LOUISIANA

BELLSOUTH'S

SELF-EFFECTUATING ENFORCEMENT MECHANISM

SEEM

Service Performance Measurements And Enforcement Mechanisms Administrative Plan

1 Scope

This Administrative Plan ("Plan") includes Service Quality Measurements ("SQM") with corresponding Self Effectuating Enforcement Mechanisms ("SEEM") to be implemented by BellSouth pursuant to the Orders issued by the Louisiana Public Service Commission (the "Commission") on January 12, 2001 and May 7, 2001, in Docket 7892-U.

2 Reporting

2.1 In providing services pursuant to the Interconnection Agreements between BellSouth and each CLEC, BellSouth will report its performance to each CLEC in accordance with BellSouth's SQMs and applicable SEEMs, which are posted on the Performance Measurement Reports website.

2.2 BellSouth will make performance reports available to each CLEC on a monthly basis. The reports will contain information collected in each performance category and will be available to EACH CLEC via the Performance Measurements Reports website. BellSouth will also provide electronic access to the raw data underlying the SQMs.

2.3 Preliminary SQM reports will be posted on the Performance Measurements Reports website by 8:00 A.M. EST on the 21st day of each month or the first business day after the 21st for the previous month's performance. Final validated SQM reports will be posted by 8:00 A.M. EST on the last day of the month. SQM reports not posted by this time will be considered late for SEEM purposes.

2.4 Preliminary SEEM reports will be posted on the Performance Measurements Reports website by 8:00 A.M. EST on the last day of each month or the first business day after the last day of the month for the previous month's performance. Final validated SEEM reports will be posted on the 15th of the month, following the final validated SQM report.

2.5 BellSouth shall pay penalties to the Commission, in the aggregate, for late or incomplete reports as detailed below.

2.5.1 Late Performance Reports – If performance reports are not available to CLECs by the due day, BellSouth shall be liable for payments of $1,250 for every day past the due date of the reports posting to the web.

2.5.2 Incomplete Reports – If performance reports are incomplete, BellSouth shall be liable for payments of $250 for every day past the due date of the original reports posting to the web.

2.5.3 Revised Reports – If previous performance reports are revised, BellSouth shall be liable for payments of $250 for every day past the due date of the original reports posting on the web.

3 Review of Measurements

3.1 The Louisiana Public Service Commission has established a process for the periodic review of SQMs and SEEM, initially occurring every six months. All modifications to the SQMs will be approved by the Commission. Each CLEC may provide input regarding any suggested additions, deletions or other modifications to the SQMs or the SEEM.

3.2 BellSouth acknowledges that that the Commission reserves the right to modify the SQMs or the SEEMS plan at any time it deems necessary upon Commission order.

4 Enforcement Mechanisms

4.1 Definitions

4.1.1 Enforcement Measurement Elements means the performance measurements identified as SEEM measurements within the SQM.

4.1.2 Enforcement Measurement Benchmark means a competitive level of performance established by the Commission to evaluate the performance of BellSouth and each CLEC where no analogous retail process, product or service is feasible.

4.1.3 Enforcement Measurement Compliance means comparing performance levels provided to BellSouth retail customers with performance levels provided by BellSouth to the CLEC customer.

4.1.4 Test Statistic and Balancing Critical Value is the means by which enforcement will be determined using statistically valid equations. The Test Statistic and Balancing Critical Value are set forth in Appendix C and Appendix D of this Exhibit.

4.1.5 Cell is a grouping of transactions at which like-to-like comparisons are made. For example, all BellSouth retail POTS services, for residential customers, requiring a dispatch in a particular wire center, at a particular point in time will be compared directly to CLEC resold services for residential customers, requiring a dispatch, in the same wire center, at a particular point in time. When determining

compliance, these cells can have a positive or negative Test Statistic. See Appendices C and D.

4.1.6 Affected Volume means that proportion of the total impacted CLEC volume or CLEC Aggregate volume for which remedies will be paid.

4.1.7 Delta is a measure of the meaningful difference between BellSouth performance and CLEC performance used for mean measures. For individual CLECs the Delta value shall be 1.0 and for the CLEC aggregate the Delta value shall be 0.50. The proposed 6-month review period will be used to evaluate the impact of this value on remedy payments.

4.1.8 Psi and Epsilon measure the meaningfulness of changes in service performance for proportion and rate measures. The value for Psi shall be set at 3 for individual CLECs and 2 for the CLEC aggregate. The value for Epsilon shall be set at 2.5 for both individual CLECs and the CLEC aggregate. The proposed 6-month review period will be used to evaluate the impact of these values on remedy payments.

4.1.9 Parity Gap refers to the incremental departure from a compliant-level of service. This is also referred to as "diff" in the Statistical paper located in Appendices C and D.

4.1.10 Tier-1 Enforcement Mechanisms means self-executing liquidated damages paid directly to each CLEC when BellSouth delivers non-compliant performance of any one of the Tier-1 Enforcement Measurement Elements for any month as calculated by BellSouth.

4.1.11 Tier-2 Enforcement Mechanisms means Assessments paid directly to the Louisiana Public Service Commission or its designee. Tier 2 Enforcement Mechanisms are triggered by three consecutive monthly failures in which BellSouth performance is out of compliance or does not meet the benchmarks for the aggregate of all CLEC data as calculated by BellSouth for a particular Tier-2 Enforcement Measurement Element.

4.1.12 Tier-3 Enforcement Mechanisms means the potential suspension of additional marketing and sales of long distance services triggered by excessive repeat failures of those specific sub-measures as defined in Appendix B. The Tier-3 enforcement mechanism triggers a hearing by the Commission to determine if it should recommend to the FCC that BellSouth's right to market InterLATA long distance be revoked.

4.1.13 Market Penetration Adjustment means the additional Tier –2 payments made directly to the Louisiana Public Service Commission where

CLECs order low volumes of advanced and nascent services. These additional payments would apply when there are more than 5 and less than 100 observations for qualifying measurements.

4.2 Application

4.2.1 The application of the Tier-1, Tier-2, and Tier-3 Enforcement Mechanisms does not foreclose other legal and regulatory claims and remedies available to EACH CLEC.

4.2.2 Payment of any Tier-1 or Tier-2 Enforcement Mechanisms shall not be considered as an admission against interest or an admission of liability or culpability in any legal, regulatory or other proceeding relating to BellSouth's performance. The payment of any Tier-1 Enforcement Mechanisms to EACH CLEC shall be credited against any liability associated with or related to BellSouth's service performance.

4.2.3 It is not the intent of the Parties that BellSouth be liable for both Tier-2 Enforcement Mechanisms and any other assessments or sanctions imposed by the Commission. CLECs will not oppose any effort by BellSouth to set off Tier-2 Enforcement Mechanisms from any additional assessment imposed by the Commission.

4.2.4 The Enforcement Mechanisms contained in this Plan have been provided by BellSouth in order to maintain compliance between BellSouth and each CLEC. Therefore, CLECs may not use the existence of this section or any payments of any Tier-1 or Tier-2 Enforcement Mechanisms under this section as evidence that BellSouth has not complied with or has violated any state or federal law or regulation.

4.3 Methodology

4.3.1 Tier-1 Enforcement Mechanisms will be triggered by BellSouth's failure to achieve applicable Enforcement Measurement Compliance or Enforcement Measurement Benchmarks for each CLEC for the State of Louisiana for a given Enforcement Measurement Element in a given month. Enforcement Measurement Compliance is based upon a Test Statistic and Balancing Critical Value calculated by BellSouth utilizing BellSouth generated data. The method of calculation is set forth in Appendix E.

4.3.1.1 Tier-1 Enforcement Mechanisms apply on a per transaction basis for each negative cell and will escalate based upon the number of consecutive months that BellSouth has reported non-compliance.

4.3.1.2 Fee Schedule for Tier-1 Enforcement Mechanisms is shown on the Performance Measurement Reports website in Table-1 of Appendix A. Failures beyond Month 6 will be subject to Month 6 fees.

4.3.2 Tier-2 Enforcement Mechanisms will be triggered by BellSouth's failure to achieve applicable Enforcement Measurement Compliance or Enforcement Measurement Benchmarks for the State for given Enforcement Measurement Elements for three consecutive months based upon a statistically valid equation calculated by BellSouth utilizing BellSouth generated data. The method of calculation is set forth in Appendix E.

4.3.2.1 Tier- 2 Enforcement Mechanisms apply, for an aggregate of all CLEC data generated by BellSouth, on a per transaction basis for each negative cell for a particular Enforcement Measurement Element.

4.3.2.2 Fee Schedule for Total Quarterly Tier-2 Enforcement Mechanisms is listed on Table-2 of Appendix A.

4.2.5 Tier-3 Enforcement Mechanisms will be triggered by BellSouth's failure to achieve Enforcement Measurement Compliance or Enforcement Measurement Benchmarks for the State for five of eighteen given Enforcement Measurement Elements for three consecutive months in a calendar quarter. The Tier-3 enforcement mechanism would trigger an expedited hearing by the Commission to determine if it should recommend to the FCC that BellSouth's right to market InterLATA long distance service be revoked. The method of calculation for specified sub-measures is identical to the method of calculation for Tier-2 Enforcement Mechanisms as described above. The specific sub-measures that are the mechanism for triggering and removing Tier-3 Enforcement Mechanisms are described in Appendix B.

4.3.4 A Market Penetration Adjustment will be applied based on the following provisions to enhance competition for small volume and nascent products.

4.3.4.1 In order to ensure parity and benchmark performance where CLECs order low volumes of advanced and nascent services, BellSouth will make additional payments to the Louisiana Public Service Commission. These additional payments will only apply when there are more than 5 and less than 100 observations for those measures listed below on average statewide for a three-month period.

P-3. Percent Missed Installation Appointments
UNE loop and port combinations
UNE xDSL loops
UNE Line Sharing
P-4. Average Completion Interval
UNE loop and port combinations
UNE xDSL loops
UNE Line Sharing
M&R-1. Missed Repair Appointments
UNE loop and port combinations
UNE xDSL loops
UNE Line Sharing
M&R-3. Maintenance Average Duration
UNE loop and port combinations
UNE xDSL loops
UNE Line Sharing

4.3.4.2 The additional payments in the form of a market penetration adjustment will be made if BellSouth fails to provide parity for the above measurements as determined by the use of the Truncated Z-test and the balancing critical value for 3 consecutive months.

4.3.4.3 If, for the three months that are utilized to calculate the rolling average, there were 100 observations or more on average for the sub-metric, i.e., product disaggregation, then no additional voluntary payments will be made to the Louisiana Public Service Commission. However, if during this same time frame there is an average of more than 5 but less than 100 observations for a sub-metric on a statewide basis, then BellSouth shall calculate the additional payments to the Louisiana Public Service Commission by trebling the normal Tier II remedy and applying the method of calculating affected volumes ordered by the Commission.

4.3.4.4 Any payments made hereunder shall be subject to the annual procedural cap of $59.0 million.

4.4 Payment of Tier-1 and Tier-2 Amounts

4.4.1 If BellSouth's performance triggers an obligation to pay Tier-1 Enforcement Mechanisms to a CLEC or an obligation to remit Tier-2 Enforcement Mechanisms to the Commission or its designee, BellSouth shall make payment in the required amount on the day upon which the final validated SEEM reports are posted on the Performance Measurements Reports website as set forth in Section 2.4 above.

4.4.2 For each day after the due date that BellSouth fails to pay a CLEC or the Commission the required amount, BellSouth shall be liable for the accrued interest, payable at the maximum rate allowed by the state.

4.4.3 If a CLEC disputes the amount paid to for Tier-1 Enforcement Mechanisms, the CLEC shall submit a written claim to BellSouth within sixty (60) days after the date of the performance measurement report for which the obligation arose. BellSouth shall investigate all claims and provide the CLEC written findings within thirty (30) days after receipt of the claim. If BellSouth determines the CLEC is owed additional amounts, BellSouth shall pay the CLEC such additional amounts within thirty (30) days after its findings along with 6% simple interest per annum.

4.4.4 BellSouth may set off any SEEM payment to a CLEC against undisputed amounts owed by a CLEC to BellSouth pursuant to the Interconnection Agreement between the parties which have not been paid to BellSouth within ninety (90) days past the Bill Due Date as set forth in the Billing Attachment of the Interconnection Agreement.

4.4.5 At the end of each calendar year, BellSouth will have its independent auditing and accounting firm certify that the results of all Tier-1 and Tier-2 Enforcement Mechanisms were paid and accounted for in accordance with Generally Accepted Account Principles (GAAP).

4.5 Limitations of Liability

4.5.1 BellSouth will not be responsible for CLEC acts or omissions that cause performance measures to be missed or fail, including but not limited to accumulation and submission of orders at unreasonable quantities or times or failure to submit accurate orders or inquiries. BellSouth shall provide each CLEC with reasonable notice of such acts or omissions and provide each CLEC any such supporting documentation.

4.5.2 BellSouth shall not be obligated for Tier-1, Tier-2 or Tier 3 Enforcement Mechanisms for non-compliance with a performance measure if such non-compliance was the result of an act or omission by a CLEC that is in bad faith.

4.5.3 BellSouth shall not be obligated to pay Tier-1 Enforcement Mechanisms or Tier-2 Enforcement Mechanism for non-compliance with a performance measurement if such non-compliance was the result of any of the following: a Force Majeure event as set forth in the General Terms and Conditions of the Interconnection Agreement between BellSouth and each CLEC; an act or omission by a CLEC that is contrary to any of its obligations under its Interconnection Agreement with BellSouth; an act or omission by a CLEC that is contrary to any of its obligations under the

Act, Commission rule, or state law; an act or omission associated with third-party systems or equipment.

4.6 Enforcement Mechanism Cap

4.6.1 BellSouth's total liability for payments under the Tier-1 and Tier-2 Enforcement Mechanisms shall reflect a procedural cap amount of $59 million in Louisiana applied on a rolling twelve-month period and not to individual months.

4.6.2 If the procedural cap is exceeded, BellSouth shall pay remedy amounts up to the procedural cap amount. Within thirty days of exceeding the cap amount, BellSouth must file a petition with the Commission for an expedited hearing showing why it should not be required to pay remedies in excess of the procedural cap.

4.6.3 BellSouth shall have the burden of showing why it should not pay out remedies in excess of the procedural cap of $59 million. The Commission shall decide whether and to what extent the amount in excess of the procedural cap should be paid out

4.7 Audits

4.7.1 If a CLEC detects potential discrepancies between the CLEC's internally generated data and the data relied upon by BellSouth in the reporting process, for good cause shown, the affected CLEC should be permitted to audit the data collection, computation and reporting process of BellSouth within fifteen days of a written request, that those costs will be borne by the CLEC.

4.7.2 An annual comprehensive audit of BellSouth's performance measurements for both BellSouth and CLECs will occur for each of the next five years, the audit will be conducted by an independent third party, the results of the audit will be made available to all parties, the cost of the audit will be borne by BellSouth, the selection of the independent third party auditor will be done by the Louisiana Public Service Commission and BellSouth, that the scope of the audit will be determined by Louisiana Public Service Commission and BellSouth with input by the CLECs, and the audit be done on all CLEC data. The results of all audits shall be filed with the Commission.

4.8 Dispute Resolution

4.8.1 Notwithstanding any other provision of the Interconnection Agreement between BellSouth and each CLEC, any dispute regarding BellSouth's performance or obligations pursuant to this Plan shall be resolved by the Commission.

APPENDIX A
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

APPENDIX B
SEEM Sub-Metrics

SEEM TIER-1 SUB-METRICS

1. Reject Interval - Fully Mechanized, Partially Mechanized, Non-Mechanized
2. Firm Order Confirmation Timeliness - Fully Mechanized, Partially Mechanized, Non-Mechanized, Interconnection Trunks
3. Percent Missed Installation Appointments - Resale POTS
4. Percent Missed Installation Appointments - Resale Design
5. Percent Missed Installation Appointments - UNE Loop
6. Percent Missed Installation Appointments - UNE Loop & Port Combo
7. Percent Missed Installation Appointments - UNE xDSL (ADSL, HDSL, UCL)
8. Percent Missed Installation Appointments - UNE Line Sharing
9. Percent Missed Installation Appointments - Interconnection Trunks
10. Average Order Completion Interval - Resale POTS
11. Average Order Completion Interval - Resale Design
12. Average Order Completion Interval - UNE Loop
13. Average Order Completion Interval - UNE Loop & Port Combo
14. Average Order Completion Interval - UNE xDSL (ADSL, HDSL, UCL)
15. Average Order Completion Interval - Line Sharing
16. Average Order Completion Interval - Interconnection Trunks
17. Average Completion Notice Interval – Resale POTS
18. Average Completion Notice Interval – Resale Design
19. Average Completion Notice Interval – UNE Loop
20. Average Completion Notice Interval – UNE Loop & Port Combo
21. Average Completion Notice Interval – UNE xDSL (ADSL, HDSL, UCL)
22. Average Completion Notice Interval – Line Sharing
23. Average Completion Notice Interval – Interconnection Trunks
24. Coordinated Customer Conversions Interval
25. Coordinated Customer Conversion - Hot Cut Timeliness Percent within Interval and Average Interval
26. Percent Provisioning Troubles within 30 Days - Resale POTS
27. Percent Provisioning Troubles within 30 Days - Resale Design
28. Percent Provisioning Troubles within 30 Days - UNE Loop
29. Percent Provisioning Troubles within 30 Days - UNE Loop & Port Combo
30. Percent Provisioning Troubles within 30 Days - UNE xDSL (ADSL, HDSL, UCL)
31. Percent Provisioning Troubles within 30 Days - UNE Line Sharing
32. Percent Provisioning Troubles within 30 Days - Interconnection Trunks
33. LNP - Percent Missed Installation Appointments
34. LNP – Average Disconnect Timeliness Interval & Disconnect Timeliness Interval Distribution
35. Missed Repair Appointments - Resale POTS
36. Missed Repair Appointments - Resale Design
37. Missed Repair Appointments - UNE Loop + Port Combo

SEEM TIER-1 SUB-METRICS
CONTINUED

38. Missed Repair Appointments - UNE Loops
39. Missed Repair Appointments - UNE xDSL
40. Missed Repair Appointments - UNE Line Sharing
41. Missed Repair Appointments - Interconnection Trunks
42. Customer Trouble Report Rate - Resale POTS
43. Customer Trouble Report Rate - Resale Design
44. Customer Trouble Report Rate - UNE Loop + 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 Interconnection Trunks
49. Maintenance Average Duration - Resale POTS
50. Maintenance Average Duration - Resale Design
51. Maintenance Average Duration - UNE Loop + 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 Interconnection Trunks
56. Percent Repeat Troubles within 30 Days - Resale POTS
57. Percent Repeat Troubles within 30 Days - Resale Design
58. Percent Repeat Troubles within 30 Days - UNE Loop + Port Combinations
59. Percent Repeat Troubles within 30 Days - UNE Loops
60. Percent Repeat Troubles within 30 Days - UNE xDSL
61. Percent Repeat Troubles within 30 Days - UNE Line Sharing
62. Percent Repeat Troubles within 30 Days - Local Interconnection Trunks
63. Trunk Group Performance – CLEC Specific
64. Collocation Percent of Due Dates Missed

SEEM TIER-2 SUB-METRICS

1. Average Response Time and Response Interval (Pre-Ordering/Ordering)
2. Interface Availability (Pre-Ordering/Ordering)
3. Interface Availability (Maintenance & Repair)
4. Response Interval (Maintenance & Repair)
5. Loop Makeup Inquiry - Manual
6. Loop Makeup Inquiry - Electronic
7. Flow Through Service Request (Summary)
8. Reject Interval
9. Firm Order Confirmation Timeliness
10. Percent Missed Installation Appointments - Resale POTS
11. Percent Missed Installation Appointments - Resale Design
12. Percent Missed Installation Appointments - UNE Loop
13. Percent Missed Installation Appointments - UNE Loop & Port Combo
14. Percent Missed Installation Appointments - UNE xDSL (ADSL, HDSL, UCL)
15. Percent Missed Installation Appointments - UNE Line Sharing
16. Percent Missed Installation Appointments - Interconnection Trunks
17. Average Order Completion Interval - Resale POTS
18. Average Order Completion Interval - Resale Design
19. Average Order Completion - UNE Loop
20. Average Order Completion - UNE Loop & Port Combo
21. Average Order Completion - UNE xDSL (ADSL, HDSL, UCL)
22. Average Order Completion - Line Sharing
23. Average Order Completion - Interconnection Trunks
24. Average Completion Notice Interval – Resale POTS
25. Average Completion Notice Interval – Resale Design
26. Average Completion Notice Interval – UNE Loop
27. Average Completion Notice Interval – UNE Loop & Port Combo
28. Average Completion Notice Interval – UNE xDSL (ADSL, HDSL, UCL)
29. Average Completion Notice Interval – Line Sharing
30. Average Completion Notice Interval – Interconnection Trunks
31. Coordinated Customer Conversions Interval
32. Coordinated Customer Conversion - Hot Cut Timeliness Percent within Interval and Average Interval
33. Percent Provisioning Troubles within 30 Days - Resale POTS
34. Percent Provisioning Troubles within 30 Days - Resale Design
35. Percent Provisioning Troubles within 30 Days - UNE Loop
36. Percent Provisioning Troubles within 30 Days - UNE Loop & Port Combo
37. Percent Provisioning Troubles within 30 Days - UNE xDSL (ADSL, HDSL, UCL)
38. Percent Provisioning Troubles within 30 Days - UNE Line Sharing
39. Percent Provisioning Troubles within 30 Days - Interconnection Trunks
40. LNP Percent Missed Installation Appointments
41. LNP – Average Disconnect Timeliness Interval & Disconnect Timeliness Interval Distribution

SEEM TIER – 2 SUB-METRICS
CONTINUED

42. Missed Repair Appointments - Resale POTS
43. Missed Repair Appointments - Resale Design
44. Missed Repair Appointments - UNE Loop + Port Combo
45. Missed Repair Appointments - UNE Loops
46. Missed Repair Appointments - UNE xDSL
47. Missed Repair Appointments - UNE Line Sharing
48. Missed Repair Appointments - Interconnection Trunks
49. Customer Trouble Report Rate - Resale POTS
50. Customer Trouble Report Rate - Resale Design
51. Customer Trouble Report Rate - UNE Loop + Port Combinations
52. Customer Trouble Report Rate - UNE Loops
53. Customer Trouble Report Rate - UNE xDSL
54. Customer Trouble Report Rate - UNE Line Sharing
55. Customer Trouble Report Rate - Local Interconnection Trunks
56. Maintenance Average Duration - Resale POTS
57. Maintenance Average Duration - Resale Design
58. Maintenance Average Duration - UNE Loop + Port Combinations
59. Maintenance Average Duration - UNE Loops
60. Maintenance Average Duration - UNE xDSL
61. Maintenance Average Duration - UNE Line Sharing
62. Maintenance Average Duration - Local Interconnection Trunks
63. Percent Repeat Troubles within 30 Days - Resale POTS
64. Percent Repeat Troubles within 30 Days - Resale Design
65. Percent Repeat Troubles within 30 Days - UNE Loop + Port Combinations
66. Percent Repeat Troubles within 30 Days - UNE Loops
67. Percent Repeat Troubles within 30 Days - UNE xDSL
68. Percent Repeat Troubles within 30 Days - UNE Line Sharing
69. Percent Repeat Troubles within 30 Days - Local Interconnection Trunks
70. Invoice Accuracy
71. Mean time to Deliver Invoices
72. Usage Data Delivery Accuracy
73. Usage Data Delivery Timeliness
74. Percent Trunk Performance – Aggregate
75. Percent of Due Dates Missed
76. Change Management Notices Sent on Time

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. Missed Repair Appointments - Resale POTS
9. Missed Repair Appointments - Resale Design
10. Missed Repair Appointments - UNE Loop + Port Combo
11. Missed Repair Appointments - UNE Loops
12. Missed Repair Appointments - UNE xDSL
13. Missed Repair Appointments - UNE Line Sharing
14. Missed Repair Appointments - Interconnection Trunks
15. Invoice Accuracy
16. Mean Time To Deliver Invoices
17. Trunk Group Performance – Aggregate
18. Collocation Percent of Due Dates Missed

APPENDIX C
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, 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 a "black box."
  - 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 λ n 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 description section.

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.

APPENDIX D
Technical Description

We start by assuming 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

Below, we have detailed the basic notation for the construction of the truncated z statistic. 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 = $1,\ldots,L$; 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.

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

$\overline{X}_{2j}$ = The CLEC sample mean of 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.

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

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

$\{y_{jk}\}$ = 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, we can avoid permutation calculations since this statistic will be normal (or Student's t) to a good approximation. For small samples, where we cannot avoid permutation calculations, we have 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 we 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 $\min(n_{1j}, n_{2j}) \le 6$, and

a) $M_j \leq 1{,}000$ (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

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

Rate Measure

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

Ratio Measure

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

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

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.

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

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

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

Mean Measure

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

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

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

Proportion Measure

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

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

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.

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

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

We want a balancing critical value, c_B, so that $\alpha = \beta$.

It can be shown that.

[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.

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

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.

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 transactions are identically distributed within cells while allowing for an analytically tractable solution is:

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

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

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]

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

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

where

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

$$\pi_j^{(1)} = f_j^{(1)}\left(n_j^2 + f_j^{(2)} + f_j^{(3)} - f_j^{(4)}\right)$$
$$\pi_j^{(2)} = f_j^{(1)}\left(-n_j^2 - f_j^{(2)} + f_j^{(3)} + f_j^{(4)}\right)$$
$$\pi_j^{(3)} = f_j^{(1)}\left(-n_j^2 + f_j^{(2)} - f_j^{(3)} + f_j^{(4)}\right)$$
$$\pi_j^{(4)} = f_j^{(1)}\left(n_j^2\left(\tfrac{2}{\psi_j} - 1\right) - f_j^{(2)} - f_j^{(3)} - f_j^{(4)}\right)$$
$$f_j^{(1)} = \frac{1}{2n_j^2\left(\frac{1}{\psi_j} - 1\right)}$$
$$f_j^{(2)} = n_j n_{1j}\left(\tfrac{1}{\psi_j} - 1\right)$$
$$f_j^{(3)} = n_j a_j\left(\tfrac{1}{\psi_j} - 1\right)$$
$$f_j^{(4)} = \sqrt{n_j^2\left[4n_{1j}\left(n_j - a_j\right)\left(\tfrac{1}{\psi_j} - 1\right) + \left(n_j + \left(a_j - n_{1j}\right)\left(\tfrac{1}{\psi_j} - 1\right)\right)^2\right]}$$

Recall that the cell test statistic is given by

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

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

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

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

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 transaction are identically distributed within cells is:

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

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

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

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

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

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

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

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 exhibit 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 we may consider one alternative in which all the δ_j are set to a common non-zero value, and another set of alternatives 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 we have presented can be used to evaluate the impact of different choices of the overall critical value. For each putative choice, we 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 Louisiana 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 we are aggregating over 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.

Corrections

LPSC "Statistical Techniques for the Analysis and Comparison of Performance Measure Data",

Appendix A, page A-5

$$T_j = t_j + \frac{g}{6}\left(\frac{n_{1j} + 2n_{2j}}{\sqrt{n_{1j}\, n_{2j}(n_{1j} + n_{2j})}}\right)\left(t_j^2 + \frac{n_{2j} - n_{1j}}{n_{1j} + 2n_{2j}}\right)$$

Appendix C, page C-8, rate measures section for balancing critical value.

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

APPENDIX E
BST SEEM Remedy Procedure

TIER-1 CALCULATION FOR RETAIL ANALOGUES:

1. Calculate the overall test statistic for each CLEC; z^{T}_{CLEC1} (See Exhibit C)
2. Calculate the balancing critical value(${}^{c}B_{CLEC1}$) that is associated with the alternative hypothesis (for fixed parameters δ, Ψ or ε). (See Exhibit C)
3. If the overall test statistic is equal to or above the balancing critical value, stop here. That is, if ${}^{c}B_{CLEC1} < z^{T}_{CLEC1}$, stop here. Otherwise, go to step 4.
4. Calculate the Parity Gap by subtracting the value of step 2. from that of step 1.; $z^{T}_{CLEC1} - {}^{c}B_{CLEC1}$
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; $ABS((z^{T}_{CLEC1} - {}^{c}B_{CLEC1}) / 4)$. 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. (See Exhibit D)
7. Calculate the payment to CLEC-1 by multiplying the result of step 6 by the appropriate dollar amount from the fee schedule.

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

Example: CLEC-1 Missed Installation Appointments (MIA) for Resale POTS

	n_I	n_C	I_c	MIA_I	MIA_C	z^{T}_{CLEC1}	C_B	**Parity Gap**	Volume Proportion	Affected Volume
State	50000	600	96	9%	16%	-1.92	-0.21	**1.71**	0.4275	
Cell						z_{CLEC1}				
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_{CLEC1}	C_B	**Parity Gap**	Volume Proportion	Affected Volume
State	50000	600	600	5days	7days	-1.92	-0.21	**1.71**	0.4275	
Cell						z_{CLEC1}				
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 SEEM sub-metric in the same quarter.

2. Therefore, calculate monthly statistical results and affected volumes as outlined in steps 2. through 6. for the CLEC Aggregate performance.

3. Calculate the payment to State Designated Agency by sum totaling each months affected volume and multiplying the result by the appropriate dollar amount from the Tier-2 fee schedule.

   So, State Designated Agency payment
   = Affected Volume$_{CLECA}$ for each month in quarter) * $$ 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_{CLECA}	C_B	Parity Gap	Volume Proportion	Affected Volume
Month1	180000	2100	336	9%	16%	-1.92	-0.21	1.71	0.4275	
Cell						z_{CLECA}				
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 obsevations and n_C = CLEC-A observations

Payout for CLEC-A is (99 units) * ($300/unit) = $29,700

If the above example represented performance for each of months 1 through 3 in a calendar quarter, then

Example: CLEC-A Missed Installation Appointments for 1Q00

State	Miss	Remedy Dollars
Month 1	x	$29,700
Month 2	x	$29,700
Month 3	x	$29,700
1Q00		**$89,100**

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	Sample Size	Equivalent 90% Benchmark	Equivalent 95% Benchmark
5	60.00%	80.00%	16	75.00%	87.50%
6	66.67%	83.33%	17	76.47%	82.35%
7	71.43%	85.71%	18	77.78%	83.33%
8	75.00%	75.00%	19	78.95%	84.21%
9	66.67%	77.78%	20	80.00%	85.00%
10	70.00%	80.00%	21	76.19%	85.71%
11	72.73%	81.82%	22	77.27%	86.36%
12	75.00%	83.33%	23	78.26%	86.96%
13	76.92%	84.62%	24	79.17%	87.50%
14	78.57%	85.71%	25	80.00%	88.00%
15	73.33%	86.67%	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.

So, CLEC-1 payment = Affected $Volume_{CLEC1}$ * $$ 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, with five or more observations, CLEC 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 $CLEC_1$ Volume.

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

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

Example: CLEC-1 Reject Timeliness

	n_C	Benchmark	Reject Timeliness$_C$	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 data having failed for three months in a given calendar quarter is being assessed.

* For the applicable commission ordered market penetration adjustment, the fee schedule will be trebled if the CLEC aggregated average transaction volume is greater than 5, but less than 100 for a three month period.