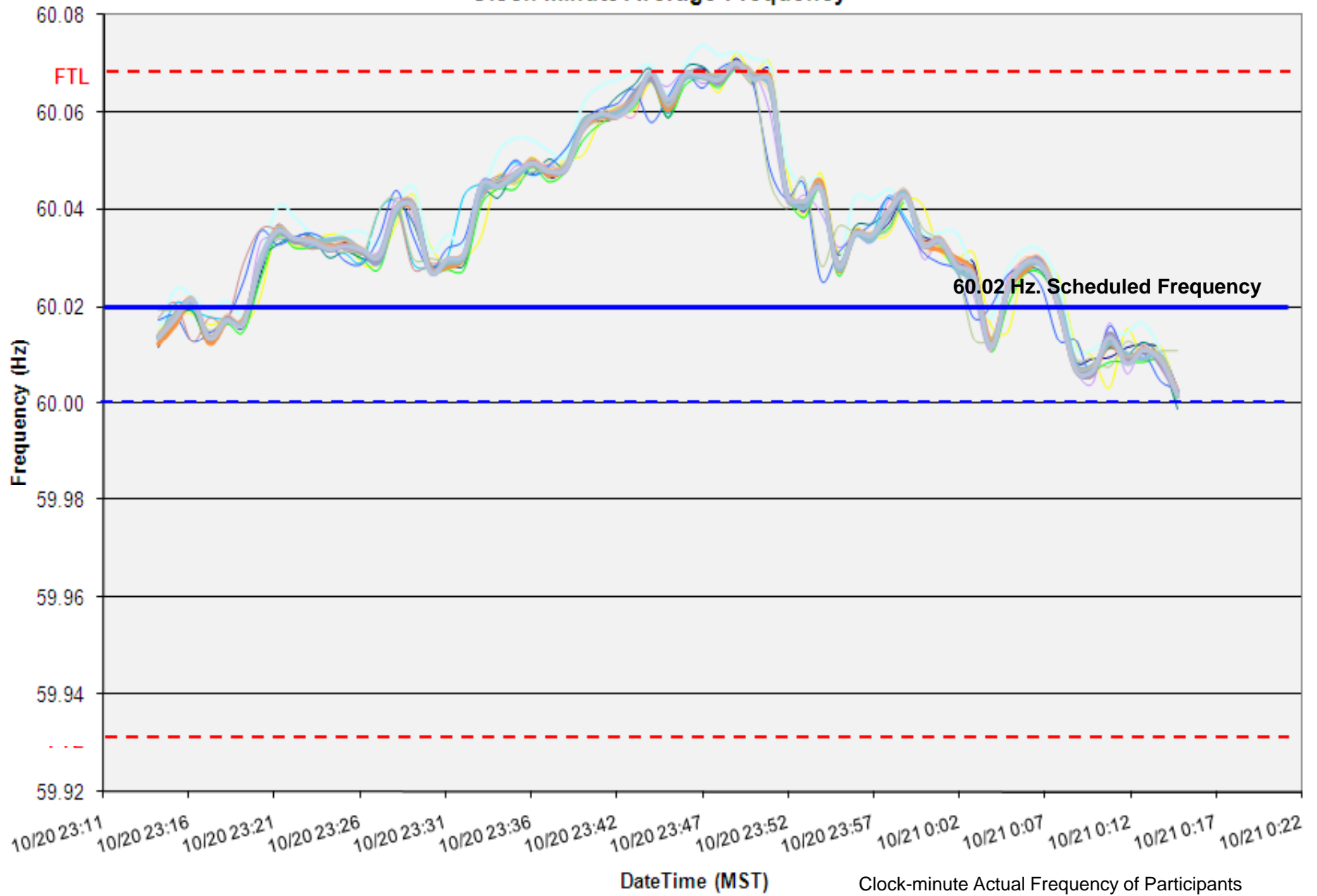


\*Expectation that the BA will not exceed the ATL for more than 30 consecutive clock-minutes within WECC.

10/20/2010 ending 23:49 PDT

2 minute duration above  $FTL_{High}$

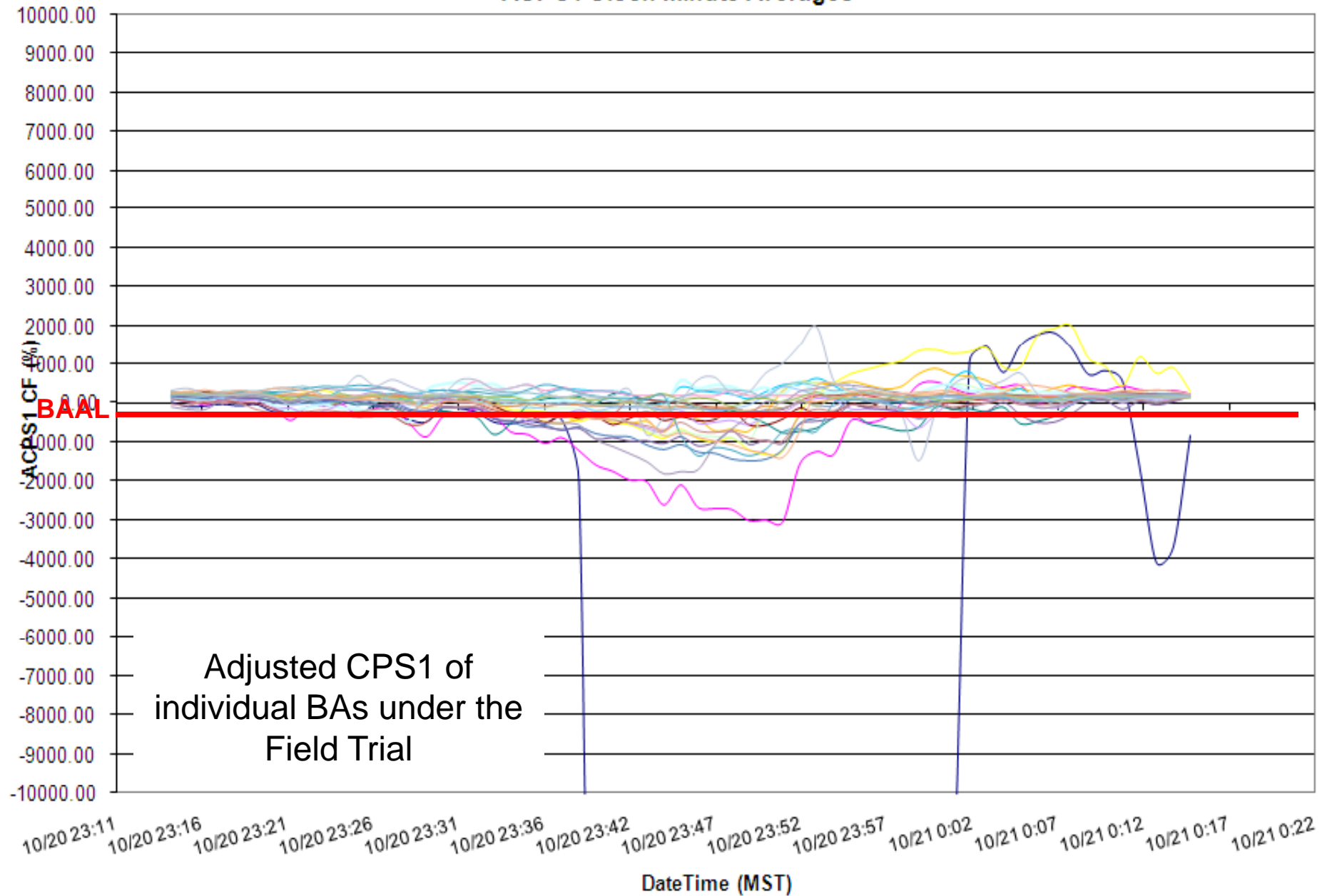
### Clock-Minute Average Frequency



10/20/2010 ending 23:49 PDT

2 minute duration above  $FTL_{High}$

### ACPS1 Clock-Minute Averages

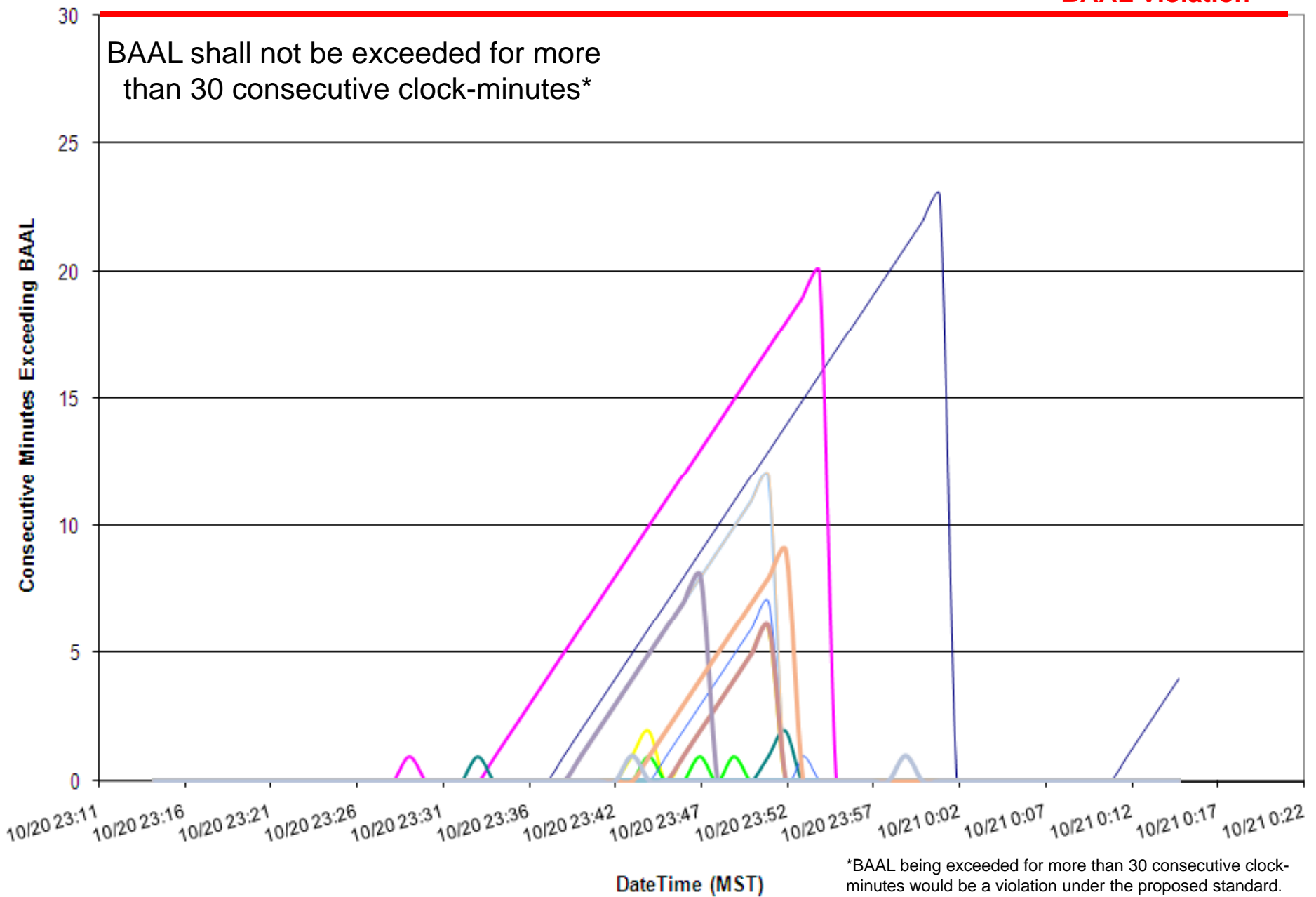


10/20/2010 ending 23:49 PDT

2 minute duration above  $FTL_{High}$

### Consecutive Minutes Exceeding BAAL

**BAAL Violation\***



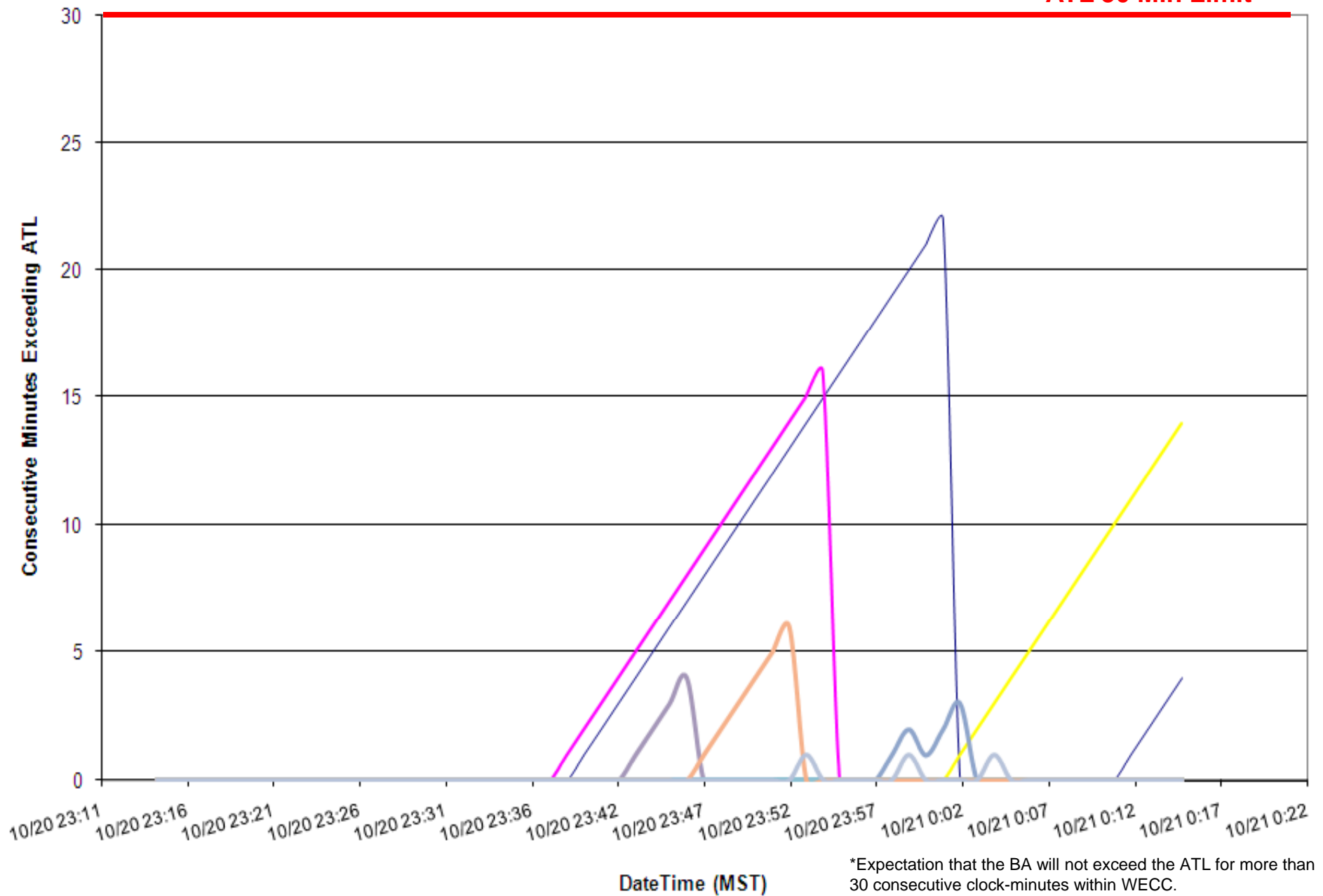
\*BAAL being exceeded for more than 30 consecutive clock-minutes would be a violation under the proposed standard.

10/20/2010 ending 23:49 PDT

2 minute duration above  $FTL_{High}$

### Consecutive Minutes Exceeding ATL

**ATL 30 Min Limit**

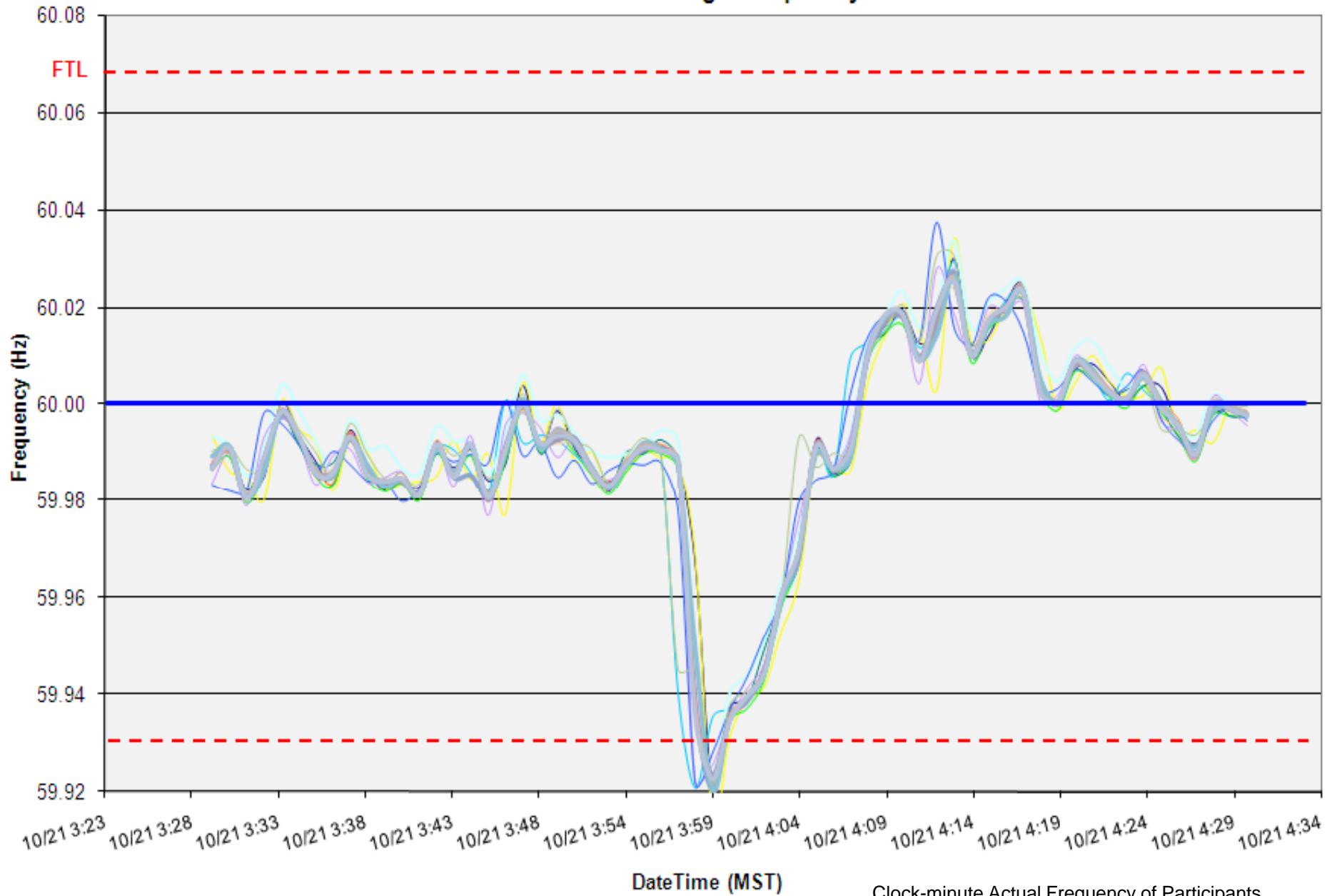


\*Expectation that the BA will not exceed the ATL for more than 30 consecutive clock-minutes within WECC.

10/21/2010 ending 3:59 PDT

1 minute duration below  $FTL_{Low}$

### Clock-Minute Average Frequency

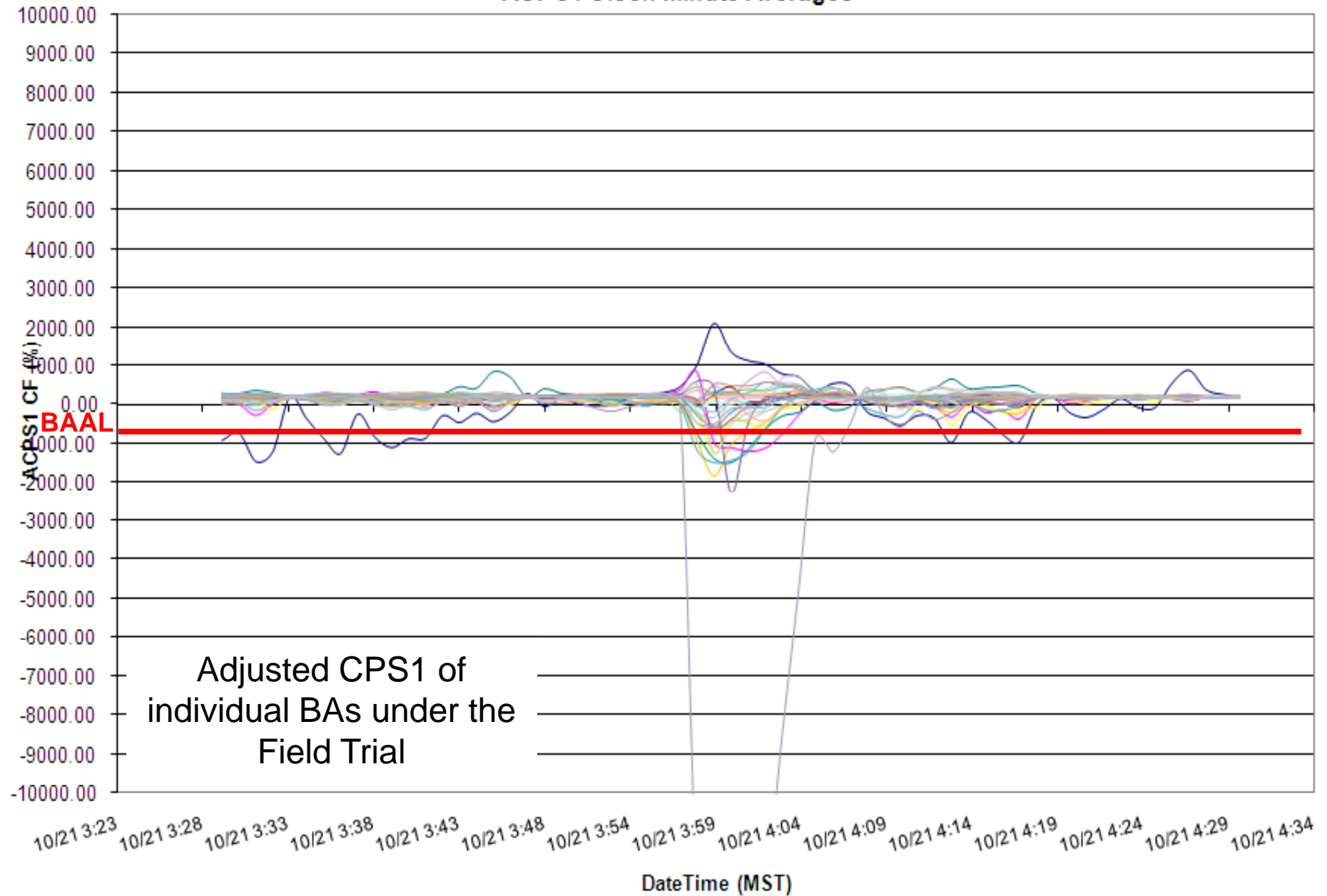


Clock-minute Actual Frequency of Participants

10/21/2010 ending 3:59 PDT

1 minute duration below  $FTL_{Low}$

### ACPS1 Clock-Minute Averages

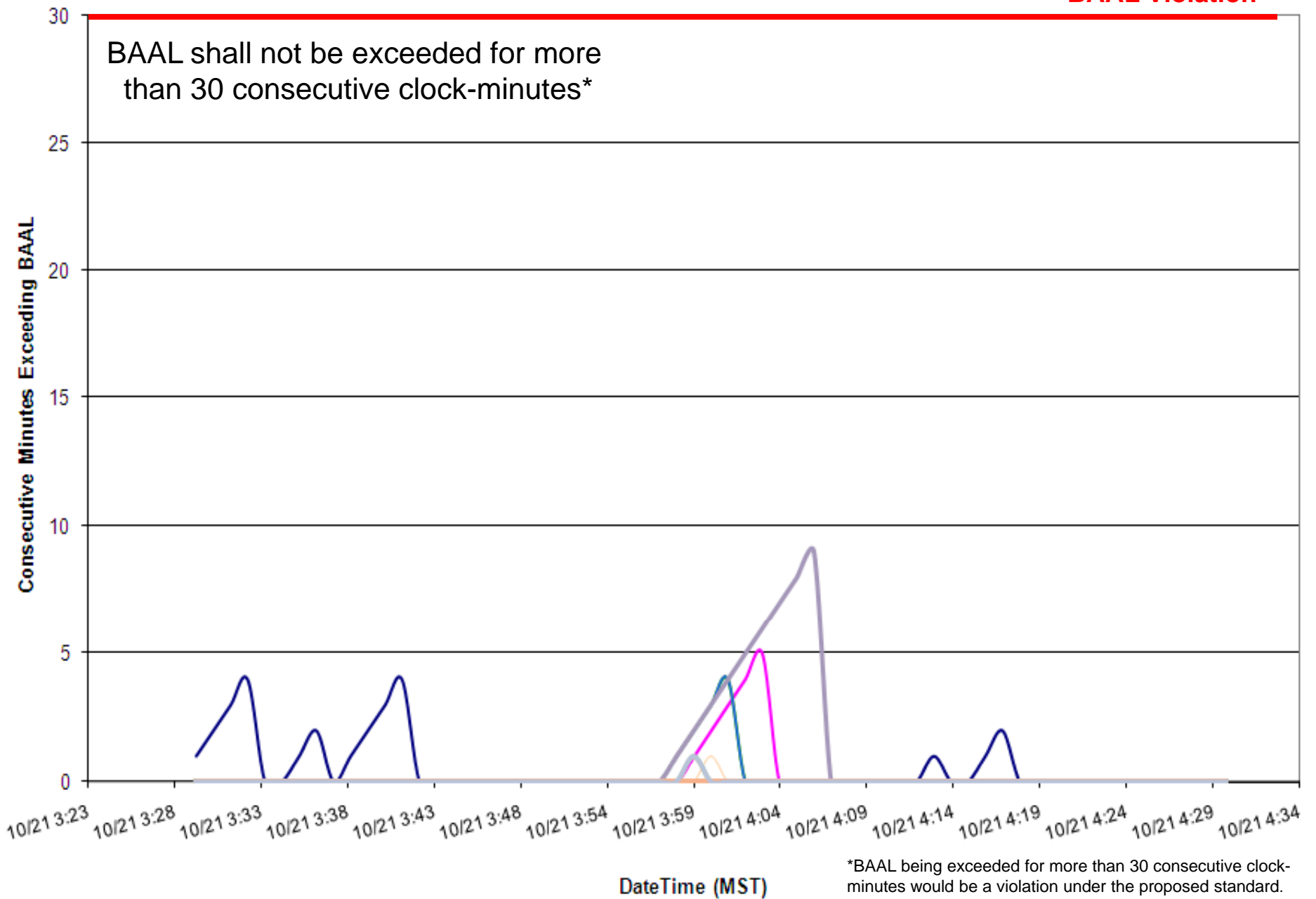


10/21/2010 ending 3:59 PDT

1 minute duration below  $FTL_{Low}$

### Consecutive Minutes Exceeding BAAL

**BAAL Violation\***

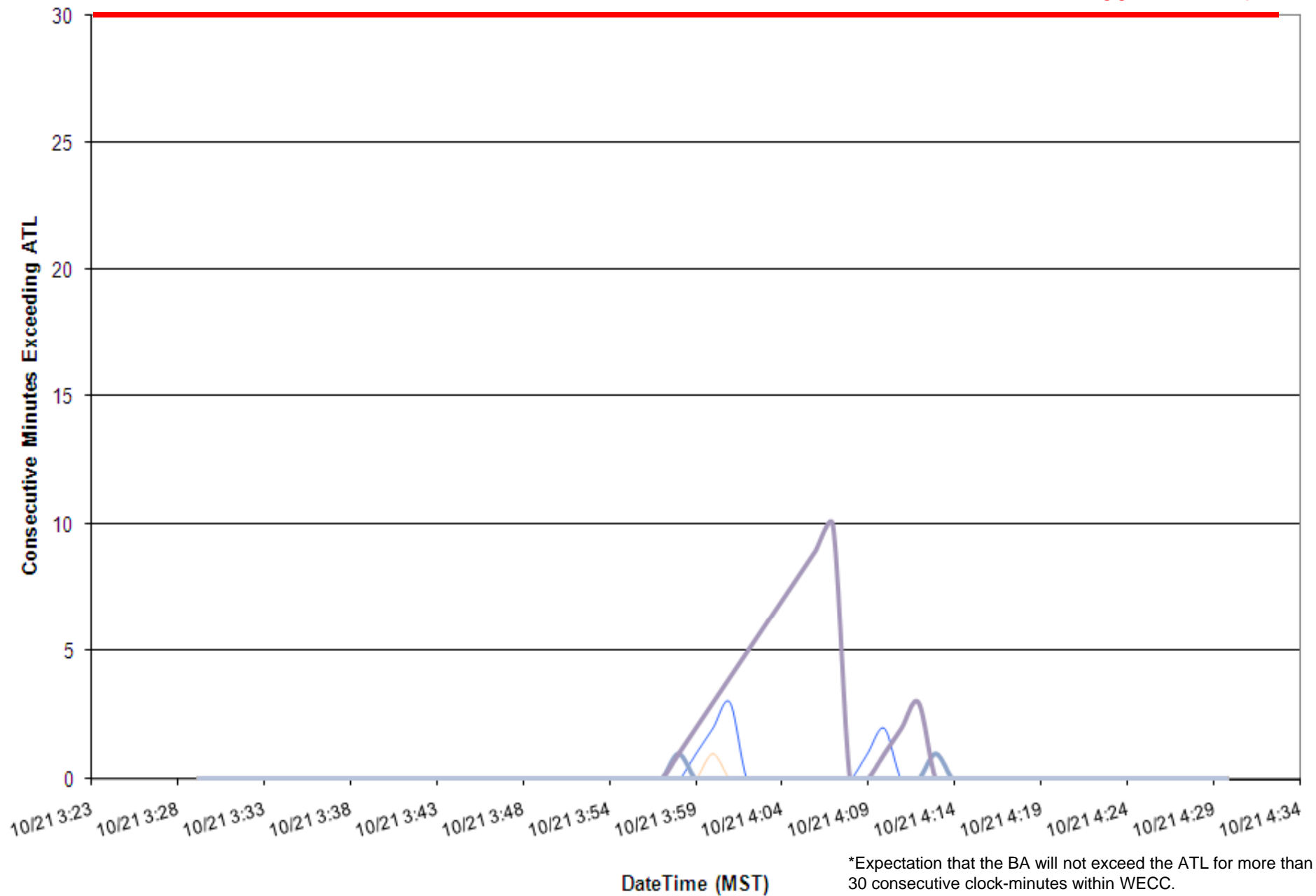


10/21/2010 ending 3:59 PDT

1 minute duration below  $FTL_{Low}$

### Consecutive Minutes Exceeding ATL

**ATL 30 Min Limit\***



\*Expectation that the BA will not exceed the ATL for more than 30 consecutive clock-minutes within WECC.

10/23/2010 ending 12:40 PDT

41-minute duration above  $ATL_{High}$

### Clock-Minute Average Frequency

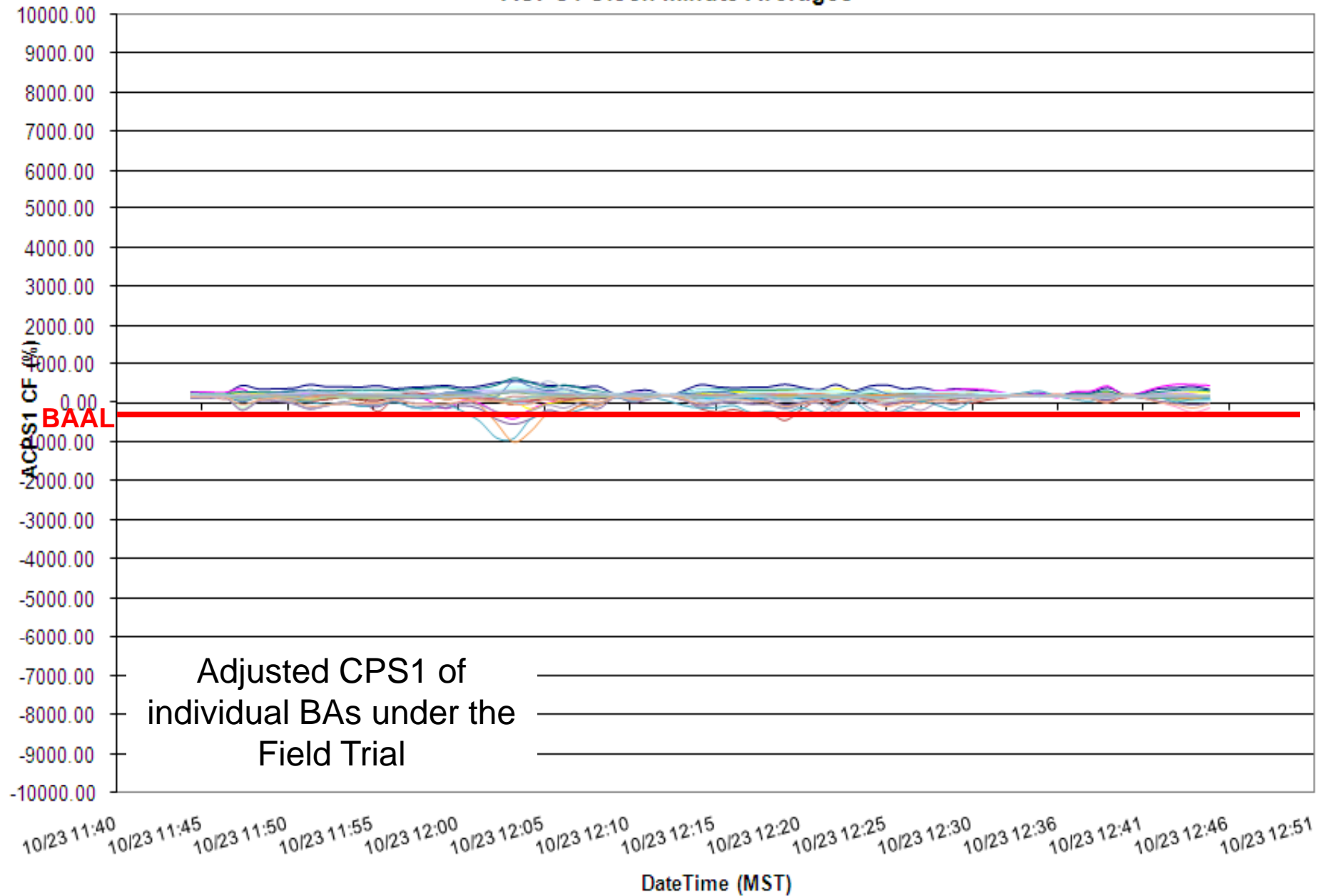


Clock-minute Actual Frequency of Participants

10/23/2010 ending 12:40 PDT

41-minute duration above ATL<sub>High</sub>

### ACPS1 Clock-Minute Averages

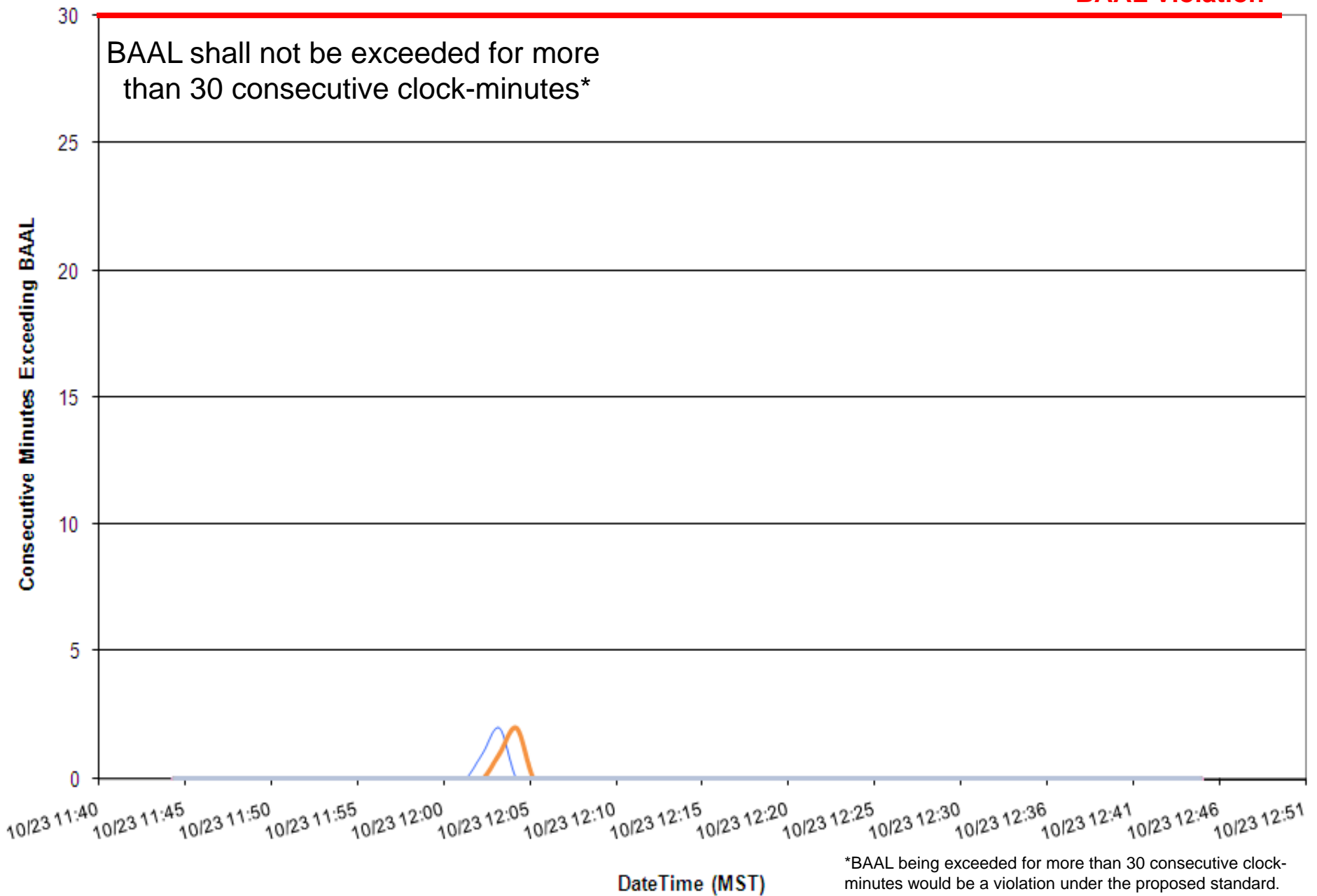


10/23/2010 ending 12:40 PDT

41-minute duration above  $ATL_{High}$

### Consecutive Minutes Exceeding BAAL

**BAAL Violation\***

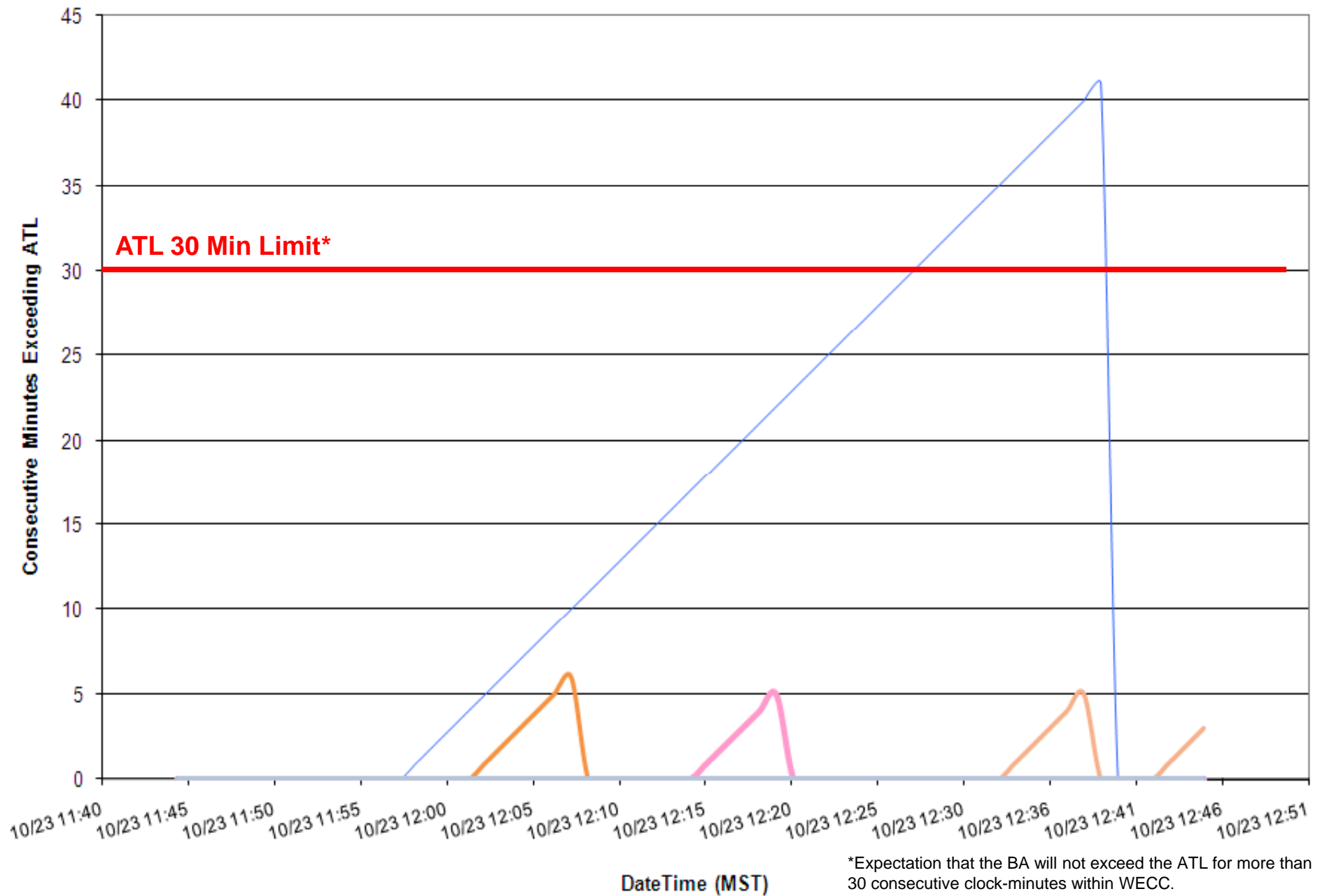


\*BAAL being exceeded for more than 30 consecutive clock-minutes would be a violation under the proposed standard.

10/23/2010 ending 12:40 PDT

41-minute duration above ATL<sub>High</sub>

### Consecutive Minutes Exceeding ATL

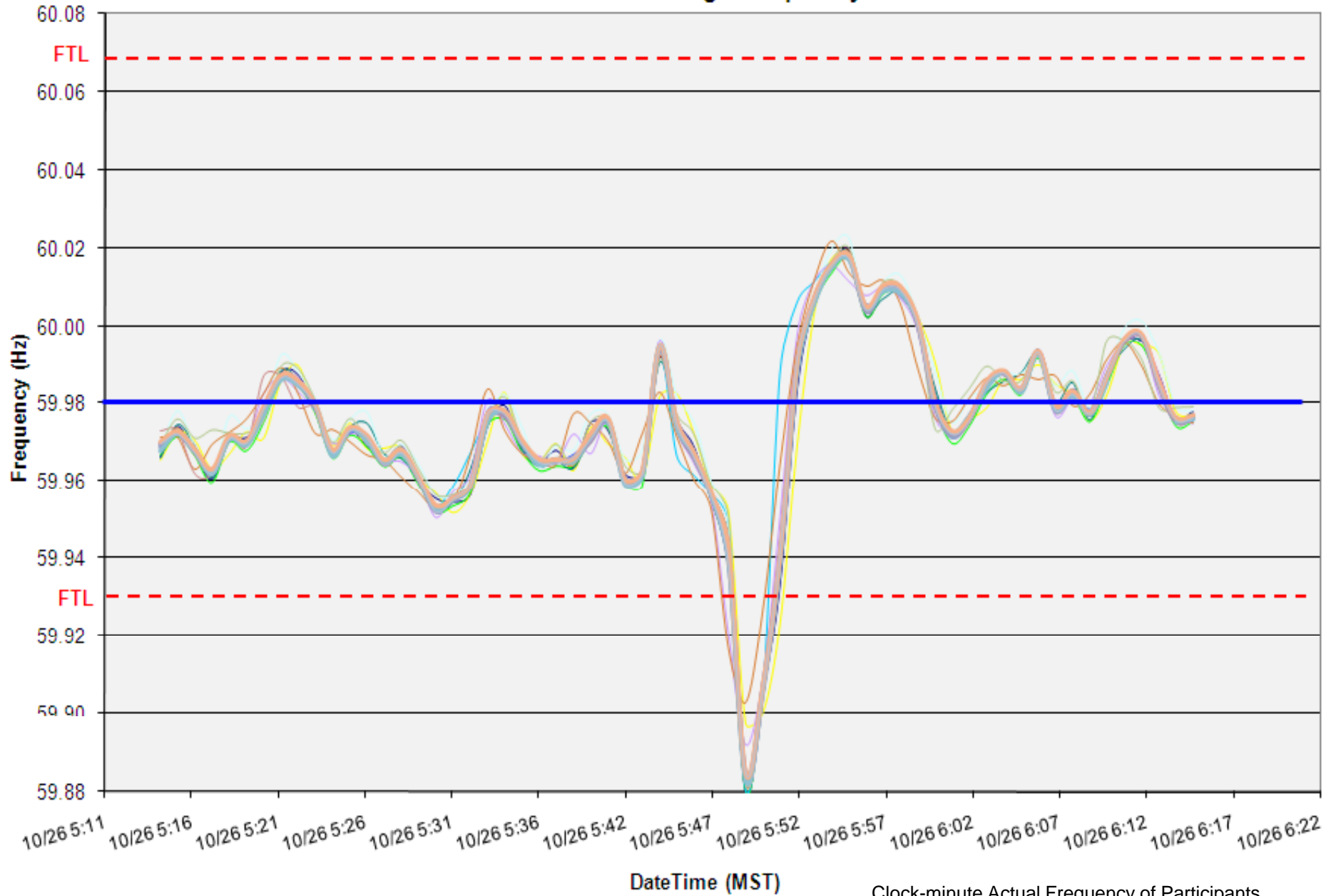


\*Expectation that the BA will not exceed the ATL for more than 30 consecutive clock-minutes within WECC.

10/26/2010 ending 5:50 PDT

2-minute duration below  $FTL_{Low}$

### Clock-Minute Average Frequency

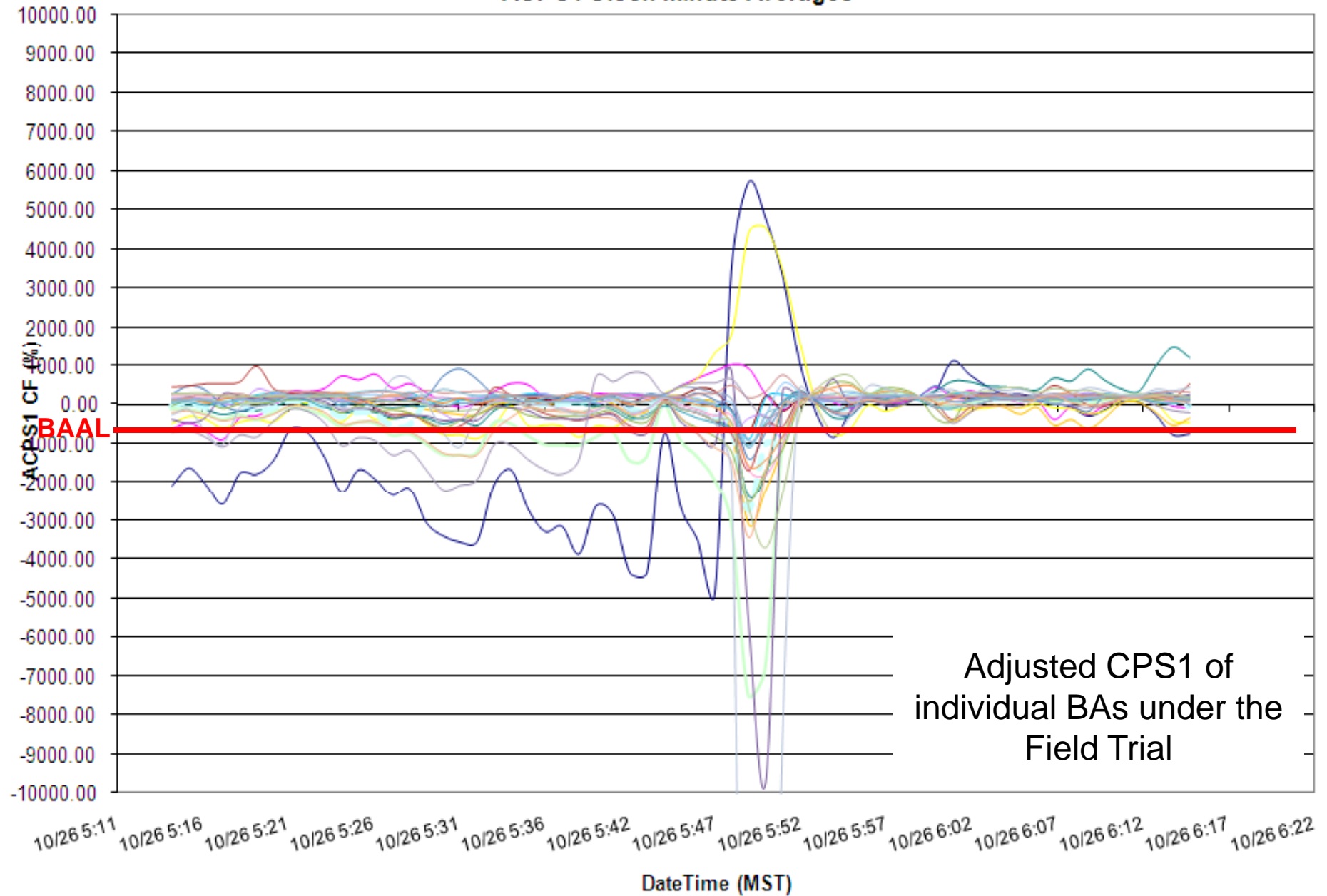


Clock-minute Actual Frequency of Participants

10/26/2010 ending 5:50 PDT

2-minute duration below  $FTL_{Low}$

### ACPS1 Clock-Minute Averages

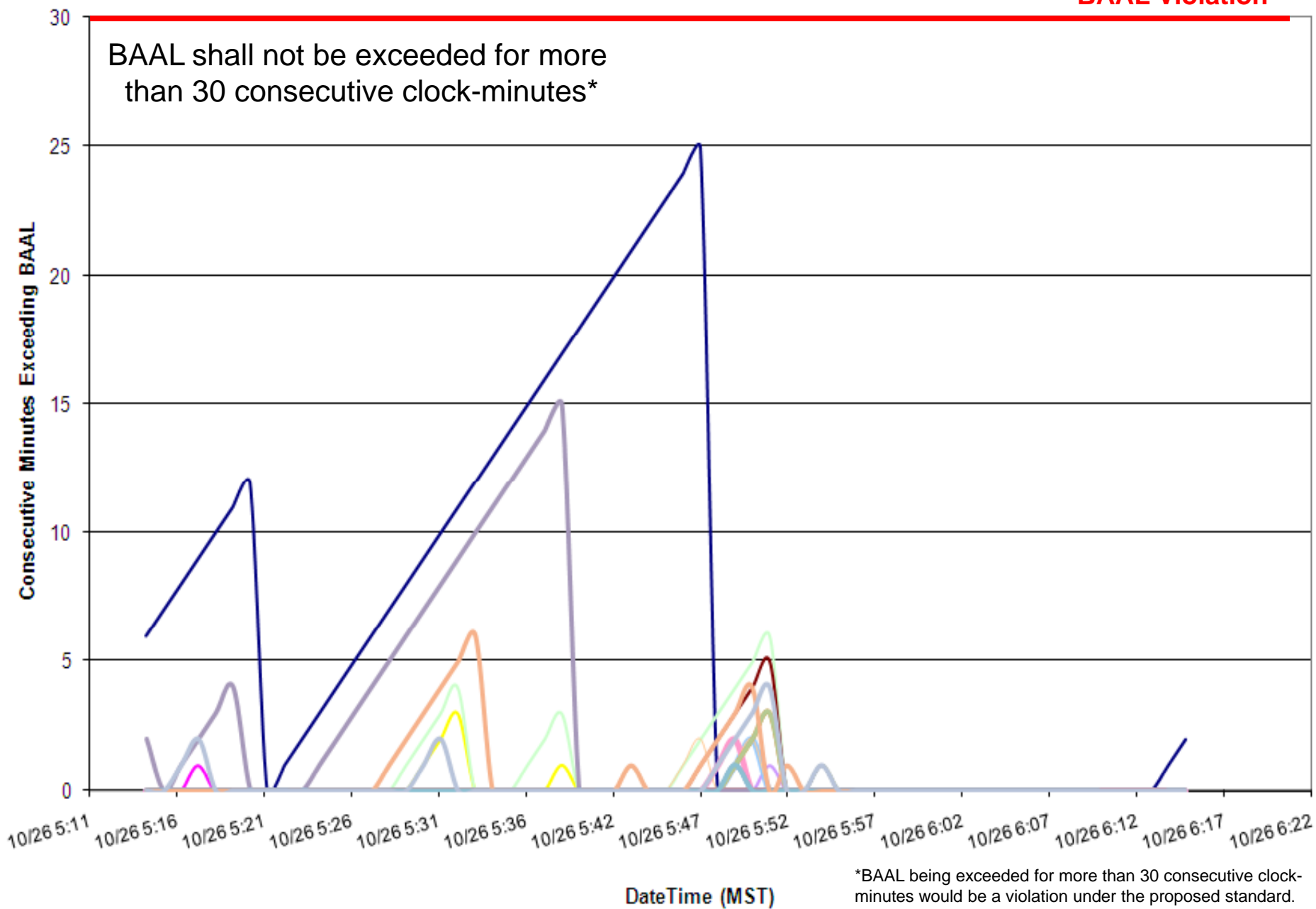


10/26/2010 ending 5:50 PDT

2-minute duration below  $FTL_{Low}$

### Consecutive Minutes Exceeding BAAL

**BAAL Violation\***

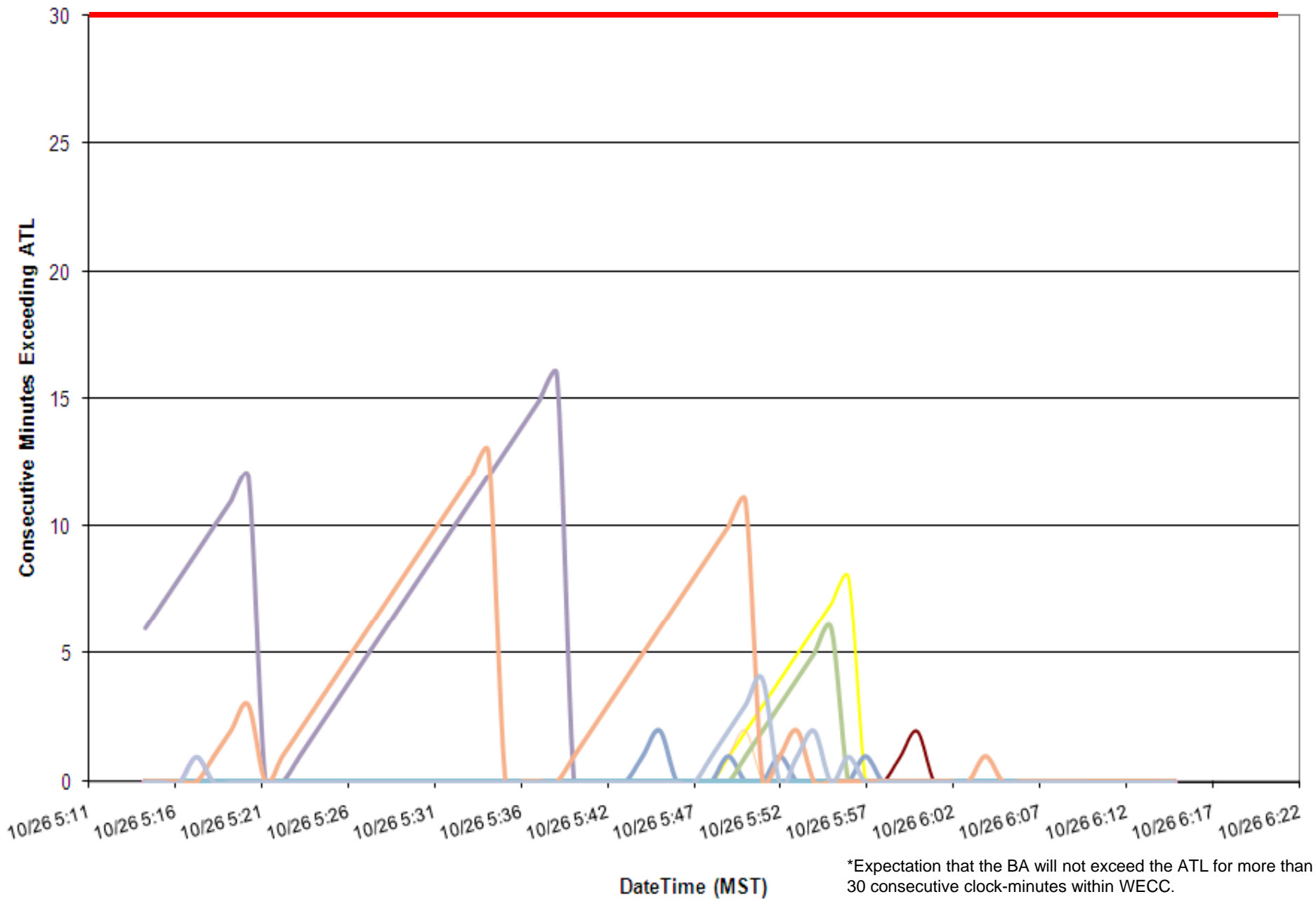


10/26/2010 ending 5:50 PDT

2-minute duration below  $FTL_{Low}$

### Consecutive Minutes Exceeding ATL

**ATL 30 Min Limit\***



\*Expectation that the BA will not exceed the ATL for more than 30 consecutive clock-minutes within WECC.

10/30/2010 ending 1:40 PDT

55-minute duration above ATL<sub>High</sub>

### Clock-Minute Average Frequency

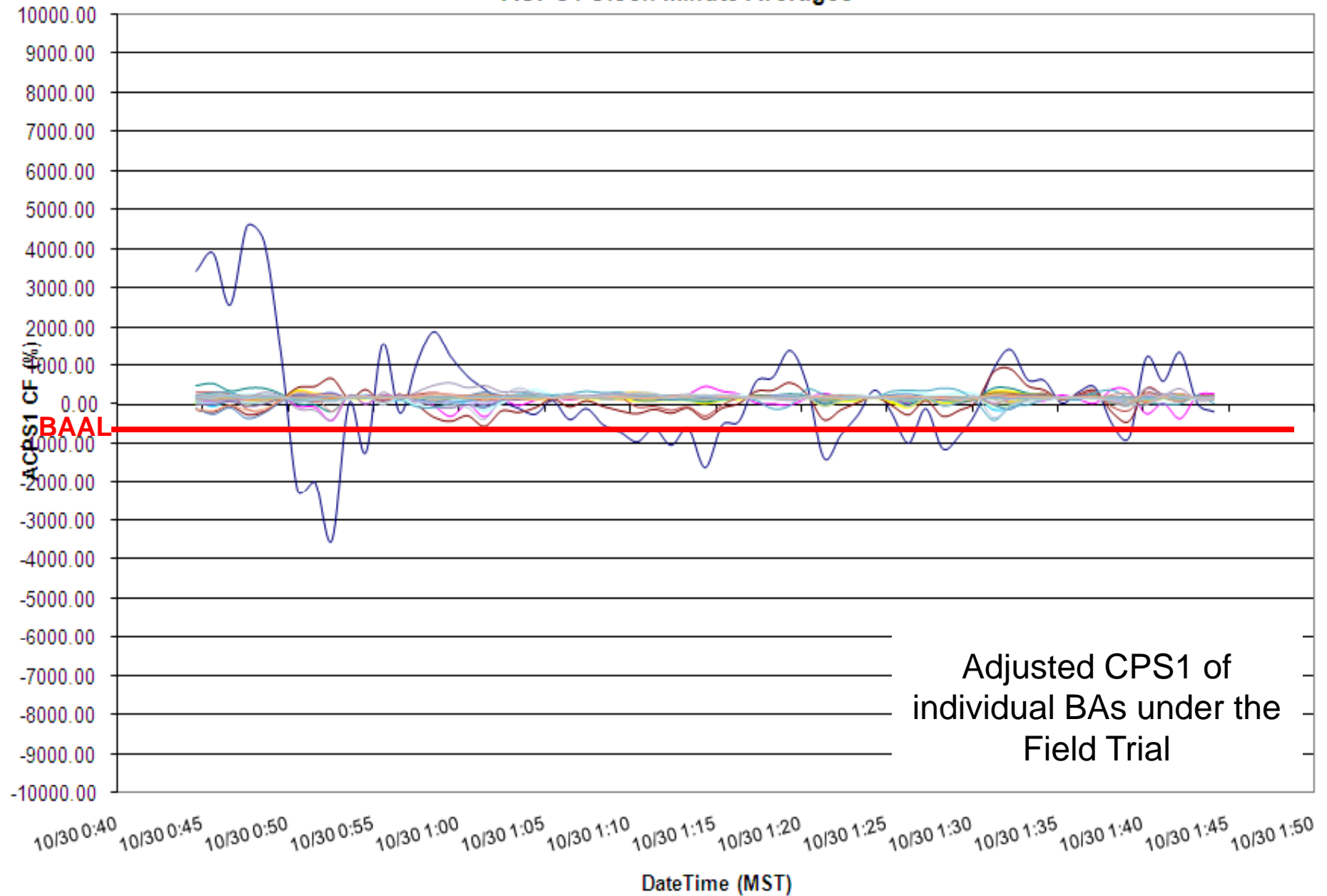


Clock-minute Actual Frequency of Participants

10/30/2010 ending 1:40 PDT

55-minute duration above ATL<sub>High</sub>

### ACPS1 Clock-Minute Averages



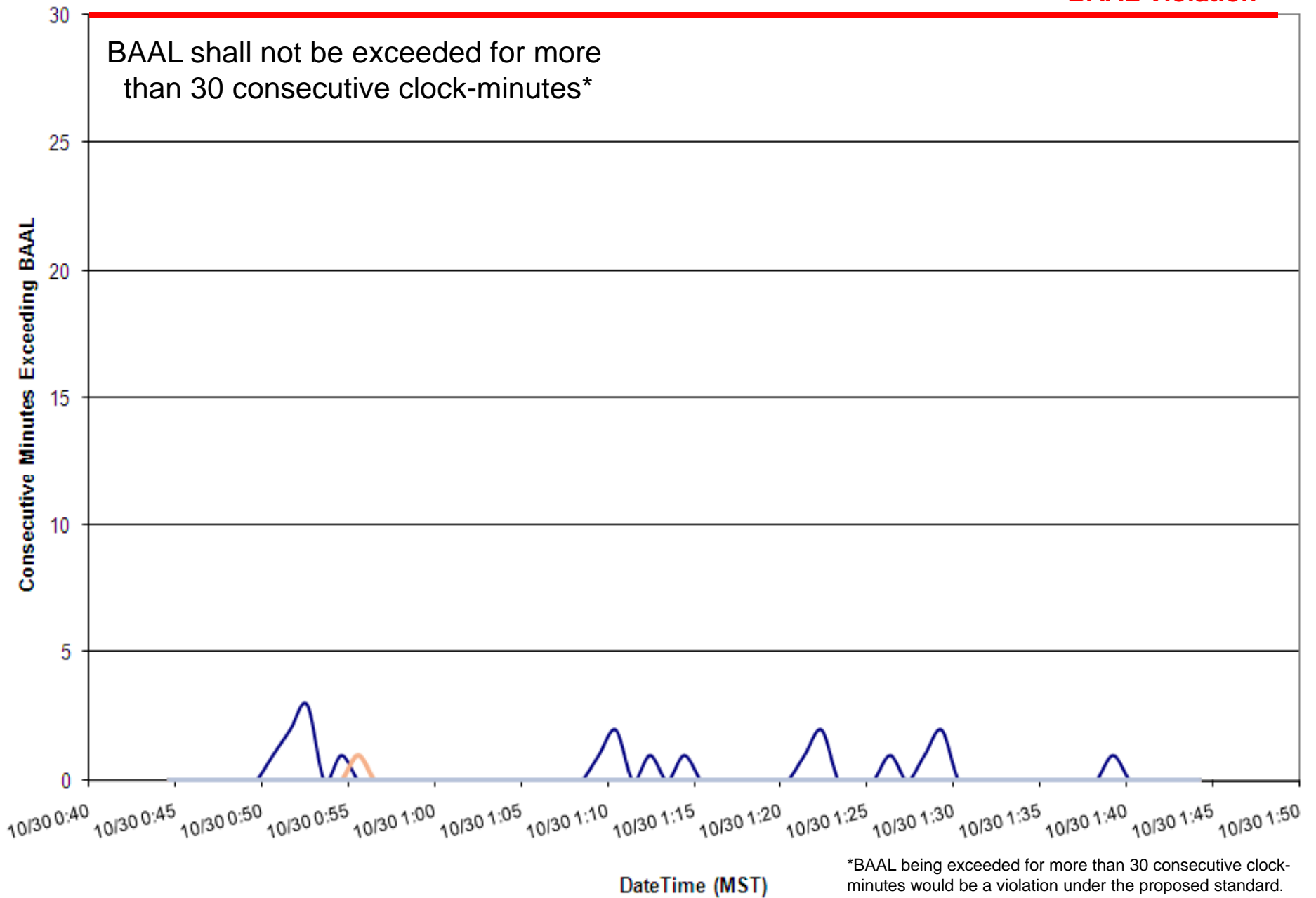
Adjusted CPS1 of individual BAs under the Field Trial

10/30/2010 ending 1:40 PDT

55-minute duration above ATL<sub>High</sub>

### Consecutive Minutes Exceeding BAAL

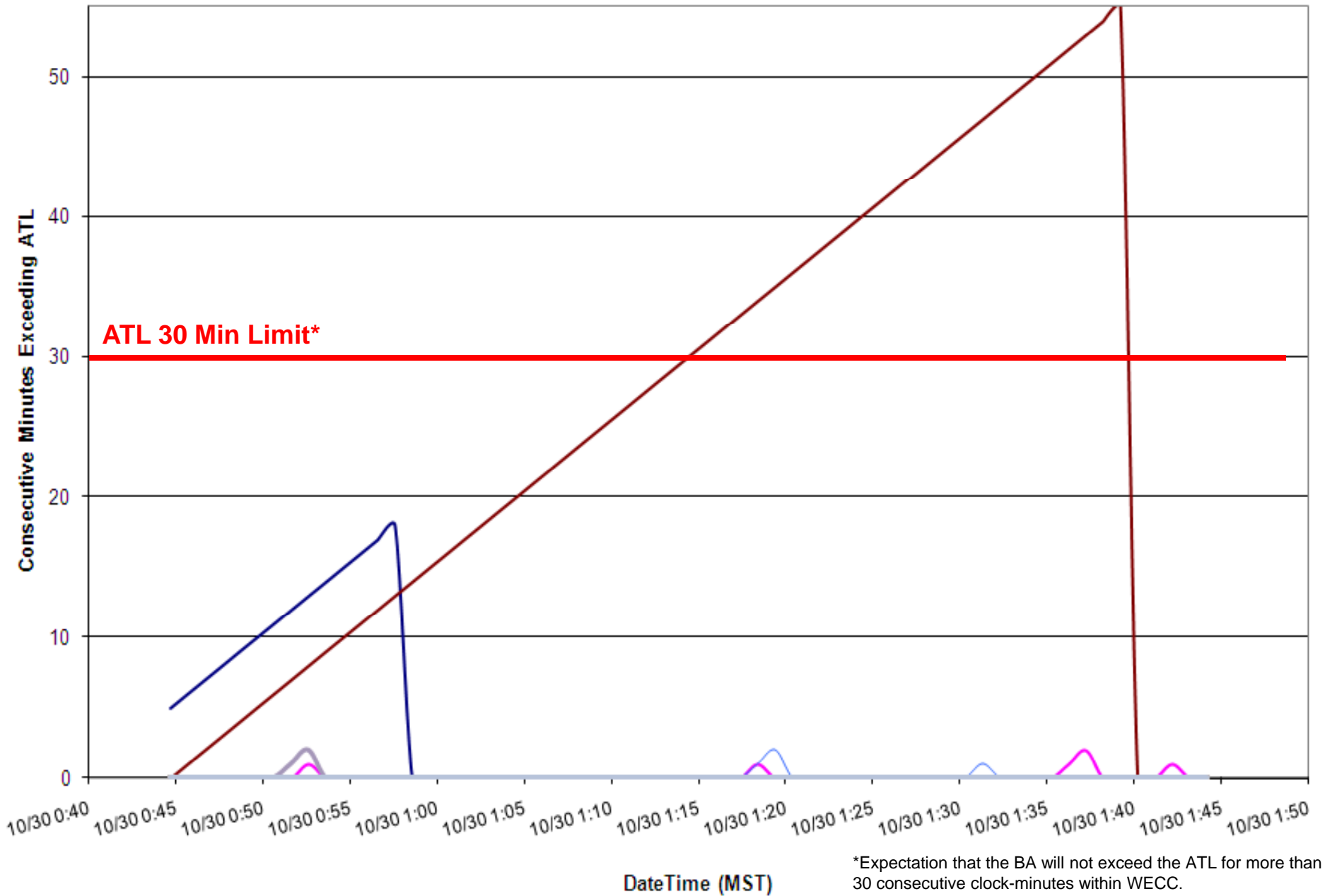
**BAAL Violation\***



10/30/2010 ending 1:40 PDT

55-minute duration above ATL<sub>High</sub>

### Consecutive Minutes Exceeding ATL



\*Expectation that the BA will not exceed the ATL for more than 30 consecutive clock-minutes within WECC.

# **Balancing Authority ACE Limit Proof-of-Concept Field Trial Project 2010-14**

## **Discussion**

Doug Hils

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