Date Mailed March 2, 2001

BEFORE THE

PUBLIC SERVICE COMMISSION OF WISCONSIN

Investigation Into Ameritech Wisconsin Operational Support Systems	6720-TI-160

FIRST MASTER TEST PLAN EXECUTION DECISION

On November 29, 2000, the Commission issued an interlocutory order in this proceeding, hereinafter the November Order, that tentatively determined to adopt the Master Test Plan (MTP) as set forth in Appendix J to the Second Report of the Temporary Administrative Law Judge, dated October 2, 2000, (Second Report). In addition, the November Order designated the Telecommunications Division Administrator to decide routine and non-controversial matters affecting the execution of the MTP.

This decision's attachment details the statistical methods and principles that KPMG Consulting (KPMG) will apply in executing the MTP. KPMG's proposals, as modified, are adopted for the reasons set forth below.

Under the approved MTP (Page 7), KPMG was to conduct workshops regarding statistical methods and principles. The principal objective of this workshop process was to obtain the views of the parties regarding appropriate statistical methods and principles to apply to evaluating the various performance measures. The workshops were not intended to create a joint decision-making process. The workshops consisted of a face-to-face session on January 18, 2001, and conference calls on January 30 and February 9, 2001. Between sessions, there were additional e-mail exchanges of documents and discussions between and among staff, parties, the facilitator, and KPMG. The workshops have caused KPMG to modify and clarify its original statistical approaches to the MTP. Thus, the workshops accomplished their objective. As discussed further below, two documents were prepared to set forth KPMG's application of statistical methods and principles. The first document elaborates and clarifies "Appendix C Statistical Approach." The second document is entitled, "Discussion of Reporting Certain Statistical Results for the Ameritech-Wisconsin OSS Evaluation."

Another reason for adopting KPMG's revised proposal is that MTP statistical issues were not viewed as possible contested case issues. The MTP provides in "Appendix C: Statistical Approach" as follows:

> **D. Hypothesis Testing**
>
> This test will employ a hypothesis testing approach to frame the analysis of test results. The standard "null" hypothesis will be that Ameritech is performing adequately. The possibility of an error arises if this hypothesis is rejected when it is true (Type I error) or is accepted when it is false (Type II error). An attempt will be made to balance Type I and Type II errors as much as is feasible.

The foregoing part of the MTP from the Second Report was accepted, apparently because of, or at least consistent with, the following entry (Issue 68, referencing Appendix B of the MTP) provided in KPMG's report on closed test issues sent electronically to prehearing conference participants in this docket on September 28, 2000, by Carla Morreale, Manager of KPMG:

Please describe whether any statistical principles, other than those already identified in Appendix C, are being discussed in any state proceeding.	CLOSED 9/15/00: There will be workshops for each state (where appropriate, there may be several states attending one workshop).

By this entry, the parties accepted the use of workshops to understand what statistical principles KMPG intended to employ. The description of the use of workshops as "closing" the issue, and the fact that the statistical issue was never made a contested case issue for hearing in November 2000, are conclusive. If a party, in this case believed that the statistical principles KPMG might use would be inappropriate for whatever reason, it was obliged to identify statistical principles as a contested issue at a point when the Commission could have timely set the matter for contested case hearing.

Based upon the information supplied through the workshop process, the appendix attached hereto, designated as WI-MTP Directive No. 1, shall constitute an operational directive from the Commission to KPMG elaborating upon and clarifying "Appendix C: Statistical Approach" overall, and, specifically, "C. Sampling" and "D. Hypothesis Testing."

KMPG will do additional work in two areas beyond that which it originally explained in the MTP. First, when sample sizes are met but unusual or inconsistent data exist or when sample sizes are not met, KPMG will calculate the *p*-value analogues for several non-zero differences, thereby permitting the CLECs to evaluate the results in further detail. To evaluate whether unusual or inconsistent data exist, CLECs at least can do their own calculations for error levels where a performance measure is a rate and most performance measures are expressed in both a rate and an interval format. Second, KPMG will describe in its reports further analyses that it undertakes when unusual conditions occur with respect to an interval-type performance measures. The intention of this decision is that (1) parties be able to understand how KPMG reached its tentative conclusions, especially in the situation where a sample size requirement is not met or unusual or inconsistent data compel further analyses, and (2) the test not be burdened by an unnecessarily large test bed or the re-calculation of interval measures that involve normative judgments not previously argued as necessary for the test.[1]

KPMG's statistical methods will disaggregate samples for various products and services based on certain characteristics. Those disaggregated samples, however, will be smaller (35) than the full samples (138) that are used at the aggregate level. To use full samples (138) instead of smaller samples (35) at the disaggregate level as proposed by the CLECs, would add additional cost to the study without a corresponding benefit, according to KPMG.

The full scope of KPMG's further efforts at this time is stated in the attached directive. All proposals made in the workshop process described above and not incorporated in the directive are deemed rejected as infeasible in terms of cost or the purported benefit gained, or untimely for failure to present as a contested issue for hearing.

This determination does not bind the Commission's determination on any statistical issue inherent in the contested issues regarding remedy plans that are being briefed at this time.

This decision is reviewable pursuant to Wis. Admin. Code § PSC 2.66, as provided in the November Order. This decision is issued pursuant to authority and jurisdiction provided in the November Order, WIS. STAT. § 196.02(1), 196.37(2), 196.219, Wis. Admin. Code ch. PSC 1, and other provisions of Wis. Stat. chs. 196 and 227, and Wis. Admin. Code ch. PSC 2 as may be pertinent hereto.

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[1] CLECS also expressed a desire for additional manual order submission, but then withdrew this proposal. This proposal suggested full samples on further desegregations for both manually and electronically submitted orders and tests for field dispatches would unduly burden the test and cause unnecessary delays. In Wisconsin, about 90% of the current orders are submitted electronically. The cost of testing manual order submissions beyond that already in the MTP would likely have outweighed any benefits and created unnecessary and costly delays. Proposed testing of field installations or repairs probably also would not have been practical because test blindness could not be effectively maintained. In addition, some discussion has suggested that the cost would likely be excessive relative to the benefit to the test.

Order

This decision is effective upon mailing. WI-MTP Directive No. 1 attached hereto as an appendix is adopted to direct KMPG in its administration of the Wisconsin MTP.

Dated at Madison, Wisconsin, ______________________________________

For the Commission:

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David Albino
Administrator
Telecommunications Division

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Attachment: WI-MTP Directive No. 1

KPMG Consulting Statistical Methodology

This attachment sets forth the detail of the statistical principles and methodologies that KPMG has prepared and represents that it will apply in its execution of the MTP. The main directive obliges KPMG (regardless of the grammatical constructions and self-references used in the attachments) to execute the MTP using statistical principles and methodologies consistent with its representations herein. Any statement in this attachment that recites or relates to a KPMG operational practice in its business that is relevant to the conduct of the MTP should be construed as factual information supporting KPMG's position set forth herein. Any statement, which indicates a KPMG belief or consideration with respect to a particular matter, has been construed as a factual representation of KPMG's viewpoint supporting KPMG's recommendation, as adopted by this directive. In all events, this attachment should be construed consistent with the principal text of the directive and with a view towards efficient and expeditious conduct of the MTP.

Proposed Statistical Approach

A. Introduction

This appendix describes the statistical approach for designing, implementing, and evaluating Ameritech-Wisconsin performance where quantitative evaluation criteria are to be applied in the test.

There are two types of standards that will be used to evaluate performance:

- Parity standards
- Benchmark standards

A parity standard means that the wholesale process should be completed in an equivalent time to the retail analog (e.g., in the same amount of time or with the same level of accuracy as the retail analog). A benchmark standard is often used when no comparable retail analog exists. The benchmark is a fixed target, such as "90% of address verification requests should be returned within 9 seconds."

It should be noted that there will be test evaluation criteria for which there are no established standards or the results are not quantitative. In these cases, KPMG Consulting will use its professional judgment to evaluate the outcome. When such evaluation criteria have quantitative results and if it is appropriate to do so, KPMG Consulting will use applicable statistical testing, as described in this appendix, to inform its judgments.

The next section describes the KPMG Consulting methodology for determining sample sizes and evaluating test results. These statistical methods and standards will guide the design and conduct of the test, and facilitate evaluation of the results.

B. Statistical Methodology

In this section, KPMG Consulting reviews the basic framework and specific evaluation methods that will guide the conduct of the statistical design and analyses for the test. Some of the testing that is done is functional testing only; consequently, no statistical evaluation is necessary and therefore will not be conducted. This section addresses the evaluation methods and techniques to use in establishing sample size targets for those portions of the test for which statistical evaluation methods are appropriate.

1.0 Null and Alternative Hypotheses

For the purposes of this test, a standard statistical hypothesis testing framework will be used. The two mutually exclusive hypotheses that will be used in the Ameritech-Wisconsin test are:

- Null Hypothesis: Ameritech-Wisconsin is meeting or exceeding the standard.
- Alternative Hypothesis: Ameritech-Wisconsin is not meeting the standard.

In order to calculate target sample sizes and error levels, an exact specification of these hypotheses are framed. The specification of these hypotheses will depend on the comparison being made. For the Ameritech-Wisconsin test, there are four possible comparisons:

- Comparing two averages to see whether they are the same (parity tests for intervals)
- Comparing two rates to see whether they are the same (parity tests for rates)[2]
- Comparing an average to a standard (benchmark tests for intervals)
- Comparing a rate to a standard (benchmark tests for rates)

An exact specification of the Null Hypothesis is easily made for each of these comparisons, because the Null hypothesis is always that Ameritech-Wisconsin is just meeting the standard. For example, for a 90% on-time benchmark standard, the Null Hypothesis is that Ameritech's performance is exactly 90% on-time. This specification of the Null Hypothesis allows for an exact calculation of one of the possible errors, called Type I error (to be discussed below). The Alternative Hypothesis also needs to be exactly specified, in order to calculate the other type of error, called Type II error. These errors and the Alternative Hypotheses are discussed below.

2.0 Test Error Levels

In making the test comparisons involving parity tests, there are two possible types of error:

- Ameritech is found to fail the standard, when in fact Ameritech is meeting the standard (Type I error)
- Ameritech is found to be meeting the standard, when in fact Ameritech is failing the standard (Type II error)

The chance of making the first error above is more formally stated as the probability of rejecting the null hypothesis, conditioned on the assumption that it is true. It is often called the Type I error level or "α" in statistics. The Type I error level is set at $\alpha = 0.05$ for Ameritech-Wisconsin test, and assumes the null hypothesis above.

A Type II error is the chance of failing to reject the null hypothesis when in fact it should be rejected. It is the chance of making the second error above. This probability is typically referred to as "β." For the purpose of the Ameritech-Wisconsin test, we target the samples so that β is at most 5% for "aggregated" metrics and β is at most 50% for "disaggregated" metrics.[3] An aggregated metric can be thought of as a metric calculation using all orders or items to be included in a numbered metric in the Wisconsin carrier-to-carrier performance measures. For example, consider a metric "Percent Mechanized Completions Returned Within One Day Of

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[2] Rates are usually defined as any ratio between two numbers. However, for the purposes of most of the discussion below (except where footnoted), we define them here as proportions, or the ratio between the number of successes (or failures) and the total number of attempts. Proportions always vary between zero and one. Rates do not have such a restriction.

[3] KPMG Consulting will use non-statistical tests when testing only for functionality. This sort of test has no Type I or Type II error levels associated with it.

Work Completion". The calculation for this aggregated metric includes all mechanized orders where work was completed. A disaggregated metric can be thought of as a specific reporting dimension specified in the "disaggregation" section of a numbered metric in the Wisconsin carrier-to-carrier performance measures. For example, in a metric "Percent Firm Order Confirmations (FOCs) Returned Within "X" Hours", one disaggregation might be Electronically submitted, Simple Res. And Bus." Using these probabilities and a specific alternative hypothesis, we can calculate sample size for the test[4]. First, however, we discuss the evaluation methods for the test.

3.0 Statistical Evaluation Methods

In general, KPMG Consulting will use the Type I error level of 5% to evaluate test results. This section describes the specific methods that will be used in this evaluation.

For parity tests for intervals, KPMG will use a modified Z test when the sample size is greater than 100. This test assumes that, under the Null Hypothesis, Ameritech and the test CLEC have equal variances. It also assumes a large enough sample size that the parametric assumptions of the test can be ignored.[5] For small samples (when one sample is less than 100), a permutation test will be used. A permutation test does not make implicit assumptions about the probability distribution of the underlying data.

For parity tests for rates, a Hypergeometric test will be used when sample sizes are moderately large (less than 10,000) for both Ameritech and the P-CLEC.[6] This test allows for an exact measurement of the statistical probabilities for Type I and Type II errors. For extremely large sample sizes, a Binomial test is used. This test assumes that the Ameritech proportion is exact, but will not affect the test results for large samples.[7]

For benchmark tests for intervals, a t-test will be used for sample sizes above 100, when the benchmark involves an average value. For sample sizes below 100 in which the benchmark involves an average value, a Binomial test will be used, and the Null Hypothesis will be that the median of the data equals the benchmark. For benchmark tests for rates, a Binomial test is used.

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[4] We note that practical limitations on the test will sometimes prevent reaching such target sample sizes for all possible disaggregations of metrics (certain high capacity services, for example) and in some cases such levels of disaggregation will be outside of the scope of the test. In cases where the target sample sizes cannot be met because of test constraints, any limitations on the strength of the conclusions that can be drawn will be noted in reporting the results.

[5] In particular, the modified Z test assumes the data comes from a particular probability distribution called the Normal distribution. This assumption is practical for large sample sizes.

[6] In the rare case that the rate is not a proportion, KPMG Consulting will use a Poisson distribution with the ILEC mean to test for parity.

[7] KPMG Consulting will calculate the Hypergeometric test whenever possible, which may mean the calculation will be performed for sample sizes above 10,000. For sample sizes in which the Binomial test is used, the assumption of the fixed Ameritech proportion will not affect the outcome, except in extremely rare circumstances, and KPMG Consulting will note if that actually occurs.

This allows for an exact measurement of the statistical probabilities for Type I and Type II errors.[8]

4.0 Sample Size Determinations

In this section, we discuss the methodology for determining sample size. In order to determine the sample size, we need to know or assume the α and β error levels, a particular alternative hypothesis, the statistical test to be performed, and the distribution of the data upon which the test is being performed. We describe calculations for each test, but for a single alternative hypothesis. For the Ameritech-Wisconsin test, the particular alternative will depend upon the type of test, and we discuss the alternative to be used for each test here.

Below, we make target sample size calculations assuming α=5% and β equals 5 or 50%. We would like to calculate sample sizes based upon the test that will be used to evaluate the results. However, this is not always practical. For parity tests for rates, we use the Binomial test to calculate sample sizes, because we would need to know the Ameritech-Wisconsin retail count to use the Hypergeometric test, and because the result is the same as long as the Ameritech-Wisconsin count is high. For parity test for intervals, we use a modified Z test to calculate sample size, because with a permutation test we would have to assume a specific probability. We also use a Z test in calculating the sample size in benchmark tests for intervals, because it allows a calculation without any assumptions concerning the standard deviation, and it allows us to maintain the same alternative hypothesis for different sample sizes.

For parity tests for rates, we use 90% as the Null Hypothesis and 80% as the Alternative in computing sample size. For α=β=5%, the sample size is 134. For α=5% and β=50%, the sample size is 33. These sample sizes are determined by using standard Binomial probabilities and assume a large enough ILEC sample size that the ILEC proportion can be considered fixed.[9]

For benchmark tests for rates, we use 90% as the assumed benchmark and 80% as the alternative. For α=β=5%, the sample size is 134. For α=5% and β=50%, the sample size is 33. These sample sizes are determined by using standard Binomial probabilities.[10]

For parity tests for intervals, we use an alternative hypothesis that a difference of 0.28 standard deviations or more exists. In this case, the sample size, when α=5% and β=5%, is $138n_{ILEC}/(n_{ILEC}-138)$ where n_{ILEC} is the number observations at Ameritech-Wisconsin. For α=5% and β=50% for parity measures, the sample size is $35n_{ILEC}/(n_{ILEC}-35)$. Because we assume the ILEC sample sizes are large, these figures reduce to 138 and 35 for β=5% and β=50%, respectively.

For benchmark tests for intervals, the sample sizes are also 138 and 35, respectively, for β=5% and β=50%, respectively. These calculations assume an alternative hypothesis that the

[8] There do not appear to be any benchmarks associated with rates that are NOT proportions. Thus a Poisson-type test is not necessary here.

[9] Note that these sample sizes do not apply to rate tests where the rate is not a proportion.

[10] These calculations also apply to benchmark tests for intervals, where the test is determined to be Binomial with a 90% standard.

average is .28 standard deviations below the benchmark. If the benchmark test assumes a particular percentage, then the analogous 'benchmark test for rates' sample size will be used.

5.0 Technical Calculations

In this section, we detail the calculations performed in order to determine the sample sizes for intervals presented above. This section is technical and assumes some knowledge of statistics.

First consider the case of β=α=5% for interval measures for parity. For this scenario, we use the modified Z, assume normality, and calculate β at .28 standard deviations from the ILEC mean. As defined above, the modified Z test statistic is

$$z = \frac{\overline{X}_{CLEC} - \overline{X}_{ILEC}}{\sqrt{\sigma^2_{ILEC}\left[\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}}\right]}}$$

In a one-sided test with α=5%, we reject when z>1.645 and accept the Null when z<=1.645. Since we want to find the sample size where β=5%, this translates to finding the sample size where the P(z<=1.645)=.05.

Thus, we have

$$P_{(\mu_{CLEC} - \mu_{ILEC} - .28\sigma = 0)}\left(\frac{\overline{X}_{CLEC} - \overline{X}_{ILEC}}{\sqrt{\sigma^2_{ILEC}\left[\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}}\right]}} < 1.645\right) = .05$$

, where the subscript to the P indicates the conditioning. Adding and subtracting a term, we get

$$P_{(\mu_{CLEC} - \mu_{ILEC} - .28\sigma_{ILEC} = 0)}\left(\frac{\overline{X}_{CLEC} - \overline{X}_{ILEC} - .28\sigma_{ILEC}}{\sqrt{\sigma^2_{ILEC}\left[\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}}\right]}} + \frac{.28\sigma_{ILEC}}{\sqrt{\sigma^2_{ILEC}\left[\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}}\right]}} < 1.645\right) = .05$$

Now, the first term is a standard Normal variable, because we have assumed Normality of the data, the Alternative hypothesis, and we assume the variance is the ILEC variance. Thus, substituting Z for a N(0,1) variable, we get

$$P\left(Z + \frac{.28\sigma_{ILEC}}{\sqrt{\sigma^2_{ILEC}\left[\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}}\right]}} < 1.645\right) = .05 \qquad (1)$$

More algebra gives us

$$P\left(Z < 1.645 - \frac{.28\sigma_{ILEC}}{\sqrt{\sigma^2_{ILEC}\left[\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}}\right]}} \right) = .05 \qquad (2)$$

Now we know (from a standard Normal distribution) that P(Z<-1.645)=.05, so we can set the right hand side of the equation equal to –1.645 and solve. The equation becomes

$$3.290 = \frac{.28\sigma_{ILEC}}{\sqrt{\sigma^2_{ILEC}\left[\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}}\right]}} \Rightarrow \qquad (3)$$

$$10.8241\left(\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}}\right) = .0784 \Rightarrow$$

$$138 = \frac{n_{ILEC}n_{CLEC}}{n_{ILEC} + n_{CLEC}} \Rightarrow$$

$$138\frac{n_{ILEC} + n_{CLEC}}{n_{ILEC}} = n_{CLEC} \Rightarrow$$

$$138 = n_{CLEC}\left(1 - \frac{138}{n_{ILEC}}\right) \Rightarrow$$

$$n_{CLEC} = \frac{138 n_{ILEC}}{n_{ILEC} - 138} \qquad (4)$$

Next, consider the case where β=50% and α=5%. The calculations are the same as above, except that the right hand side is .5. Since P(Z<0)=.5, equation (3) becomes

$$1.645 = \frac{.28\sigma_{ILEC}}{\sqrt{\sigma^2_{ILEC}\left[\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}}\right]}}$$

After some algebra, we get

$$n_{CLEC} = \frac{35 n_{ILEC}}{n_{ILEC} - 35}$$

Note that if we are comparing the CLEC value to a benchmark instead of an ILEC value, the calculations above stay the same, except the terms with n_{ILEC} disappear. The result is that n_{CLEC}=138 and 35 for β=5% and β=50%, respectively.

Discussion of Reporting Certain Statistical Results for the Ameritech-Wisconsin OSS Evaluation

A. Introduction and Background

Certain parties have noted that the power of the statistical tests suffers when the target sample sizes are not reached or when the assumed probability distributions are not observed. In this paper, KPMG Consulting discusses statistical analyses and results reporting in the final report for the Ameritech-Wisconsin OSS evaluation such that all interested parties may better understand the reasons for KPMG Consulting's results and preliminary evaluations[11].

As discussed in the statistical appendix, there are two types of standards that will be used to evaluate performance; 1) Parity standards and 2) Benchmark standards. These standards lead to four types of comparisons:

- Comparing two averages to see whether they are the same (parity tests for intervals)
- Comparing two rates to see whether they are the same (parity tests for rates)[12]
- Comparing an average to a standard (benchmark tests for intervals)
- Comparing a rate to a standard (benchmark tests for rates)

KPMG Consulting shall use the following statistical hypotheses for performing statistical tests related to these comparisons:

- Null Hypothesis: Ameritech-Wisconsin is meeting or exceeding the standard.
- Alternative Hypothesis: Ameritech-Wisconsin is not meeting the standard.

When reporting results of testing these hypotheses, KPMG Consulting typically reports the test result (average or rate), the statistical test conclusion, and the p-value. The p-value gives the probability of obtaining the observed test result (or something more extreme), conditioned on the assumption that the Null Hypothesis is true. In the Ameritech-Wisconsin test, KPMG Consulting has set error levels such that a p-value of less than 5% leads to rejection of the Null Hypothesis and a p-value of more than 5% leads to an adoption of the Null Hypothesis.

KPMG Consulting is comfortable with the methodology outlined in the statistical appendix. For most test criteria, sample size targets are met. In some extraordinary instances, sample size targets may be met, but a re-examination of the test results will be nonetheless necessary, due to

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[11] The Commission is responsible for the final evaluation of the test results.

[12] Rates are usually defined as any ratio between two numbers. However, for the purposes of most of the discussion below (except where footnoted), we define them here as proportions, or the ratio between the number of successes (or failures) and the total number of attempts. Proportions always vary between zero and one. Rates do not have such a restriction.

unusual data or test conditions. In other cases, sample size targets are not met. In such cases, further analysis may be necessary.

When sample sizes are met, KPMG uses different techniques for evaluating tests of averages as compared to tests of rates when determining whether unusual data or test conditions exist even when sample sizes are met. In the next section KPMG describes additional information it shall include in its Final Report about its evaluation of unusual data or test conditions.

When sample size goals are not met, a p-value of less than 5% still indicates strong statistical evidence that the Null Hypothesis is not true, but a p-value of more than 5% may not indicate strong evidence that the Null Hypothesis is true. In the next section, KPMG Consulting describes additional information it shall include in the Final Report that should allow parties to understand individual conclusion strength, when that conclusion is the adoption of the Null Hypothesis.

B. Proposed Reporting Dimensions

KPMG Consulting shall report several values of an analogue of the p-value for results where the conclusion is to adopt the Null Hypothesis and where the sample size targets are not met or unusual data conditions are identified. In addition, KPMG Consulting shall report on other analyses relevant to the test conclusions. In this section, the p-value analogue is discussed in some detail along with some of the other analyses that KPMG Consulting shall report.

As stated above, the p-value is the chance of observing the test result (or something more extreme), given that the Null Hypothesis is true. The obvious analogue of this is the chance of observing the test result, given that the Null Hypothesis is false. The p-value is always calculated assuming the true value is the borderline between meeting and not meeting the standard. For example, if the standard is at least 95% on time, the p-value is calculated assuming exactly 95% on time. If the standard is parity, the p-value is calculated assuming exact equality between Ameritech retail and the test CLEC.

For calculating an analogue for the p-value that is related to failing to meet the standard, there is no obvious assumption about the true on-time rate. Instead, we could calculate the analogue for any value below the standard. Because of this ambiguity, KPMG Consulting shall calculate the analogue for several different values.

For rate tests, KPMG Consulting shall calculate the analogue for various percentages below the standard. For example, for a 95% within 2 hours on-time standard, KPMG Consulting may calculate the analogue for 50, 60, 70, 80, and 90 percent. When sample size targets are met but KPMG has found unusual data or test conditions, it will also provide this sensitivity analysis. Since KPMG Consulting will give the counts and the test result for rate tests, any interested party could calculate additional p-value analogues using the Binomial or Hypergeometric distribution for either small samples or when the sample sizes are met.

For interval tests with small sample sizes, KPMG Consulting shall calculate the analogue for several non-zero differences. The actual range of differences used will depend on the measurement under consideration. When sample sizes are met, a concern still remains that there may be unusual data or test conditions. As most performance measure are expressed in both rate and interval formats, KMPG can use the rate test data in identifying whether it believes unusual data or test conditions exist. For example Performance Measure 43 is the Average Installation Interval while Performance Measure 44 is Percent Installations Completed Within 20 Calendar days. This is a case where two similar measures are simultaneously generated from the same set of transactions. The results of rate and interval tests should be consistent. When the results of rate and interval tests differ further investigation would be carried out. When sample sizes are met, KMPG shall calculate the analogue for several non-zero differences in cases where results differ between rate and interval tests, and these differences are not simply due to a basic misalignment of the rate and interval tests. The analogue will also be calculated for the limited number of measures where similar rate data does not exist.

In addition to the p-value analogues discussed above, KPMG Consulting may also perform other analyses on the test data to understand the generation of a particular statistical conclusion. These analyses can take on numerous forms, depending highly on the specifics of the test and associated data collection.

An non-exhaustive list of analyses KPMG Consulting shall perform are:

- Consideration of the removal or rework of certain questionable data points. KPMG Consulting may reexamine the data and find that the result may have occurred because of an unrepresentative anomaly in several data points. KPMG Consulting may decide to redo or delete the anomalous transactions, and thereby reach a final conclusion.

- Analysis of the categorical mix of data points (e.g., order types) and determination of the effect on the outcome of the statistical test.

- Consideration of the reasonableness of certain assumptions used in the calculations. This issue arises when there is no clearly defined calculation or metric. For example, in calculating pre-order response time, time-outs are typically excluded. However, a time-out might be defined as a pre-order query that receives no response after a minute or it might instead be defined as a pre-order query that receives no response after three minutes. Pre-order response time will be higher if the second definition is used (though, system down time will be lower).

- Examination of the results of the statistical test of similar measures simultaneously generated from the same set of transactions. The results of those measures may shed light on the measure at issue.

- Analysis of the distribution of the test CLEC and Ameritech data to determine whether the distributional assumptions of the statistical test were satisfied.

For all analyses performed, KPMG Consulting shall report the results if such results are directly and principally applied in reaching the conclusions for a test criterion.

C. Summary

As previously stated, KPMG Consulting believes that the statistical methodology outlined in the proposed statistical methodology is a sound and complete one. While circumstances may necessitate the application of further analyses in certain cases, KPMG Consulting believes these instances will be infrequent. In these particular cases, KPMG Consulting shall report the result of calculating an analogue of the p-value, whenever the test sample size is below the target sample size and the statistical conclusion is to adopt the Null hypothesis. In addition, KPMG Consulting shall report the results of any further analyses, if conclusions are affected. These analyses may involve a number of different techniques, including, but not limited to, excluding outliers, analyzing the categorical mix of data points, and considering assumptions concerning standards.

AMERITECH WISCONSIN
by
Mr. Michael I. Paulson
722 North Broadway, 14th Floor
Milwaukee, WI 53202-4396
(PH: 414-270-4557 / FAX: 414-270-4553)

AT&T COMMUNICATIONS OF WISCONSIN, INC.
by
Mr. Phillip Uekert
44 East Mifflin Street, Suite 600
Madison, WI 53703-2877
(PH: 608-259-2223 / FAX: 608-259-2203)

SPRINT COMMUNICATIONS COMPANY L.P.
by
Mr. Ken Schifman
8140 Ward Parkway
Kansas City, MO 64114
(PH: 913-624-6839 / FAX: 913-624-5504)

GTE NORTH INCORPORATED
by
Mr. Paul R. Verhoeven
State Manager – Regulatory Affairs
100 Communications Drive
P.O. Box 49
Sun Prairie, WI 53590-0049
(PH: 608-837-1771 / FAX: 608-837-1733)

KIESLING CONSULTING, LLC
by
Mr. Scott Girard
6401 Odana Road
Madison, WI 53719
(PH: 608-273-2315 / FAX: 608-273-2383)

WISCONSIN STATE TELECOMMUNICATIONS ASSOCIATION
by
Mr. Nick Lester
6602 Normandy Lane
Madison, WI 53719
(PH: 608-833-8866 / FAX: 608-833-2676)

WISCONSIN DEPARTMENT OF JUSTICE
by
Mr. Edwin J. Hughes
Assistant Attorney General
123 West Washington Avenue
P.O. Box 7857
Madison, WI 53707-7857
(PH: 608-264-9487 / FAX: 608-267-2778)

MCI WORLDCOM, INC.
by
Ms. Joan Campion
205 North Michigan Avenue, Suite 3700
Chicago, IL 60601
(PH: 312-470-4784 / FAX: 312-470-4929)

MCLEODUSA TELECOMMUNICATIONS SERVICES, INC.
by
Mr. Dan M. Lipschultz
Senior Regional Counsel
400 South Highway 169, Suite 750
Minneapolis, MN 55426
(PH: 952-252-5002 / FAX: 952-252-5299)

RHYTHMS LINKS, INC.
by
Mr. Craig Brown
Assistant General Counsel
Rhythms Links, Inc.
9100 East Mineral Circle
Englewood, CO 80112
(PH: 303-876-5335 / FAX: 303-476-2272)

CHARTER COMMUNICATIONS
by
Mr. James C. Rice
440 Science Drive, Suite 302
Madison, WI 53711
(PH: 608-238-9690, ext. 224 / FAX: 608-238-9881)

TIME WARNER TELECOM
by
Ms. Pamela H. Sherwood
VP of Regulatory Affairs, Midwest Region
4625 West 86th Street, Suite 500
Indianapolis, IN 46268
(PH: 317-713-8977 / FAX: 317-713-8923)

KMC TELECOM, INC.
by
Mr. Mark A. Ozanick, Regulatory Analyst
1755 North Brown Road
Lawrenceville, GA 30043
(PH: 678-985-6264 / FAX: 678-985-6213)

TDS METROCOM
by
Mr. Nicholas D. Jackson
1212 Deming Way, Suite 350
Madison, WI 53717-1965
(PH: 608-663-3350 / FAX: 608-663-3340)

CHORUS NETWORKS, INC.
by
Ms. Angela Keelan
8501 Excelsior Drive
Madison, WI 53717
(PH: 608-826-4710 / FAX: 608-826-4300)

TDS METROCOM, TIME WARNER TELECOM,
RHYTHMS NET CONNECTIONS, KMC TELECOM,
CORECOMM
by
Mr. Peter L. Gardon
Reinhart, Boerner, Van Deuren, Norris & Rieselbach, s.c.
P.O. Box 2018
Madison, WI 53701-2018
(PH: 608-229-2200 / FAX: 608-229-2100)

CITIZENS' UTILITY BOARD
by
Ms. Mary Wright, Attorney
Cullen, Weston, Pines and Bach
122 West Washington Avenue, Suite 900
Madison, WI 53703
(PH: 608-251-0101 / FAX: 608-251-2883)

COVAD COMMUNICATIONS COMPANY
by
Ms. Felicia Franco-Feinberg, Attorney
8700 West Bryn Mawr, Suite 800 South
Chicago, IL 60631
(PH: 312-596-8666 / FAX: 312-596-8386)

MPOWER COMMUNICATIONS
by
Mr. David McGann
Regional Vice President for Legal and Regulatory Affairs
Tower 2, 5^{th} Floor
1701 West Golf Road
Rolling Meadows, IL 60008
(PH: 847-635-5362 / FAX: 847-545-1176)

PUBLIC SERVICE COMMISSION OF WISCONSIN
(Not a party, but must be served)
610 North Whitney Way
P.O. Box 7854
Madison, WI 53707-7854

Courtesy List:

Ms. Nancy Weber Atkinson
Illinois Commerce Commission
160 North LaSalle, Suite C-800
Chicago, IL 60601
(PH: 312-814-4078 / FAX: 312-814-1818)

Mr. Clark Stalker
AT&T Corporate Center
222 West Adams Street, Suite 1500
Chicago, IL 60606
(PH: 312-230-2653 / FAX: 312-230-8211)

Mr. David J. Hanson
Michael, Best & Friedrich
One South Pinckney Street, #700
P.O. Box 1806
Madison, WI 53701-1806
(PH: 608-257-3501 / FAX: 608-283-2275)

Mr. Niles Berman
Wheeler, Van Sickle & Anderson, S.C.
25 West Main Street, Suite 801
Madison, WI 53703-3398
(PH: 608-441-3824 / FAX: 608-255-6006)

Ms. Joan L. Volz
13525 – 265 Street
Welch, MN 55089
(PH: 651-490-1649 / FAX: 651-490-7579)

Docket 6720-TI-160

Mr. Thomas J. O’Brien
General Counsel
CoreComm Inc.
450 West Wilson Bridge Road
Worthington, OH 43085
(PH: 614-430-5101 / FAX: 614-847-4393)
thomas.o’brien@corecomm.com

Mr. Mark Jenn
Manager, Federal Affairs
TDS Telecom
P.O. Box 5158
Madison, WI 53705-0158
(PH: 608-664-4196 / FAX: 608-664-4184)