KENTUCKY

BELLSOUTH'S

SELF-EFFECTUATING ENFORCEMENT MECHANISM

SEEM

Fee Schedule

TABLE-1: LIQUIDATED DAMAGES TABLE FOR TIER-1 MEASURES

PER AFFECTED ITEM						
	Month 1	Month 2	Month3	Month4	Month 5	Month 6
Pre-Ordering	$20	$30	$40	$50	$60	$70
Ordering	$40	$50	$60	$70	$80	$90
Provisioning	$100	$125	$175	$250	$325	$500
Provisioning UNE (Coordinated Customer Conversions)	$400	$450	$500	$550	$650	$800
Maintenance and Repair	$100	$125	$175	$250	$325	$500
Maintenance and Repair UNE	$400	$450	$500	$550	$650	$800
LNP	$150	$250	$500	$600	$700	$800
Billing	$1.00	$1.00	$1.00	$1.00	$1.00	$1.00
IC Trunks	$100	$125	$175	$250	$325	$500
Collocation	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000

TABLE-2: REMEDY PAYMENTS FOR TIER-2 MEASURES

	Per Affected Item
OSS Pre-Ordering	$20
Ordering	$60
Provisioning	$300
Provisioning-UNE (Coordinated Customer Conversions)	$875
Maintenance and Repair	$300
Maintenance and Repair-UNE	$875
Billing	$1.00
LNP	$500
IC Trunks	$500
Collocation	$15,000
Change Management	$1,000

SEEM Sub-Metrics

SEEM TIER-1 SUB-METRICS

1. Loop Makeup – Response Time – Manual
2. Loop Makeup – Response Time – Electronic
3. Acknowledgement Message Timeliness
4. Acknowledgement Message Completeness
5. Percent Flow-Through Service Requests (Detail)
6. Reject Interval
7. Firm Order Confirmation Timeliness
8. Firm Order Confirmation and Reject Response Completeness – Fully Mechanized
9. Percent Missed Installation Appointments – Resale POTS
10. Percent Missed Installation Appointments – Resale Design
11. Percent Missed Installation Appointments – UNE Loop and Port Combinations
12. Percent Missed Installation Appointments – UNE Loops
13. Percent Missed Installation Appointments – UNE xDSL
14. Percent Missed Installation Appointments – UNE Line Sharing
15. Percent Missed Installation Appointments – Local IC Trunks
16. Average Completion Interval – Resale POTS
17. Average Completion Interval – Resale Design
18. Average Completion Interval – UNE Loop and Port Combinations
19. Average Completion Interval – UNE Loops
20. Average Completion Interval – UNE xDSL
21. Average Completion Interval – UNE Line Sharing
22. Average Completion Interval – Local IC Trunks
23. Coordinated Customer Conversions Interval – Unbundled Loops
24. Coordinated Customer Conversions – Hot Cut Timeliness % within interval - UNE Loops
25. Coordinated Customer Conversions – % Provisioning Troubles Received within 7 days of a completed service order – UNE Loops
26. Cooperative Acceptance Testing - % of xDSL Loops Tested
27. % Provisioning Troubles within 30 days of Service Order Completion – Resale POTS
28. % Provisioning Troubles within 30 days of Service Order Completion – Resale Design
29. % Provisioning Troubles within 30 days of Service Order Completion – UNE Loop and Port Combinations
30. % Provisioning Troubles within 30 days of Service Order Completion – UNE Loops
31. % Provisioning Troubles within 30 days of Service Order Completion – UNE xDSL
32. % Provisioning Troubles within 30 days of Service Order Completion – UNE Line Sharing

SEEM TIER-1 SUB-METRICS
CONTINUED

33. % Provisioning Troubles within 30 days of Service Order Completion – Local IC Trunks
34. LNP – Percent Missed Installation Appointments – LNP
35. Missed Repair Appointments – Resale POTS
36. Missed Repair Appointments – Resale Design
37. Missed Repair Appointments – UNE Loop and Port Combinations
38. Missed Repair Appointments – UNE Loops
39. Missed Repair Appointments – UNE xDSL
40. Missed Repair Appointments – UNE Line Sharing
41. Missed Repair Appointments – Local IC Trunks
42. Customer Trouble Report Rate – Resale POTS
43. Customer Trouble Report Rate – Resale Design
44. Customer Trouble Report Rate – UNE Loop and Port Combinations
45. Customer Trouble Report Rate – UNE Loops
46. Customer Trouble Report Rate – UNE xDSL
47. Customer Trouble Report Rate – UNE Line Sharing
48. Customer Trouble Report Rate – Local IC Trunks
49. Maintenance Average Duration – Resale POTS
50. Maintenance Average Duration – Resale Design
51. Maintenance Average Duration – UNE Loop and Port Combinations
52. Maintenance Average Duration – UNE Loops
53. Maintenance Average Duration – UNE xDSL
54. Maintenance Average Duration – UNE Line Sharing
55. Maintenance Average Duration – Local IC Trunks
56. % Repeat Troubles within 30 days – Resale POTS
57. % Repeat Troubles within 30 days – Resale Design
58. % Repeat Troubles within 30 days – UNE Loop and Port Combinations
59. % Repeat Troubles within 30 days – UNE Loops
60. % Repeat Troubles within 30 days – UNE xDSL
61. % Repeat Troubles within 30 days – UNE Line Sharing
62. % Repeat Troubles within 30 days – Local IC Trunks
63. Invoice Accuracy
64. Mean Time to Deliver Invoices
65. Usage Data Delivery Accuracy
66. Trunk Group Performance – CLEC Specific
67. Collocation Percent of Due Dates Missed

SEEM TIER-2 SUB-METRICS

1. Average Response Time – Pre-Ordering/Ordering
2. Interface Availability – Pre-Ordering/Ordering
3. Interface Availability – Maintenance & Repair
4. Loop Makeup – Response Time – Manual
5. Loop Makeup – Response Time – Electronic
6. Acknowledgement Message Timeliness – EDI
7. Acknowledgement Message Timeliness – TAG
8. Acknowledgement Message Completeness EDI
9. Acknowledgement Message Completeness TAG
10. Percent Flow-through Service Requests (Summary)
11. Reject Interval
12. Firm Order Confirmation Timeliness
13. Firm Order Confirmation and Reject Response Completeness – Fully Mechanized
14. Percent Missed Installation Appointments – Resale POTS
15. Percent Missed Installation Appointments – Resale Design
16. Percent Missed Installation Appointments – UNE Loop and Port Combinations
17. Percent Missed Installation Appointments – UNE Loops
18. Percent Missed Installation Appointments – UNE xDSL
19. Percent Missed Installation Appointments – UNE Line Sharing
20. Percent Missed Installation Appointments – Local IC Trunks
21. Average Completion Interval – Resale POTS
22. Average Completion Interval – Resale Design
23. Average Completion Interval – UNE Loop and Port Combinations
24. Average Completion Interval – UNE Loops
25. Average Completion Interval – UNE xDSL
26. Average Completion Interval – UNE Line Sharing
27. Average Completion Interval – Local IC Trunks
28. Coordinated Customer Conversions Interval – Unbundled Loops
29. Coordinated Customer Conversions – Hot Cut Timeliness % within interval - UNE Loops
30. Coordinated Customer Conversions – % Provisioning Troubles Received within 7 days of a completed service order – UNE Loops
31. Cooperative Acceptance Testing - % xDSL Loops Tested
32. % Provisioning Troubles within 30 days of Service Order Completion – Resale POTS
33. % Provisioning Troubles within 30 days of Service Order Completion – Resale Design
34. % Provisioning Troubles within 30 days of Service Order Completion – UNE Loop and Port Combinations
35. % Provisioning Troubles within 30 days of Service Order Completion – UNE Loops

SEEM TIER-2 SUB-METRICS
CONTINUED

36. % Provisioning Troubles within 30 days of Service Order Completion – UNE xDSL
37. Provisioning Troubles within 30 days of Service Order Completion – UNE Line Sharing
38. % Provisioning Troubles within 30 days of Service Order Completion – Local IC Trunks
39. LNP – Percent Missed Installation Appointments
40. Missed Repair Appointments – Resale POTS
41. Missed Repair Appointments – Resale Design
42. Missed Repair Appointments – UNE Loop and Port Combinations
43. Missed Repair Appointments – UNE Loops
44. Missed Repair Appointments – UNE xDSL
45. Missed Repair Appointments – UNE Line Sharing
46. Missed Repair Appointments – Local IC Trunks
47. Customer Trouble Report Rate – Resale POTS
48. Customer Trouble Report Rate – Resale Design
49. Customer Trouble Report Rate – UNE Loop and Port Combinations
50. Customer Trouble Report Rate – UNE Loops
51. Customer Trouble Report Rate – UNE xDSL
52. Customer Trouble Report Rate – UNE Line Sharing
53. Customer Trouble Report Rate – Local IC Trunks
54. Maintenance Average Duration – Resale POTS
55. Maintenance Average Duration – Resale Design
56. Maintenance Average Duration – UNE Loop and Port Combinations
57. Maintenance Average Duration – UNE Loops
58. Maintenance Average Duration – UNE xDSL
59. Maintenance Average Duration – UNE Line Sharing
60. Maintenance Average Duration – Local IC Trunks
61. % Repeat Troubles within 30 days – Resale POTS
62. % Repeat Troubles within 30 days – Resale Design
63. % Repeat Troubles within 30 days – UNE Loop and Port Combinations
64. % Repeat Troubles within 30 days – UNE Loops
65. % Repeat Troubles within 30 days – UNE xDSL
66. % Repeat Troubles within 30 days – UNE Line Sharing
67. Repeat Troubles within 30 days – Local IC Trunks
68. Invoice Accuracy
69. Mean Time to Deliver Invoices
70. Usage Data Delivery Accuracy

SEEM TIER-2 SUB-METRICS
CONTINUED

71. Trunk Group Performance – Aggregate
72. Collocation Percent of Due Dates Missed
73. Timeliness of Change Management Notices
74. Timeliness of Documents Associated with Change

SEEM TIER-3 SUB-METRICS

1. Percent Missed Installation Appointments - Resale POTS
2. Percent Missed Installation Appointments - Resale Design
3. Percent Missed Installation Appointments - UNE Loop
4. Percent Missed Installation Appointments - UNE Loop & Port Combo
5. Percent Missed Installation Appointments - UNE xDSL (ADSL, HDSL, UCL)
6. Percent Missed Installation Appointments - UNE Line Sharing
7. Percent Missed Installation Appointments - Interconnection Trunks
8. Average Completion Interval (OCI) & Order Completion Interval Distribution – Resale POTS
9. Average Completion Interval (OCI) & Order Completion Interval Distribution - Resale Design
10. Average Completion Interval (OCI) & Order Completion Interval Distribution – UNE Loop & Port Combo
11. Average Completion Interval (OCI) & Order Completion Interval Distribution – UNE xDSL (ADSL, HDSL, UCL)
12. Average Completion Interval (OCI) & Order Completion Interval Distribution – UNE Line Sharing
13. Average Completion Interval (OCI) & Order Completion Interval Distribution – Interconnection Trunks
14. Missed Repair Appointments - Resale POTS
15. Missed Repair Appointments - Resale Design
16. Missed Repair Appointments - UNE Loop + Port Combo
17. Missed Repair Appointments - UNE Loops
18. Missed Repair Appointments - UNE xDSL
19. Missed Repair Appointments - UNE Line Sharing
20. Missed Repair Appointments - Interconnection Trunks
21. Invoice Accuracy
22. Mean Time To Deliver Invoices
23. Trunk Group Performance – Aggregate
24. Collocation Percent of Due Dates Missed
25. Timeliness of Change Management Notices
26. Timeliness of Documents Associated with Change

Statistical Methodology

Statistical Methods for BellSouth Performance Measure Analysis

I. Necessary Properties for a Test Methodology

The statistical process for testing if competing local exchange carriers (CLECs) customers are being treat equally with BellSouth (BST) customers involves more than just a mathematical formula. Three key elements need to be considered before an appropriate decision process can be developed. These are

- the type of data,
- the type of comparison, and
- the type of performance measure.

Once these elements are determined a test methodology should be developed that complies with the following properties.

- Like-to-Like Comparisons. When possible, data should be compared at appropriate levels, e.g. wire center, time of month, dispatched, and residential, new orders. The testing process should:
  - Identify variables that may affect the performance measure.
  - Record these important confounding covariates.
  - Adjust for the observed covariates in order to remove potential biases and to make the CLEC and the ILEC units as comparable as possible.
- Aggregate Level Test Statistic. Each performance measure of interest should be summarized by one overall test statistic giving the decision maker a rule that determines whether a statistically significant difference exists. The test statistic should have the following properties.
  - The method should provide a single overall index, on a standard scale.
  - If entries in comparison cells are exactly proportional over a covariate, the aggregated index should be very nearly the same as if comparisons on the covariate had not been done.
  - The contribution of each comparison cell should depend on the number of observations in the cell.
  - Cancellation between comparison cells should be limited.
  - The index should be a continuous function of the observations.
- Production Mode Process. The decision system must be developed so that it does not require intermediate manual intervention, i.e. the process must be mechanized to the extent possible.
  - Calculations are well defined for possible eventualities.

  - The decision process is an algorithm that needs no manual intervention.
  - Results should be arrived at in a timely manner.
  - The system must recognize that resources are needed for other performance measure-related processes that also must be run in a timely manner.
  - The system should be auditable, and adjustable over time.

- Balancing. The testing methodology should balance Type I and Type II Error probabilities.
  - P(Type I Error) = P(Type II Error) for well defined null and alternative hypotheses.
  - The formula for a test's balancing critical value should be simple enough to calculate using standard mathematical functions, i.e. one should avoid methods that require computationally intensive techniques.
  - Little to no information beyond the null hypothesis, the alternative hypothesis, and the number of observations should be required for calculating the balancing critical value.

- Trimming. Trimming of extreme observations from BellSouth and CLEC distributions is needed in order to ensure that a fair comparison is made between performance measures. Three conditions are needed to accomplish this goal. These are:
  - Trimming should be based on a general rule that can be used in a production setting.
  - Trimmed observations should not simply be discarded; they need to be examined and possibly used in the final decision making process.
  - Trimming should only be used on performance measures that are sensitive to "outliers."

Measurement Types

The performance measures that will undergo testing are of four types:

1) means
2 proportions,
3) rates, and
4) ratio

While all four have similar characteristics, proportions and rates are derived from count data while means and ratios are derived from interval measurements.

II. Testing Methodology – The Truncated Z

Many covariates are chosen in order to provide deep comparison levels. In each comparison cell, a Z statistic is calculated. The form of the Z statistic may vary depending on the performance measure, but it should be distributed approximately as a standard normal, with mean zero and variance equal to one. Assuming that the test statistic is derived so that it is negative when the performance for the CLEC is worse than for the ILEC, a positive truncation is done – i.e. if the result is negative it is left alone, if the result is positive it is changed to zero. A weighted average of the truncated statistics is calculated where a cell weight depends on the volume of BST and CLEC orders in the cell. The weighted average is re-centered by the theoretical mean of a truncated distribution, and this is divided by the standard error of the weighted average. The standard error is computed assuming a fixed effects model.

Proportion Measures

For performance measures that are calculated as a proportion, in each adjustment cell, the truncated Z and the moments for the truncated Z can be calculated in a direct manner. In adjustment cells where proportions are not close to zero or one, and where the sample sizes are reasonably large, a normal approximation can be used. In this case, the moments for the truncated Z come directly from properties of the standard normal distribution. If the normal approximation is not appropriate, then the Z statistic is calculated from the hypergeometric distribution. In this case, the moments of the truncated Z are calculated exactly using the hypergeometric probabilities.

Rate Measures

The truncated Z methodology for rate measures has the same general structure for calculating the Z in each cell as proportion measures. For a rate measure, there are a fixed number of circuits or units for the CLEC, n_{2j} and a fixed number of units for BST, n_{1j}. Suppose that the performance measure is a "trouble rate." The modeling assumption is that the occurrence of a trouble is independent between units and the number of troubles in n circuits follows a Poisson distribution with mean λn where λ is the probability of a trouble in 1 circuit and n is the number of circuits.

In an adjustment cell, if the number of CLEC troubles is greater than 15 and the number of BST troubles is greater than 15, then the Z test is calculated using the normal approximation to the Poisson. In this case, the moments of the truncated Z come directly from properties of the standard normal distribution. Otherwise, if there are very few troubles, the number of CLEC troubles can be modeled using a binomial distribution with n equal to the total number of troubles (CLEC plus BST troubles.) In this case, the moments for the truncated Z are calculated explicitly using the binomial distribution.

Mean Measures

For mean measures, an adjusted t statistic is calculated for each like-to-like cell which has at least 7 BST and 7 CLEC transactions. A permutation test is used when one or both of the BST and CLEC sample sizes is less than 6. Both the adjusted t statistic and the permutation calculation are described in the technical appendix.

Ratio Measures

Rules will be given for computing a cell test statistic for a ratio measure, however, the current plan for measures in this category, namely billing accuracy, does not call for the use of a Z parity statistic.

Technical Description

It is initially assumed that any necessary trimming[1] of the data is complete, and that the data are disaggregated so that comparisons are made within appropriate classes or adjustment cells that define "like" observations.

Notation and Exact Testing Distributions

The basic notation for the construction of the truncated z statistic is detailed below. In what follows the word "cell" should be taken to mean a like-to-like comparison cell that has both one (or more) ILEC observation and one (or more) CLEC observation.

L = the total number of occupied cells

j = 1,…,L; an index for the cells

n_{1j} = the number of ILEC transactions in cell j

n_{2j} = the number of CLEC transactions in cell j

n_j = the total number transactions in cell j; $n_{1j} + n_{2j}$

X_{1jk} = individual ILEC transactions in cell j; $k = 1,\ldots, n_{1j}$

X_{2jk} = individual CLEC transactions in cell j; $k = 1,\ldots, n_{2j}$

Y_{jk} = individual transaction (both ILEC and CLEC) in cell j

$$= \begin{cases} X_{1jk} & k = 1,\ldots, n_{1j} \\ X_{2jk} & k = n_{1j} + 1,\ldots, n_j \end{cases}$$

$\Phi^{-1}(\cdot)$ = the inverse of the cumulative standard normal distribution function

For Mean Performance Measures the following additional notation is needed.

$\bar{X}_{1j}$ = The ILEC sample mean of cell j

$\bar{X}_{2j}$ = The CLEC sample mean of cell j

s_{1j}^2 = The ILEC sample variance in cell j

s_{2j}^2 = The CLEC sample variance in cell j

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[1] When it is determined that a measure should be trimmed, a trimming rule that is easy to implement in a production setting is:

> **Trim the ILEC observations to the largest CLEC value from all CLEC observations in the month under consideration.**

That is, no CLEC values are removed; all ILEC observations greater than the largest CLEC observation are trimmed.

$\{y_{jk}\}$ = a random sample of size n_{2j} from the set of $Y_{j1},\ldots,Y_{jn_j}$; $k = 1,\ldots,n_{2j}$

M_j = The total number of distinct pairs of samples of size n_{1j} and n_{2j};

$$= \binom{n_j}{n_{1j}}$$

The exact parity test is the permutation test based on the "modified Z" statistic. For large samples, permutation calculations can be avoided since this statistic will be normal (or Student's t) to a good approximation. For small samples, where permutation calculations cannot be avoided, it has been found that the difference between "modified Z" and the textbook "pooled Z" is negligible. We therefore propose to use the permutation test based on pooled Z for small samples. This decision speeds up the permutation computations considerably, because for each permutation one need only compute the sum of the CLEC sample values, and not the pooled statistic itself.

A permutation probability mass function distribution for cell j, based on the “pooled Z” can be written as

$$PM(t) = P(\sum_k y_{jk} = t) = \frac{\textit{the number of samples that sum to } t}{M_j},$$

and the corresponding cumulative permutation distribution is

$$CPM(t) = P(\sum_k y_{jk} \le t) = \frac{\textit{the number of samples with sum } \le t}{M_j}.$$

For Proportion Performance Measures the following notation is defined

a_{1j} = The number of ILEC cases possessing an attribute of interest in cell j

a_{2j} = The number of CLEC cases possessing an attribute of interest in cell j

a_j = The number of cases possessing an attribute of interest in cell j; $a_{1j} + a_{2j}$

The exact distribution for a parity test is the hypergeometric distribution. The hypergeometric probability mass function distribution for cell j is

$$HG(h) = P(H = h) = \begin{cases} \dfrac{\binom{n_{1j}}{h}\binom{n_{2j}}{a_j - h}}{\binom{n_j}{a_j}}, & \max(0, a_j - n_{2j}) \le h \le \min(a_j, n_{1j}) \\ 0 & \text{otherwise} \end{cases},$$

and the cumulative hypergeometric distribution is

$$CHG(x) = P(H \le x) = \begin{cases} 0 & x < \max(0, a_j - n_{2j}) \\ \sum_{h=\max(0,a_j-n_{1j})}^{x} HG(h), & \max(0, a_j - n_{2j}) \le x \le \min(a_j, n_{1j}) \\ 1 & x > \min(a_j, n_{1j}) \end{cases}.$$

For Rate Measures, the notation needed is defined as

b_{1j} = The number of ILEC base elements in cell j

b_{2j} = The number of CLEC base elements in cell j

b_j = The total number of base elements in cell j; $b_{1j} + b_{2j}$

$\hat{r}_{1j}$ = The ILEC sample rate of cell j; n_{1j}/b_{1j}

$\hat{r}_{2j}$ = The CLEC sample rate of cell j; n_{2j}/b_{2j}

q_j = The relative proportion of ILEC elements for cell j; b_{1j}/b_j

The exact distribution for a parity test is the binomial distribution. The binomial probability mass function distribution for cell j is

$$BN(k) = P(B = k) = \begin{cases} \binom{n_j}{k} q_j^k (1 - q_j)^{n_j - k}, & 0 \le k \le n_j \\ 0 & \text{otherwise} \end{cases},$$

and the cumulative binomial distribution is

$$CBN(x) = P(B \le x) = \begin{cases} 0 & x < 0 \\ \sum_{k=0}^{x} BN(k), & 0 \le x \le n_j \\ 1 & x > n_j \end{cases}.$$

For Ratio Performance Measures the following additional notation is needed.

U_{1jk} = additional quantity of interest of an individual ILEC transaction in cell j; $k = 1, \ldots, n_{1j}$

U_{2jk} = additional quantity of interest of an individual CLEC transaction in cell j; $k = 1, \ldots, n_{2j}$

$\hat{R}_{ij}$ = the ILEC (I = 1) or CLEC (i = 2) ratio of the total additional quantity of interest to the base transaction total in cell j, i.e., $\sum_k U_{ijk} \Big/ \sum_k X_{ijk}$

Calculating the Truncated Z

The general methodology for calculating an aggregate level test statistic is outlined below.

1. **Calculate cell weights**, W_j. A weight based on the number of transactions is used so that a cell, which has a larger number of transactions, has a larger weight. The actual weight formulae will depend on the type of measure.

Mean or Ratio Measure

$$W_j = \sqrt{\frac{n_{1j} n_{2j}}{n_j}}$$

Proportion Measure

$$W_j = \sqrt{\frac{n_{2j} n_{1j}}{n_j} \cdot \frac{a_j}{n_j} \cdot \left(1 - \frac{a_j}{n_j}\right)}$$

Rate Measure

$$W_j = \sqrt{\frac{b_{1j} b_{2j}}{b_j} \cdot \frac{n_j}{b_j}}$$

2. **In each cell, calculate a Z value**, Z_j. A Z statistic with mean 0 and variance 1 is needed for each cell.

   - If $W_j = 0$, set $Z_j = 0$.
   - Otherwise, the actual Z statistic calculation depends on the type of performance measure.

Mean Measure

$$Z_j = \Phi^{-1}(\alpha)$$

where α is determine by the following algorithm.

If $\min(n_{1j}, n_{2j}) > 6$, then determine α as

$$\alpha = P(t_{n_{1j}-1} \le T_j),$$

that is, α is the probability that a t random variable with n_{1j} - 1 degrees of freedom, is less than

$$T_j = \begin{cases} t_j + \frac{g}{6}\left(\frac{n_{1j} + 2n_{2j}}{\sqrt{n_{1j}\, n_{2j}(n_{1j} + n_{2j})}}\right)\left(t_j^2 + \frac{n_{2j} - n_{1j}}{n_{1j} + 2n_{2j}}\right) & t_j \ge t_{\min j} \\ t_j + \frac{g}{6}\left(\frac{n_{1j} + 2n_{2j}}{\sqrt{n_{1j}\, n_{2j}(n_{1j} + n_{2j})}}\right)\left(t_{\min j}^2 + \frac{n_{2j} - n_{1j}}{n_{1j} + 2n_{2j}}\right) & \text{otherwise} \end{cases},$$

where

$$t_j = \frac{\bar{X}_{1j} - \bar{X}_{2j}}{s_{1j}\sqrt{\frac{1}{n_{1j}} + \frac{1}{n_{2j}}}},$$

$$t_{\min j} = \frac{-3\sqrt{n_{1j} n_{2j} n_j}}{g(n_{1j} + 2n_{2j})}$$

and g is the median value of all values of

$$\gamma_{1j} = \frac{n_{1j}}{(n_{1j} - 1)(n_{1j} - 2)} \sum_k \left(\frac{X_{1jk} - \bar{X}_{1j}}{s_{1j}}\right)^3$$

with $n_{1j} > n_{3q}$ for all values of j. n_{3q} is the 3 quartile of all values of n_{1j}.

Note, that t_j is the "modified Z" statistic. The statistic T_j is a "modified Z" corrected for the skewness of the ILEC data.

If min(n_{1j}, n_{2j}) ≤ 6, and

a) $M_j \le 1{,}000$ (the total number of distinct pairs of samples of size n_{1j} and n_{2j} is 1,000 or less).

- Calculate the sample sum for all possible samples of size n_{2j}.
- Rank the sample sums from smallest to largest. Ties are dealt by using average ranks.
- Let R_0 be the rank of the observed sample sum with respect all the sample sums.

$$\alpha = 1 - \frac{R_0 - 0.5}{M_j}$$

b) $M_j > 1{,}000$

- Draw a random sample of 1,000 sample sums from the permutation distribution.
- Add the observed sample sum to the list. There are a total of 1001 sample sums. Rank the sample sums from smallest to largest. Ties are dealt by using average ranks.
- Let R_0 be the rank of the observed sample sum with respect all the sample sums.

$$\alpha = 1 - \frac{R_0 - 0.5}{1001}.$$

Proportion Measure

$$Z_j = \frac{n_j\, a_{1j} - n_{1j}\, a_j}{\sqrt{\dfrac{n_{1j}\, n_{2j}\, a_j\, (n_j - a_j)}{n_j - 1}}}.$$

Rate Measure

$$Z_j = \frac{n_{1j} - n_j\, q_j}{\sqrt{n_j\, q_j (1 - q_j)}}$$

Ratio Measure

$$Z_j = \frac{\hat{R}_{1j} - \hat{R}_{2j}}{\sqrt{V(\hat{R}_{1j})\left(\dfrac{1}{n_{1j}} + \dfrac{1}{n_{2j}}\right)}}$$

$$V(\hat{R}_{1j}) = \frac{\sum_k \left(U_{1jk} - \hat{R}_{1j} X_{1jk}\right)^2}{\bar{X}_{1j}^2 (n_{1j} - 1)} = \frac{\sum_k U_{1jk}^2 - 2\hat{R}_{1j} \sum_k \left(U_{1jk} X_{1jk}\right) + \hat{R}_{1j}^2 \sum_k X_{1jk}^2}{\bar{X}_{1j}^2 (n_{1j} - 1)}$$

3. **Obtain a truncated Z value for each cell**, Z_j^*. To limit the amount of cancellation that takes place between cell results during aggregation, cells whose results suggest possible favoritism are left alone. Otherwise the cell statistic is set to zero. This

means that positive equivalent Z values are set to 0, and negative values are left alone. Mathematically, this is written as

$$Z_j^* = \min(0, Z_j).$$

4. **Calculate the theoretical mean and variance of the truncated statistic under the null hypothesis of parity**, $E(Z_j^*|H_0)$ and $Var(Z_j^*|H_0)$. In order to compensate for the truncation in step 3, an aggregated, weighted sum of the Z_j^* will need to be centered and scaled properly so that the final aggregate statistic follows a standard normal distribution.

- If $W_j = 0$, then no evidence of favoritism is contained in the cell. The formulae for calculating $E(Z_j^* | H_0)$ and $Var(Z_j^* | H_0)$ cannot be used. Set both equal to 0.

- If $\min(n_{1j}, n_{2j}) > 6$ for a mean measure, $\min\left\{a_{1j}\left(1-\frac{a_{1j}}{n_{1j}}\right), a_{2j}\left(1-\frac{a_{2j}}{n_{2j}}\right)\right\} > 9$ for a proportion measure, $\min\left(n_{1j}, n_{2j}\right) > 15$ and $n_j q_j (1-q_j) > 9$ for a rate measure, or n_{1j} and n_{2j} are large for a ratio measure then

$$E(Z_j^* | H_0) = -\frac{1}{\sqrt{2\pi}}, \text{ and}$$

$$Var(Z_j^* | H_0) = \frac{1}{2} - \frac{1}{2\pi}.$$

- Otherwise, determine the total number of values for Z_j^*. Let z_{ji} and θ_{ji}, denote the values of Z_j^* and the probabilities of observing each value, respectively.

$$E(Z_j^* | H_0) = \sum_i \theta_{ji} z_{ji} \text{ ,and}$$

$$Var(Z_j^* | H_0) = \sum_i \theta_{ji} z_{ji}^2 - \left[E(Z_j^* | H_0)\right]^2.$$

The actual values of the z's and θ's depends on the type of measure.

Mean Measure

$$N_j = \min(M_j, 1{,}000), \; i = 1, \ldots, N_j$$

$$z_{ji} = \min\left\{0, \Phi^{-1}\left(1 - \tfrac{R_i - 0.5}{N_j}\right)\right\} \quad \text{where } R_i \text{ is the rank of sample sum i}$$

$$\theta_j = \frac{1}{N_j}$$

Proportion Measure

$$z_{ji} = \min\left\{0, \frac{n_j\, i - n_{1j}\, a_j}{\sqrt{\dfrac{n_{1j}\, n_{2j}\, a_j\, (n_j - a_j)}{n_j - 1}}}\right\}, \quad i = \max(0, a_j - n_{2j}), \ldots, \min(a_j, n_{1j})$$

$$\theta_{ji} = HG(i)$$

Rate Measure

$$z_{ji} = \min\left\{0, \frac{i - n_j\, q_j}{\sqrt{n_j\, q_j (1 - q_j)}}\right\}, \quad i = 0, \ldots, n_j$$

$$\theta_{ji} = BN(i)$$

Ratio Measure

The performance measure that is in this class is billing accuracy. If a parity test were used, the sample sizes for this measure are quite large, so there is no need for a small sample technique. If one does need a small sample technique, then a re-sampling method can be used.

1. **Calculate the aggregate test statistic**, Z^T.

$$Z^T = \frac{\sum_j W_j Z_j^* - \sum_j W_j E(Z_j^* \mid H_0)}{\sqrt{\sum_j W_j^2 \operatorname{Var}(Z_j^* \mid H_0)}}$$

The Balancing Critical Value

There are four key elements of the statistical testing process:

1. the null hypothesis, H_0, that parity exists between ILEC and CLEC services

2. the alternative hypothesis, H_a, that the ILEC is giving better service to its own customers
3. the Truncated Z test statistic, Z^T, and
4. a critical value, c

The decision rule[2] is

- If $Z^T < c$ then accept H_a.
- If $Z^T \geq c$ then accept H_0.

There are two types of error possible when using such a decision rule:

Type I Error: Deciding favoritism exists when there is, in fact, no favoritism.
Type II Error: Deciding parity exists when there is, in fact, favoritism.

The probabilities of each type of each are:

Type I Error: $\alpha = P(Z^T < c \mid H_0)$.
Type II Error: $\beta = P(Z^T \geq c \mid H_a)$.

Aa balancing critical value, c_B, is needed so that $\alpha = \beta$.

It can be shown that.

$$c_B = \frac{\sum_j W_j M(m_j, se_j) - \sum_j W_j \frac{-1}{\sqrt{2\pi}}}{\sqrt{\sum_j W_j^2 V(m_j, se_j)} + \sqrt{\sum_j W_j^2 \left(\frac{1}{2} - \frac{1}{2\pi}\right)}}.$$

where

$$M(\mu,\sigma) = \mu\,\Phi(\tfrac{-\mu}{\sigma}) - \sigma\,\phi(\tfrac{-\mu}{\sigma})$$

$$V(\mu,\sigma) = (\mu^2 + \sigma^2)\Phi(\tfrac{-\mu}{\sigma}) - \mu\,\sigma\,\phi(\tfrac{-\mu}{\sigma}) - M(\mu,\sigma)^2$$

$\Phi(\cdot)$ is the cumulative standard normal distribution function, and $\phi(\cdot)$ is the standard normal density function.

[2] This decision rule assumes that a negative test statistic indicates poor service for the CLEC customer. If the opposite is true, then reverse the decision rule.

This formula assumes that Z_j is approximately normally distributed within cell j. When the cell sample sizes, n_{1j} and n_{2j}, are small this may not be true. It is possible to determine the cell mean and variance under the null hypothesis when the cell sample sizes are small. It is much more difficult to determine these values under the alternative hypothesis. Since the cell weight, W_j will also be small (see calculate weights section above) for a cell with small volume, the cell mean and variance will not contribute much to the weighted sum. Therefore, the above formula provides a reasonable approximation to the balancing critical value.

The values of m_j and se_j will depend on the type of performance measure.

Mean Measure

For mean measures, one is concerned with two parameters in each cell, namely, the mean and variance. A possible lack of parity may be due to a difference in cell means, and/or a difference in cell variances. One possible set of hypotheses that capture this notion, and take into account the assumption that transaction are identically distributed within cells is:

$$H_0: \mu_{1j} = \mu_{2j},\ \sigma_{1j}^2 = \sigma_{2j}^2$$

$$H_a: \mu_{2j} = \mu_{1j} + \delta_j \cdot \sigma_{1j},\ \sigma_{2j}^2 = \lambda_j \cdot \sigma_{1j}^2 \qquad \delta_j > 0,\ \lambda_j \geq 1 \text{ and } j = 1,\ldots,L.$$

Under this form of alternative hypothesis, the cell test statistic Z_j has mean and standard error given by

$$m_j = \frac{-\delta_j}{\sqrt{\frac{1}{n_{1j}} + \frac{1}{n_{2j}}}}, \text{ and}$$

$$se_j = \sqrt{\frac{\lambda_j n_{1j} + n_{2j}}{n_{1j} + n_{2j}}}$$

Proportion Measure

For a proportion measure there is only one parameter of interest in each cell, the proportion of transaction possessing an attribute of interest. A possible lack of parity may be due to a difference in cell proportions. A set of hypotheses that take into account the assumption that transaction are identically distributed within cells while allowing for an analytically tractable solution is:

$$H_0: \frac{p_{2j}(1 - p_{1j})}{(1 - p_{2j})p_{1j}} = 1$$

$$H_a\text{: } \frac{p_{2j}(1-p_{1j})}{(1-p_{2j})p_{1j}} = \psi_j \qquad \psi_j > 1 \text{ and } j = 1,\ldots,L.$$

These hypotheses are based on the "odds ratio." If the transaction attribute of interest is a missed trouble repair, then an interpretation of the alternative hypothesis is that a CLEC trouble repair appointment is ψ_j times more likely to be missed than an ILEC trouble.

Under this form of alternative hypothesis, the within cell asymptotic mean and variance of a_{1j} are given by[3]

$$E(a_{1j}) = n_j \pi_j^{(1)}$$

$$\mathrm{var}(a_{1j}) = \frac{n_j}{\frac{1}{\pi_j^{(1)}} + \frac{1}{\pi_j^{(2)}} + \frac{1}{\pi_j^{(3)}} + \frac{1}{\pi_j^{(4)}}}$$

where

$$\pi_j^{(1)} = f_j^{(1)}\left(n_j^2 + f_j^{(2)} + f_j^{(3)} - f_j^{(4)}\right)$$

$$\pi_j^{(2)} = f_j^{(1)}\left(-n_j^2 - f_j^{(2)} + f_j^{(3)} + f_j^{(4)}\right)$$

$$\pi_j^{(3)} = f_j^{(1)}\left(-n_j^2 + f_j^{(2)} - f_j^{(3)} + f_j^{(4)}\right)$$

$$\pi_j^{(4)} = f_j^{(1)}\left(n_j^2\left(\frac{2}{\psi_j} - 1\right) - f_j^{(2)} - f_j^{(3)} - f_j^{(4)}\right)$$

$$f_j^{(1)} = \frac{1}{2n_j^2\left(\frac{1}{\psi_j} - 1\right)}$$

$$f_j^{(2)} = n_j n_{1j}\left(\frac{1}{\psi_j} - 1\right)$$

$$f_j^{(3)} = n_j a_j\left(\frac{1}{\psi_j} - 1\right)$$

$$f_j^{(4)} = \sqrt{n_j^2\left[4n_{1j}\left(n_j - a_j\right)\left(\frac{1}{\psi_j} - 1\right) + \left(n_j + \left(a_j - n_{1j}\right)\left(\frac{1}{\psi_j} - 1\right)\right)^2\right]}$$

Recall that the cell test statistic is given by

$$Z_j = \frac{n_j\, a_{1j} - n_{1j}\, a_j}{\sqrt{\dfrac{n_{1j}\, n_{2j}\, a_j\,(n_j - a_j)}{n_j - 1}}}.$$

[3] Stevens, W. L. (1951) Mean and Variance of an entry in a Contingency Table. *Biometrica*, **38**, 468-470.

Using the equations above, we see that Z_j has mean and standard error given by

$$m_j = \frac{n_j^2 \pi_j^{(1)} - n_{1j}\, a_j}{\sqrt{\dfrac{n_{1j}\, n_{2j}\, a_j\, (n_j - a_j)}{n_j - 1}}}, \text{ and}$$

$$se_j = \sqrt{\frac{n_j^3 (n_j - 1)}{n_{1j}\, n_{2j}\, a_j\, (n_j - a_j)\left(\frac{1}{\pi_j^{(1)}} + \frac{1}{\pi_j^{(2)}} + \frac{1}{\pi_j^{(3)}} + \frac{1}{\pi_j^{(4)}}\right)}}.$$

Rate Measure

A rate measure also has only one parameter of interest in each cell, the rate at which a phenomenon is observed relative to a base unit, e.g. the number of troubles per available line. A possible lack of parity may be due to a difference in cell rates. A set of hypotheses that take into account the assumption that transactions are identically distributed within cells is:

H_0: $r_{1j} = r_{2j}$

H_a: $r_{2j} = \varepsilon_j r_{1j}$ $\varepsilon_j > 1$ and $j = 1,\dots,L$.

Given the total number of ILEC and CLEC transactions in a cell, n_j, and the number of base elements, b_{1j} and b_{2j}, the number of ILEC transaction, n_{1j}, has a binomial distribution from n_j trials and a probability of

$$q_j^* = \frac{r_{1j} b_{1j}}{r_{1j} b_{1j} + r_{2j} b_{2j}}.$$

Therefore, the mean and variance of n_{1j}, are given by

$$E(n_{1j}) = n_j q_j^*$$
$$var(n_{1j}) = n_j q_j^* (1 - q_j^*)$$

Under the null hypothesis

$$q_j^* = q_j = \frac{b_{1j}}{b_j},$$

but under the alternative hypothesis

$$q_j^* = q_j^a = \frac{b_{1j}}{b_{1j} + \varepsilon_j b_{2j}}.$$

Recall that the cell test statistic is given by

$$Z_j = \frac{n_{1j} - n_j\, q_j}{\sqrt{n_j\, q_j(1-q_j)}}\,.$$

Using the relationships above, we see that Z_j has mean and standard error given by

$$m_j = \frac{n_j\left(q_j^a - q_j\right)}{\sqrt{n_j q_j(1-q_j)}} = (1-\varepsilon_j)\frac{\sqrt{n_j b_{1j} b_{2j}}}{b_{1j}+\varepsilon_j b_{2j}}, \text{ and}$$

$$se_j = \sqrt{\frac{q_j^a(1-q_j^a)}{q_j(1-q_j)}} = \sqrt{\varepsilon_j}\,\frac{b_j}{b_{1j}+\varepsilon_j b_{2j}}\,.$$

Ratio Measure

As with mean measures, one is concerned with two parameters in each cell, the mean and variance, when testing for parity of ratio measures. As long as sample sizes are large, as in the case of billing accuracy, the same method for finding m_j and se_j that is used for mean measures can be used for ratio measures.

Determining the Parameters of the Alternative Hypothesis

In this appendix we have indexed the alternative hypothesis of mean measures by two sets of parameters, λ_j and δ_j. Proportion and rate measures have been indexed by one set of parameters each, ψ_j and ε_j respectively. A major difficulty with this approach is that more than one alternative will be of interest; for example, one alternative may be considered in which all the δ_j are set to a common non-zero value, and another set of alternatives may be considered in each of which just one δ_j is non-zero, while all the rest are zero. There are very many other possibilities. Each possibility leads to a single value for the balancing critical value; and each possible critical value corresponds to many sets of alternative hypotheses, for each of which it constitutes the correct balancing value.

The formulas herein presented can be used to evaluate the impact of different choices of the overall critical value. For each putative choice, one can evaluate the set of alternatives for which this is the correct balancing value. While statistical science can be used to evaluate the impact of different choices of these parameters, there is not much that an appeal to statistical principles can offer in directing specific choices. Specific choices are best left to telephony experts. Still, it is possible to comment on some aspects of these choices:

- Parameter Choices for λ_j. The set of parameters λ_j index alternatives to the null hypothesis that arise because there might be greater unpredictability or variability in the delivery of service to a CLEC customer over that which would be achieved for an otherwise comparable ILEC customer. While concerns about differences in the variability of service are important, it turns out that the truncated Z testing which is being recommended here is relatively insensitive to all but very large values of the λ_j. Put another way, reasonable differences in the values chosen here could make very little difference in the balancing points chosen.

- Parameter Choices for δ_j. The set of parameters δ_j are much more important in the choice of the balancing point than was true for the λ_j. The reason for this is that they directly index differences in average service. The truncated Z test is very sensitive to any such differences; hence, even small disagreements among experts in the choice of the δ_j could be very important. Sample size matters here too. For example, setting all the δ_j to a single value – $\delta_j = \delta$ – might be fine for tests across individual CLECs where currently in Kentucky the CLEC customer bases are not too different. Using the same value of δ for the overall state testing does not seem sensible. At the state level the process involves aggregating over all CLECs, so using the same δ as for an individual CLEC would be saying that a "meaningful" degree of disparity is one where the violation is the same (δ) for each CLEC. But the detection of disparity for any component CLEC is important, so the relevant "overall" δ should be smaller.

- Parameter Choices for ψ_j or ε_j. The set of parameters ψ_j or ε_j are also important in the choice of the balancing point for tests of their respective measures. The reason for this is that they directly index increases in the proportion or rate of service performance. The truncated Z test is sensitive to such increases; but not as sensitive as the case of δ for mean measures. Sample size matters here too. As with mean measures, using the same value of ψ or ε for the overall state testing does not seem sensible.

The three parameters are related however. If a decision is made on the value of δ, it is possible to determine equivalent values of ψ and ε. The following equations, in conjunction with the definitions of ψ and ε, show the relationship with delta.

$$\delta = 2 \cdot \arcsin(\sqrt{\hat{p}_2}) - 2 \cdot \arcsin(\sqrt{\hat{p}_1})$$
$$\delta = 2\sqrt{\hat{r}_2} - 2\sqrt{\hat{r}_1}$$

The bottom line here is that beyond a few general considerations, like those given above, a principled approach to the choice of the alternative hypotheses to guard against must come from elsewhere.

Decision Process

Once Z^T has been calculated, it is compared to the balancing critical value to determine if the ILEC is favoring its own customers over a CLEC's customers.

This critical value changes as the ILEC and CLEC transaction volume change. One way to make this transparent to the decision-maker, is to report the difference between the test statistic and the critical value, $diff = Z^T - c_B$. If favoritism is concluded when $Z^T < c_B$, then the $diff < 0$ indicates favoritism.

This makes it very easy to determine favoritism: a positive *diff* suggests no favoritism, and a negative *diff* suggests favoritism.

BST SEEM Remedy Procedure

BST SEEM REMEDY PROCEDURE

TIER-1 CALCULATION FOR RETAIL ANALOGUES:

1. Calculate the overall test statistic for each CLEC; z^T_{CLEC-1} (Per Statistical Methodology discussed by Dr. Mulrow)
2. Calculate the balancing critical value ($^cB_{CLEC-1}$) that is associated with the alternative hypothesis (for fixed parameters δ,Ψ, or ε)
3. If the overall test statistic is equal to or above the balancing critical value, stop here. That is, if $^cB_{CLEC-1} < z^T_{CLEC-1}$, stop here. Otherwise, go to step 4.
4. Calculate the Parity Gap by subtracting the value of step 2 from that of step 1. ABS ($z^T_{CLEC-1} - {}^cB_{CLEC-1}$)
5. Calculate the Volume Proportion using a linear distribution with slope of ¼. This can be accomplished by taking the absolute value of the Parity Gap from step 4 divided by 4; ABS (($z^T_{CLEC-1} - {}^cB_{CLEC-1}$) / 4). All parity gaps equal or greater to 4 will result in a volume proportion of 100%.
6. Calculate the Affected Volume by multiplying the Volume Proportion from step 5 by the Total Impacted CLEC-$_1$ Volume (I_c) in the negatively affected cell; where the cell value is negative.
7. Calculate the payment to CLEC-1 by multiplying the result of step 6 by the appropriate dollar amount from the fee schedule.
8. Then, CLEC-1 payment = Affected Volume$_{CLEC1}$ * $$ from Fee Schedule

Example: CLEC-1 Missed Installation Appointments (MIA) for Resale POTS.
Note – the statistical results are only illustrative. They are not a result of a statistical test of this data.

	n_I	N_C	I_c	MIA_I	MIA_C	z^T_{CLEC-1}	C_B	Parity Gap	Volume Proportion	Affected Volume
State	50000	600	96	9%	16%	-1.92	-0.21	1.71	0.4275	
Cell						z_{CLEC-1}				
1		150	17	0.091	0.113	-1.994				8
2		75	8	0.176	0.107	0.734				
3		10	4	0.128	0.400	-2.619				2
4		50	17	0.158	0.340	-2.878				8
5		15	2	0.245	0.133	1.345				
6		200	26	0.156	0.130	0.021				
7		30	7	0.166	0.233	-0.600				3
8		20	3	0.106	0.150	-0.065				2

9		40	9	0.193	0.225	-0.918				4
10		10	3	0.160	0.300	-0.660				2
										29

where n_I = ILEC observations and n_C = CLEC-1 observations
Payout for CLEC-1 is (29 units) * ($100/unit) = $2,900

Example: CLEC-1 Order Completion Interval (OCI) for Resale POTS

	n_I	n_C	I_c	OCI_I	OCI_C	z^T_{CLEC-1}	C_B	Parity Gap	Volume Proportion	Affected Volume
State	50000	600	600	5days	7days	-1.92	-0.21	1.71	0.4275	
Cell						z_{CLEC-1}				
1		150	150	5	7	-1.994				64
2		75	75	5	4	0.734				
3		10	10	2	3.8	-2.619				4
4		50	50	5	7	-2.878				21
5		15	15	4	2.6	1.345				
6		200	200	3.8	2.7	0.021				
7		30	30	6	7.2	-0.600				13
8		20	20	5.5	6	-0.065				9
9		40	40	8	10	-0.918				17
10		10	10	6	7.3	-0.660				4
										133

where n_I = ILEC observations and n_C = CLEC-1 observations

Payout for CLEC-1 is (133 units) * ($100/unit) = $13,300

TIER-2 CALCULATION FOR RETAIL ANALOGUES:

1. Tier-2 is triggered by three consecutive monthly failures of any Tier 2 Remedy Plan sub-metric.
2. Therefore, calculate monthly statistical results and affected volumes as outlined in steps 2 through 6 for the CLEC Aggregate performance. Determine average monthly affected volume for the rolling 3-month period.
3. Calculate the payment to State Designated Agency by multiplying average monthly volume by the appropriate dollar amount from the Tier-2 fee schedule.
4. Therefore, State Designated Agency payment = Average monthly volume * $$ from Fee Schedule

Example: CLEC-A Missed Installation Appointments (MIA) for Resale POTS

State	n_I	n_C	I_c	MIA_I	MIA_C	z^T_{CLEC-A}	C_B	Parity Gap	Volume Proportion	Affected Volume
Month 1	180000	2100	336	9%	16%	-1.92	-0.21	1.71	0.4275	
Cell						z_{CLEC-A}				
1		500	56	0.091	0.112	-1.994				24
2		300	30	0.176	0.100	0.734				
3		80	27	0.128	0.338	-2.619				12
4		205	60	0.158	0.293	-2.878				26
5		45	4	0.245	0.089	1.345				
6		605	79	0.156	0.131	0.021				
7		80	19	0.166	0.238	-0.600				9
8		40	6	0.106	0.150	-0.065				3
9		165	36	0.193	0.218	-0.918				16
10		80	19	0.160	0.238	-0.660				9

99

where n_I = ILEC observations and n_C = CLEC-A observations

Assume Months 2 and 3 have the same affected volumes. Payout 99 units * $300/unit = $29,700.

TIER-1 CALCULATION FOR BENCHMARKS

1. For each CLEC, with five or more observations, calculate monthly performance results for the State.

2. CLECs having observations (sample sizes) between 5 and 30 will use Table I below. The only exception will be for Collocation Percent Missed Due Dates.

Table I

Small Sample Size Table (95% Confidence)

Sample Size	Equivalent 90% Benchmark	Equivalent 95% Benchmark
5	60.00%	80.00%
6	66.67%	83.33%
7	71.43%	85.71%
8	75.00%	75.00%
9	66.67%	77.78%
10	70.00%	80.00%
11	72.73%	81.82%
12	75.00%	83.33%
13	76.92%	84.62%
14	78.57%	85.71%
15	73.33%	86.67%

Sample Size	Equivalent 90% Benchmark	Equivalent 95% Benchmark
16	75.00%	87.50%
17	76.47%	82.35%
18	77.78%	83.33%
19	78.95%	84.21%
20	80.00%	85.00%
21	76.19%	85.71%
22	77.27%	86.36%
23	78.26%	86.96%
24	79.17%	87.50%
25	80.00%	88.00%
26	80.77%	88.46%
27	81.48%	88.89%
28	78.57%	89.29%
29	79.31%	86.21%
30	80.00%	86.67%

3. If the percentage (or equivalent percentage for small samples) meets the benchmark standard, stop here. Otherwise, go to step 4.

4. Determine the Volume Proportion by taking the difference between the benchmark and the actual performance result.

5. Calculate the Affected Volume by multiplying the Volume Proportion from step 4 by the Total Impacted CLEC-$_1$ Volume.

6. Calculate the payment to CLEC-1 by multiplying the result of step 5 by the appropriate dollar amount from the fee schedule.

   CLEC-1 payment = Affected Volume$_{\text{CLEC-1}}$ * $$ from Fee Schedule

Example: CLEC-1 Percent Missed Due Dates for Collocations

	n_C	Benchmark	MIA_C	Volume Proportion	Affected Volume
State	600	10%	13%	.03	18

Payout for CLEC-1 is (18 units) * ($5000/unit) = $90,000

TIER-1 CALCULATION FOR BENCHMARKS (in the form of a target):

1. For each CLEC with five or more observations calculate monthly performance results for the State.

2. CLECs having observations (sample sizes) between 5 and 30 will use Table I above.

3. Calculate the interval distribution based on the same data set used in step 1.

4. If the 'percent within' (or equivalent percentage for small samples) meets the benchmark standard, stop here. Otherwise, go to step 5.

5. Determine the Volume Proportion by taking the difference between benchmark and the actual performance result.

6. Calculate the Affected Volume by multiplying the Volume Proportion from step 5 by the Total $CLEC\text{-}_1$ Volume.

7. Calculate the payment to CLEC-1 by multiplying the result of step 6 by the appropriate dollar amount from the fee schedule.

CLEC-1 payment = Affected $Volume_{CLEC1}$ * $$ from Fee Schedule

Example: CLEC-1 Reject Timeliness

	n_C	Benchmark	Reject Timeliness	Volume Proportion	Affected Volume
State	600	95% within 1 hour	93% within 1 hour	.02	12

Payout for CLEC-1 is (12 units) * ($100/unit) = $1,200

TIER-2 CALCULATIONS for BENCHMARKS:

Tier-2 calculations for benchmark measures are the same as the Tier-1 benchmark calculations, except the CLEC Aggregate is evaluated over a three consecutive month period.