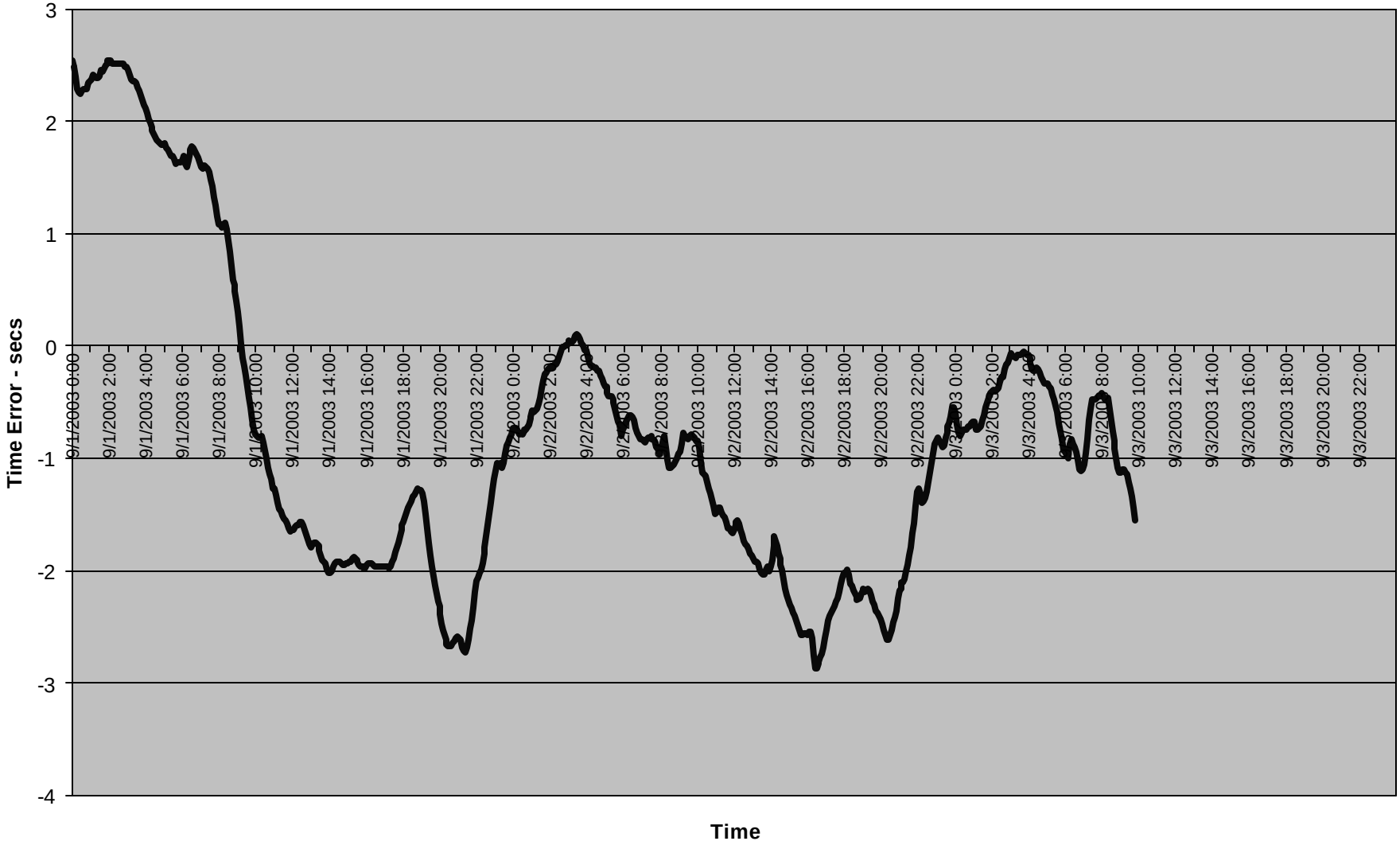
WECC AUTO TIME ERROR

Progress Report

September, 2003

How Are We Doing?

- Implemented on February 4, 2003
- Number of Manual TE Corrections Reduced
  - Expanded Time Error Correction Threshold
  - NERC wavier effective August 2003
- Inadvertent Balances Reduced
  - Most CA are managing their Primary Inadvertent
  - Some CA are not managing their Primary Inadvertent
    - Causes growth in all other CA Secondary Inadvertent
    - Computing Primary Inadvertent Balance incorrectly
    - Control problems with CPS2
    - Inaccurate time error equipment


WECC Time Error
Time Error - secs
3
2
1
0
-1
-2
-3
-4
9/1/2003 0:00
9/1/2003 2:00
9/1/2003 4:00
9/1/2003 6:00
9/1/2003 8:00
9/1/2003 10:00
9/1/2003 12:00
9/1/2003 14:00
9/1/2003 16:00
9/1/2003 18:00
9/1/2003 20:00
9/1/2003 22:00
9/2/2003 0:00
9/2/2003 2:00
9/2/2003 4:00
9/2/2003 6:00
9/2/2003 8:00
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9/3/2003 14:00
9/3/2003 16:00
9/3/2003 18:00
9/3/2003 20:00
9/3/2003 22:00
Time

Transition Experience

- Pre-Auto Time Error Inadvertent Balances frozen on February 4, 2003.
  - Bring balance to zero using bi-lateral inadvertent payback
  - Month-end adjustments assigned to either frozen balances or decomposed balances depending on what time the correction applies to.

ATE & Inadvertent Payback can be Defeated

- Requires 100% participation
  - One CA just recently implemented the vendor software
  - some generators not following ATE portion of ACE
    - CA & Affiliate renegotiated terms & conditions of dispatch instructions
- WECC TE limits were artificially tight

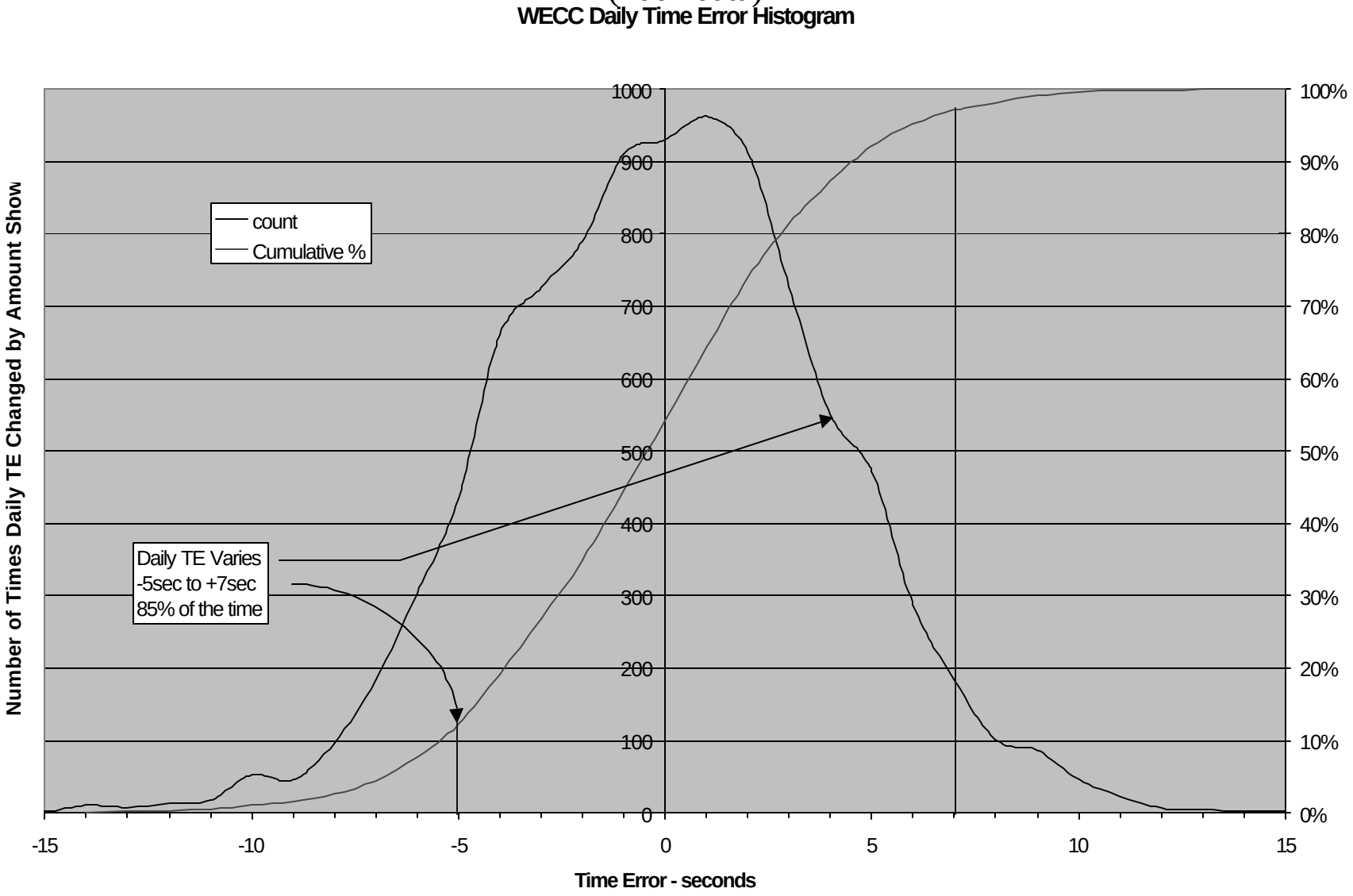
  ± 2 seconds represent only 40% of the natural TE bounds

  Natural rolling 24-hour TE bounds are ± 15 seconds

  And the average TE is about –0.9 second per day
    - This means that manual TE corrections are still necessary
- Some control is out of phase with current TE caused by H=3 hours, therefore causing more TE.

Natural WECC TE Swings

(2002 data)



Lessons Learned Beyond What We Knew Going In

(new analysis just coming to our attention)

- Hourly Σ (Inadvertent payback) =

  Σ Primary Inadvertent + Σ Secondary Inadvertent = 0.

  – But Σ Inadvertent Payback ≠ 0 when ATE correction limited 20% of frequency bias setting or L_{10}.

  – Means that WECC TE corrective action does not add to zero

  – Means that ATE correction term cannot be included in ACE for CPS performance reports

- This is a major concern among control areas

  – Control Areas express a strong desire to include correction term in ACE such that it can be included in CPS.

  – That means using unbounded ATE correction term that adds to zero across the WECC.

Recommendations

- Revise the primary inadvertent accounting and accumulation method.
  - Takes advantage of new research not known two years ago. [Time error studies by: Howard Illian]
- Use the unlimited primary inadvertent balance for the ATE correction term.
  - It becomes another schedule in ACE. Can be included in all CPS performance reports
  - All ATE payback (as primary inadvertent) plus all frequency bias obligation response (as secondary inadvertent) will add to zero in WECC
  - Still places obligation to correct TE and inadvertent on the control area that caused it in the first place.

Change the Hourly Primary Inadvertent to a Weekly Payback Method

- Uses exponential decay to reduce the on/off peak primary inadvertent to zero 168 hours later
  - Taking leap year & 6 NERC holidays into account
  - 94.16 on peak hours/week (94 h 9m 37s)
  - 73.84 off peak hours/week (73 h 50m 23s)
- Forgetting factors are:
  - $\gamma_{on} = 0.93851590$ $(\gamma^{94.16} = .25\%)$
  - $\gamma_{off} = 0.92206334$ $(\gamma^{73.84} = .25\%)$
- The slower corrective action means value of ATE term well within control area hourly regulation capability

What Accounting Changes Look Like

(On-peak)

Change the ATE correction term to an Interconnection-wide zero sum value

$$II_{primary@h-1} / [(1 - Y) * H]$$

- $Y = \beta / B_{wecc}$
- H = correction time period in hours = 1 hour
- $II_{primary@h-1} = [II_{primary\ @h-2}] * \gamma_{on}$

  $+ [(1-Y) * (II_{actual\ @h-2} - BII - \beta * \Delta TE_{@h-2}/6)] * [1 - \gamma_{on}]$
- No limit on the hourly value of the correction term

Convert to weekly correction of accumulated hourly primary inadvertent

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- $Y = \beta / B_{wecc}$
- H = correction time period in hours = 1 hour
- $II_{primary@h-1} = [II_{primary\ @h-2}] * \gamma_{off}$

  $+ [(1-Y) * (II_{actual\ @h-2} - BII - \beta * \Delta TE_{@h-2}/6)] * [1 - \gamma_{off}]$
- No limit on the hourly value of the correction term

Convert to weekly correction of accumulated hourly primary inadvertent

PWG needs to run some Simulations

- Need all CA hourly Inadvertent for Jan.2003
  - See if on/off peak paybacks will truly manage TE
  - See if on/off peak paybacks can tolerate non-participation
- Change Manual Time Error Correction Thresholds
  - When TE exceeds 85% of the normal weekly variations
  - About - 5 seconds to + 7 seconds
- Do Not Over-Drive the Manual TE Correction
  - Instead of ±0.020 hertz,
  - Use smaller increments tied to manual TE correction onset
  - Step sizes may be in increments of ±0.001 hertz