NRSC 4th Quarter 2004 Meeting
March 9, 2005
Washington DC

Opening Remarks and Introductions

Points Noted:

Archie McCain, NRSC Chair, BellSouth, welcomed NRSC participants and thanked Bell Labs for hosting the meeting (**Attendee List is Attachment 1**). He reviewed the meeting agenda noting that this will be the last quarterly NRSC report based on outage data submitted to the FCC under Part 63.100 rules. The agenda was accepted with no changes. As the new Chair of the NRSC, Mr. McCain then presented the agenda and his views of the NRSC. He noted that he believes the NRSC is the premiere forum for non-competitive cooperation between the industry, regulators, and citizens for improving network reliability. He would like to see the NRSC serve as a catalyst to improve network reliability and security by reaching out to the FCC, other federal agencies and departments, and to state regulators. He would also have the NRSC reach out to the wireless and cable sectors of the industry, as well as to the supplier community, because only by having all the significant players at the table can we improve reliability.

Fourth Quarter 2004 Quarterly Report

Points Noted:

William Klein, ATIS, reviewed the 4Q04 quarterly report (**Attachment 2**).

In discussing the results of the last outage report, Mr. Klein noted that the one outage classified as "Other" this quarter was the result of circuit packs in collocation space being removed from the rack by thieves. Whitey Thayer, FCC, noted that at a recent meeting of an NRIC Focus Group it was reported that this was an increasing problem in the New York City area. Other participants noted that activity of this type was also being experienced in their operating areas.

Mr. McCain noted that historically there have been a number of outage categories where either the frequency or outage index exhibited an increasing trend, yet in this report there was only one. He thought this ironic now that the Section 63.100 rules are no longer in effect.

Rick Canaday, AT&T; John Chapa, SBC; Jim Runyon, Lucent; Jay Bennett, Telcordia; and Robin Howard, Verizon, volunteered to assist Mr. Klein to draft the conclusion for this final reporting under the Section 63.100 rules.

Mr. Klein noted that a number of comments had been provided regarding the categorization of outages for the third quarter of 2004. The disposition of these comments could impact the results that were presented in the 3Q04 report. Mr. Klein will review those changes shortly and will send them to the Data Team so that any changes can be included in the 2004 NRSC Annual Report.

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Fourth Quarter 2004 Macro-Analysis Report

Mr. Klein also noted that several proposed changes to the categorization of outages in the fourth quarter of 2004 had just recently been received. Those changes that had a direct impact on the 4Q04 report have been incorporated in the report; other proposed changes will be reviewed with the Data Team and, if accepted, will be incorporated into the database for inclusion in the NRSC Annual Report.

Agreement Reached:

The NRSC agreed to accept the 4Q04 macro-analysis report, to include any minor changes necessary as the result of the recently received comments, and to include the conclusion to the report being developed by the previously identified team.

FCC Report

Points Noted:

Kent Nilsson, FCC, noted that with its new reporting system the FCC had fewer than expected "hiccups." He noted, although there have only been four weeks of "final" reports, the FCC had already identified some areas of significance that John Healy would discuss in his presentation. John Healy, FCC, then presented his Analysis of Network Outage Reports (**Attachment 3**).

Mr. Healy noted that the FCC was seeking comments on possible improvements to the Network Outage Reporting System (NORS). These improvements included the following:

Addition of NORS Criterion Field – this field would be used by the carrier to indicate under what criteria the report was being filed. It was envisioned that this would be a pull-down menu. A list of the fields for this menu is included in the presentation. One question posed was: because a report may be submitted for a number of reasons, would it be possible to indicate multiple criteria? John responded that only the primary reason could be indicated.

NORS Handling of Withdrawn Reports – because fields cannot be changed on withdrawn reports, logical inconsistencies arise which require direct contact between the FCC and the carrier to resolve. The FCC presented two possible solutions to this problem: (1) allow all fields to be changed on a withdrawn report; or (2) have carriers submit an Initial Report to correct fields and then withdraw it. As regards item (1), a question was asked: if an initial report is changed prior to being withdrawn, is it a new report? John responded that, no, it would be considered as a revision to the initial report. There was general agreement that

solution (2) could cause more problems than it might resolve. For instance, John Chapa, SBC, noted that he would be open to changes, but would need access to the source code in order to change SBC's internal systems; otherwise this change could cause chaos.

Placing an NCS Phone Number of the NORS Notification Template – this would be provided for information only, for those instances when it would be necessary to contact NCS. It was noted that the addition of this telephone number could be confusing, leading some employees to believe there was an obligation to contact NCS on all outages.

Mr. Healy also discussed other possible changes such as adding a column for incident date and seeking input on how the FCC should get NORS-related information out to the industry. He then presented a number of charts based on the data to date, to include;

- Percent of Reports by Notification Date
- Percent of Reports per Week
- Percent of All Notifications Eventually Withdrawn
- Percent of Outages by Reason
- Outages Reportable Using 900,000 User-Minutes (Wireline) Criterion
- Percent of DS3 Simplex Outages by Outage Date
- Number of DS3 Affected for DS3-Simplex Outages
- DS3 Outages by Outage Week
- E911 Outages by Notification Date

As regards E911 outages, Mr. Healy noted that they appear to be increasing over the last few weeks and that 56% involved Phase II failures, most of which were planned outages. It was noted that the use of the word "failure" is confusing when addressing a planned outage, unless there was a failure of the upgrade procedure. Kathleen O'Reilly, consumer representative, asked if upgrades were being designed to avoid outages. Karl Rauscher, Bell Labs, noted that carriers constantly encourage suppliers to improve these processes, which are very difficult to achieve. Ms. O'Reilly asked if there was data to show this improvement. Mr. McCain responded that this was different for each industry segment. He stated that planned wireline outages have been driven below 15 seconds on average, but other segments need to be helped to do the same.

On other items, there was discussion, but no resolution, on whether a DS3 simplex event that goes "hard" should be considered one or two outages. The FCC noted that this is an area in which it needs input from the industry. It was noted that the FCC had presented all of its data as percentages and a question was asked regarding whether there there some reason not to provide actual numbers? The FCC responded that it did not see it necessary to provide actual numbers at this time; it is concerned that actual numbers in the public domain may be misinterpreted.

The FCC also suggested possible NRSC sub teams to address the findings presented in its report. These included an Outage Reporting Advisory Team, a DS3-Simplex Team, and an E911 Team. Mr. McCain noted that the NRSC would take these recommendations under advisement and inform the FCC of its decision(s).

Adjournment

Points Noted:

Mr. McCain noted the NRSC Industry members would discuss the formation of sub-teams during the industry members meeting following this NRSC meeting.

Karl Rauscher thanked attendees from the FCC for their presentation.

Mr. McCain encouraged NRSC participants to share NRSC meeting materials as appropriate within their respective companies and noted the next NRSC meeting is June 22, 2005 at Bell Labs Network Reliability & Security Office in Washington, DC.

Mr. McCain adjourned the meeting at 12:05 PM.

NRSC 4Q04 Meeting
March 9, 2005
Washington DC

Attendees:

Archie McCain, BellSouth
Bill Klein, ATIS
Karl Rauscher, Lucent
Whitey Thayer, FCC
Todd Miller, Qwest
Tom Goode, ATIS
John Chapa, SBC
Rick Canaday, AT&T
John Healy, FCC
Spilios Makris, Telcordia
Jim Farrell, Union Pacific Railroad
Jim Runyon, Lucent
Kent Nilsson, FCC
Kathy O'Reilly, Institute for Law and Public Policy
Jay Bennett, Telcordia
Robin Howard, Verizon
Fred Stringer, Juniper Networks
Joy Jump, ATIS

NRSC Quarterly Meeting

March 9, 2005

4Q04 Reported Outages

Initial Reports	19
Withdrawn Reports	(2)
Reports Below Threshold	(1)
Multiple Reports	(1)
Reports Analyzed	15

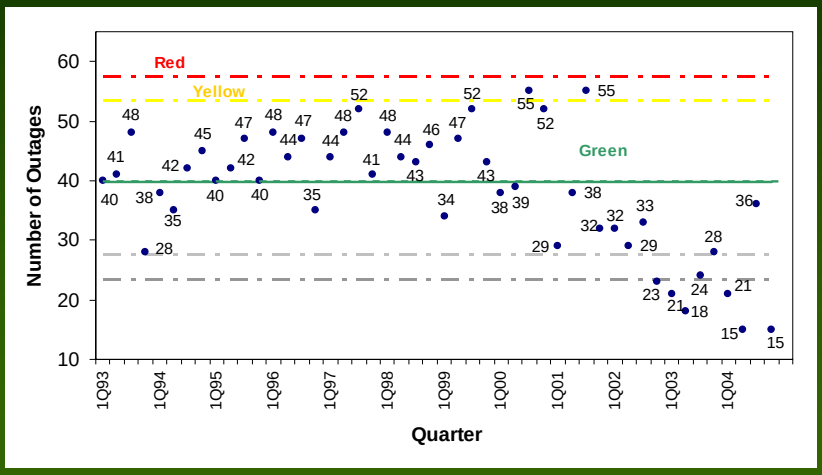
Failure Categories

	Frequency	Index
Local Switch	2	2
Tandem Switch	0	0
Facility	5	25
CO Power	2	40
CCS	5	34
DCS	0	0
Other	1	0
Total	15	101

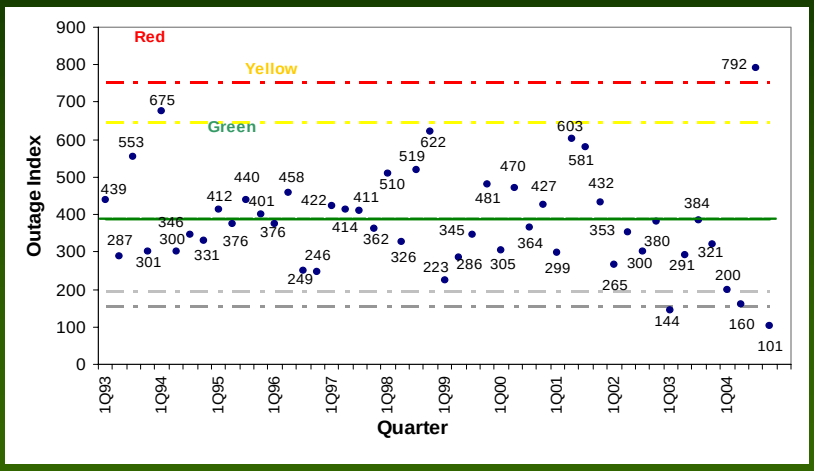
Summary Statistics

Year	Total number of outages	Mean time between outages	Median duration of outages	Median outage index	Mean outage index
1993	157	2.32 days	2.58 hours	3.33	10.07
1994	160	2.28 days	2.50 hours	3.33	10.33
1995	169	2.16 days	3.72 hours	4.84	9.64
1996	174	2.10 days	2.93 hours	3.16	7.64
1997	185	1.97 days	3.38 hours	3.72	8.69
1998	181	2.02 days	2.98 hours	4.02	10.93
1999	176	2.07 days	2.62 hours	4.00	7.59
2000	184	1.99 days	2.23 hours	3.90	8.51
2001	154	2.37 days	3.06 hours	4.99	12.38
2002	117	3.12 days	3.42 hours	4.55	11.09
2003	91	4.01 days	3.48 hours	4.84	12.83
11-year Average	159	2.30 days	2.95 hours	4.00	9.76
Current Quarter (10/1/04 - 12/31/04)	15	5.75 days	3.72 hours	1.53	6.36

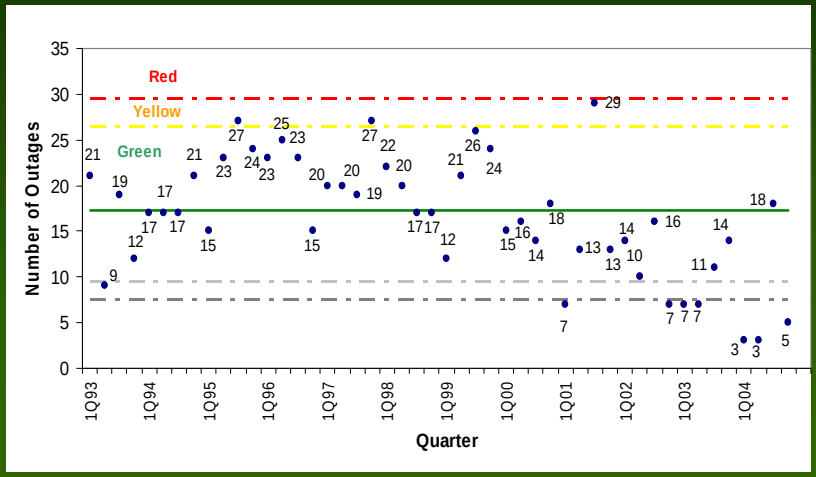
FCC Reportable Service Outages (by number of events)



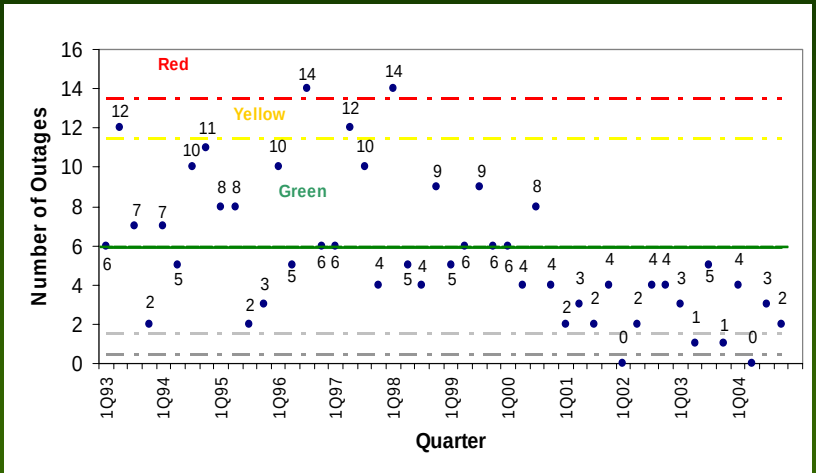
FCC Reportable Service Outages (by outage index)



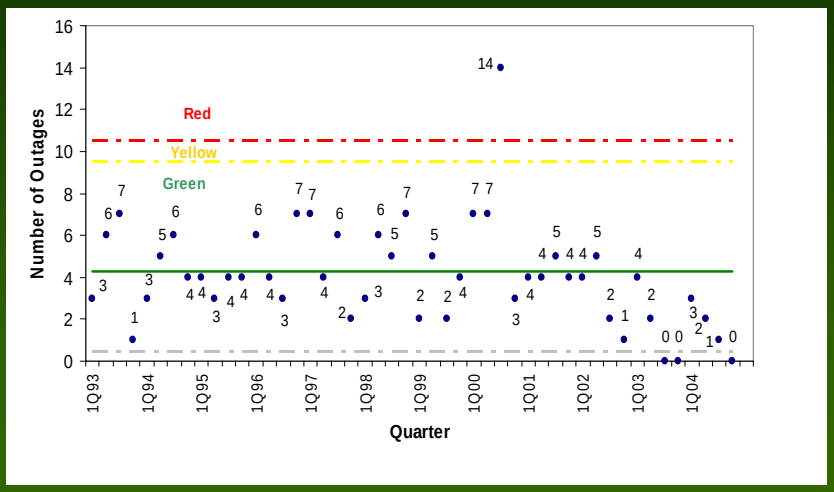
Incidents by Failure Category (Facility)



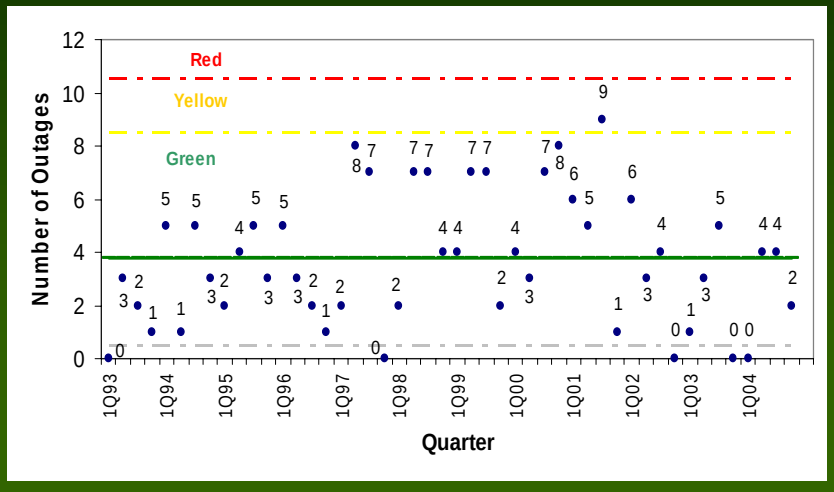
Incidents by Failure Category (Local Switch)



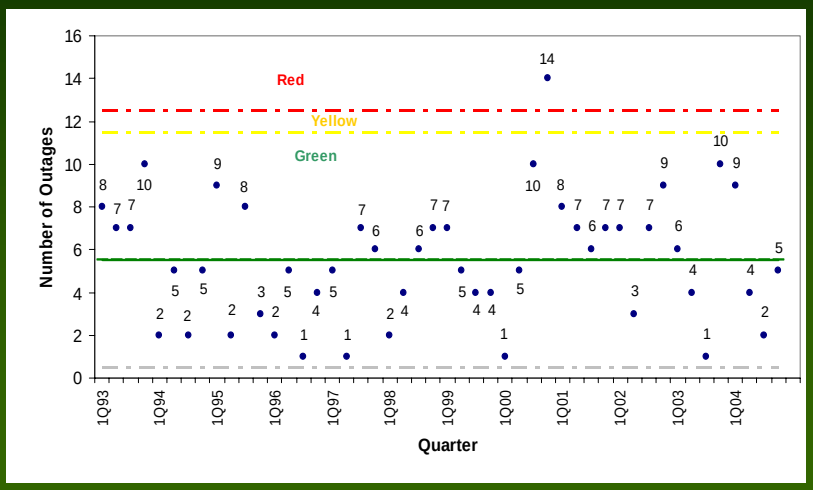
Incidents by Failure Category (Tandem Switch)



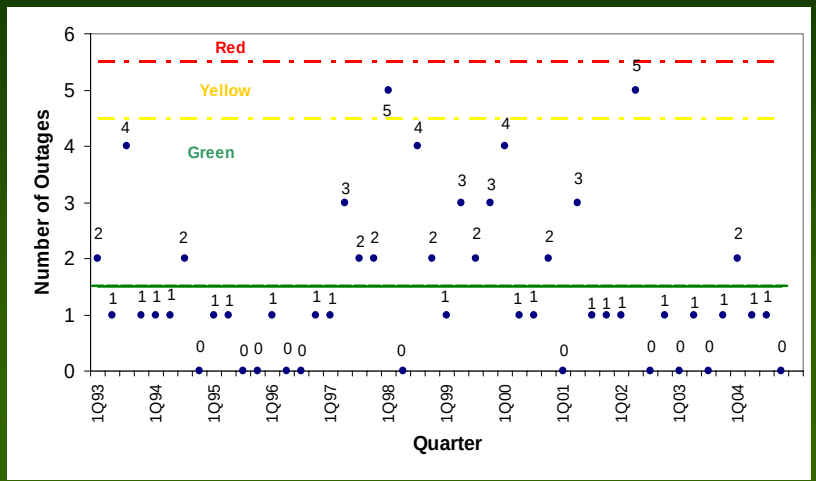
Incidents by Failure Category (CO Power)



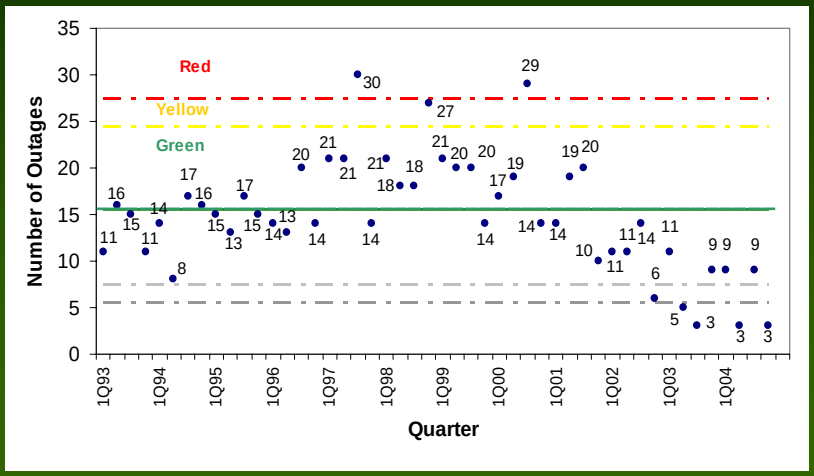
Incidents by Failure Category (Common Channel Signaling)



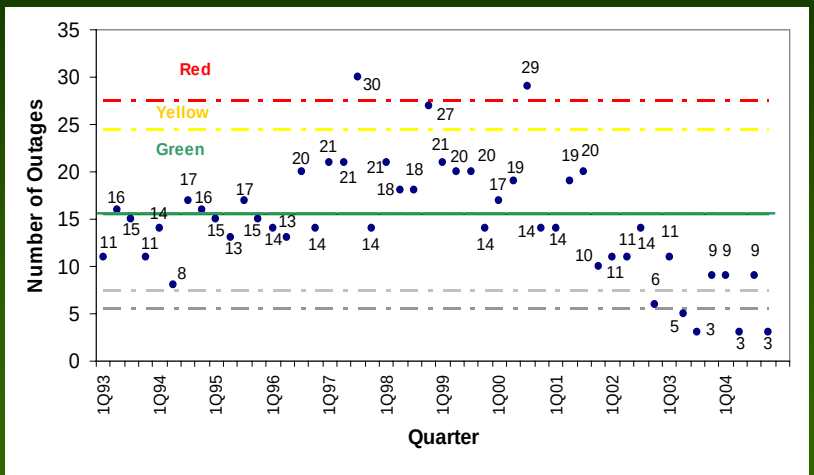
Incidents by Failure Category (Digital Cross-Connect Systems)



Procedural Error Attributed Outages (by number of events)



Procedural Error Attributed Outages (by outage index)



“Other” Results

- There was one (1) outage classified as “Other” in 4Q04. In this incident, circuit packs in collocation space were removed from the rack by thieves.

4Q04 Results

- The number of outages (15) was significantly lower than the Baseline Level.
- The overall aggregated outage index (101) was the lowest of any quarter since the start of the Baseline Period and significantly lower than the Baseline Level
- The number (5) and aggregated outage index (25) of facility outages were significantly lower than their Baseline Levels.
- The aggregated outage index (2) of Local Switch outages was significantly lower than the Baseline Level.
- No Tandem Switch outages were reported, significantly lower than the Baseline level.
- The number (3) and aggregated outage index (4) of outages with procedural Error as the root cause were significantly lower than their Baseline Levels.

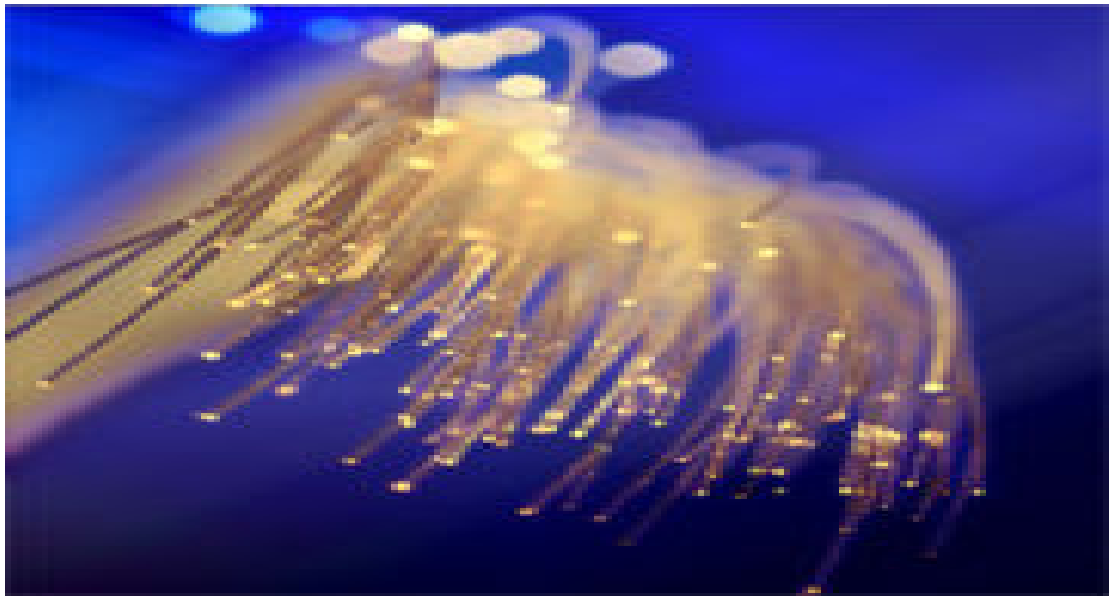
Analysis of Outages for 2004

- The total number of outages (87) is lower than any year since the start of the Baseline period.
- The number of Facility outages (29) was the lowest of any four consecutive quarters and the Facility aggregated outage index was the lowest of any year since the start of the Baseline Period.
- The number of Local Switch outages (9) was at the lowest level for any year since the start of the Baseline period.
- The number of Tandem Switch outages (6) and their aggregated outage index (81) were at their lowest levels for any four consecutive quarters since the start of the Baseline Period.
- The number of outages with Procedural Error as the root cause (24) was the lowest of any year since the start of the Baseline period. The frequency of CCS outages exhibit a significant decreasing trend since 3Q00.

Significant Results Through 4Q04

- The frequency of Common Channel Signaling (CCS) outages exhibits a statistically significant decreasing trend since 3Q00
- Tandem Switch outages exhibit statistically significant decreasing trends in both frequency and aggregated outage index since 2000.
- DCS outages exhibit a statistically significant decreasing trend in frequency since 1999.
- Outages with Procedural Error as a root cause exhibit statistically signidicant decreasing trends in both frequency and aggregated outage index since 2000.
- There are no significant overall trends in the aggregated outage indexes for CO Power and DCS outages.
- Over the past few years, there have been no significant trends in either outage frequency or aggregated outage index for Facility, CO Power, or Local Switch outages.

Analysis of Network Outage Reports for NRSC Meeting



Network Technology Division – Office of Engineering and Technology

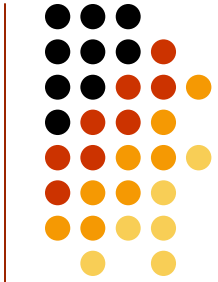
John Healy

March 9, 2005

Overview of Presentation

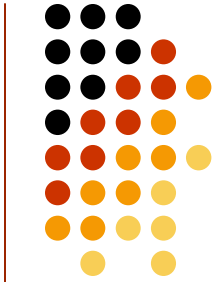
- Outage reporting has been going well with some reporting inconsistencies
- How the reporting process can be improved
- Preliminary results

Status of Outage Reporting



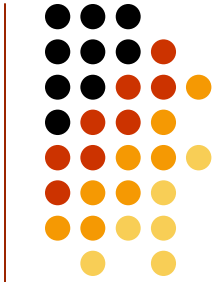
- Most reports are complete and internally consistent
- Some inconsistencies on the reports:
  - Some fields not filled in – causes
  - Durations inconsistent
  - Outage date impossible
  - Services not checked but users affected filled out

Discussion of Improvements to the Process



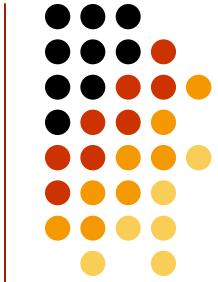
- NORS having a criterion field
- NORS handling of withdrawn outage reports
- NORS placing an NCS phone number on notification template for national security events
- NORS adding column for incident date (on table listing outages)
- FCC getting information out

Criterion Field



- Wireline – 900,000 User minutes
- Wireless – 900,000 User minutes
- Cable Telephony – 900,000 User minutes
- Blocked calls
- MTSO Failed
- E911
- DS3 – 1350 DS3 minutes
- DS3 – Simplex
- Satellite
- SS7 – MTP Messages
- Airport
- Unknown

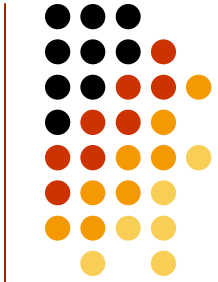
NORS Handling of Withdrawn Reports



Can not change any fields in withdrawn reports (Results in logical inconsistencies)

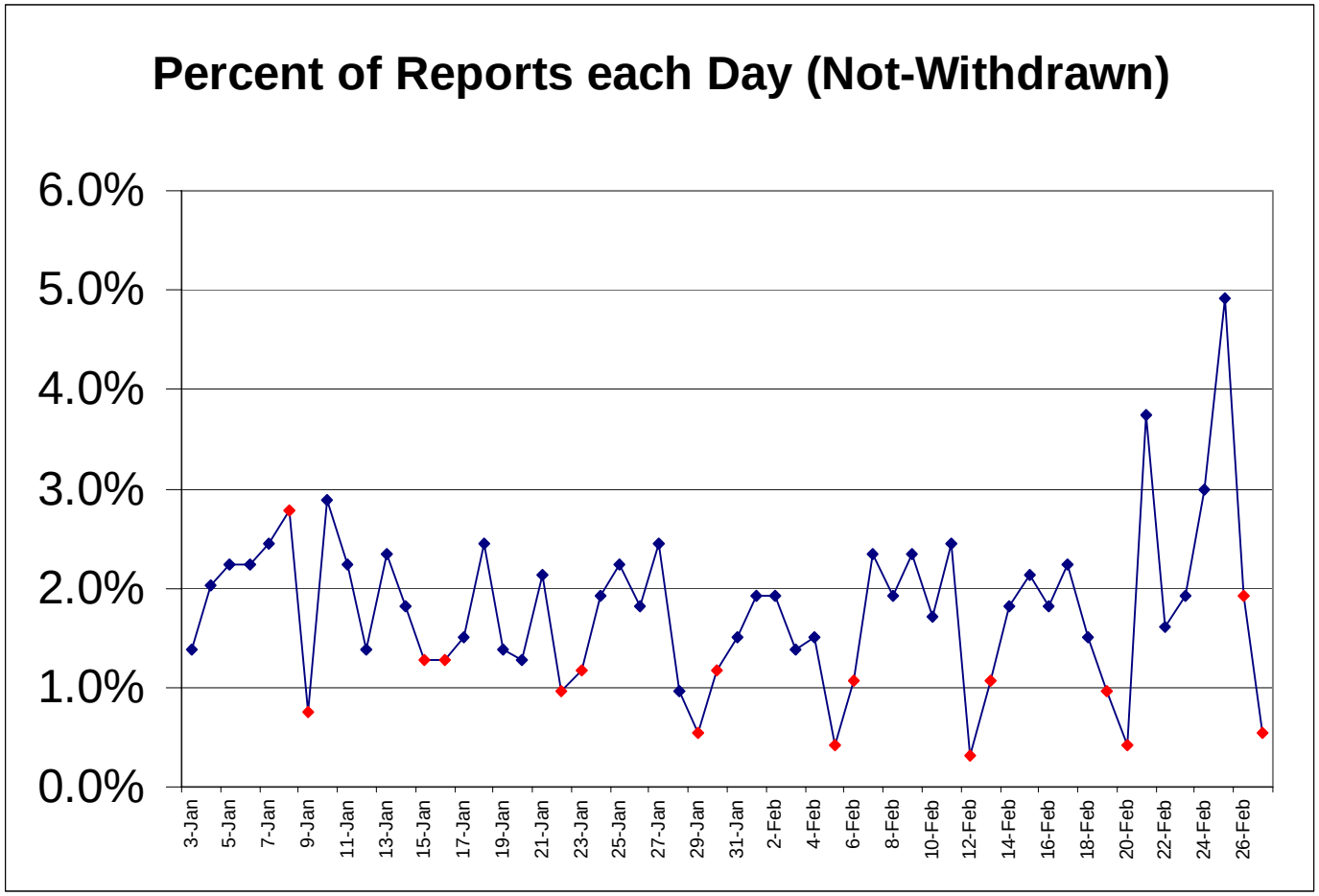
- Allow all fields to be changed on withdrawn reports
- Have people submit an Initial Report to correct fields and then withdraw it.

How Should the FCC get Information Out?

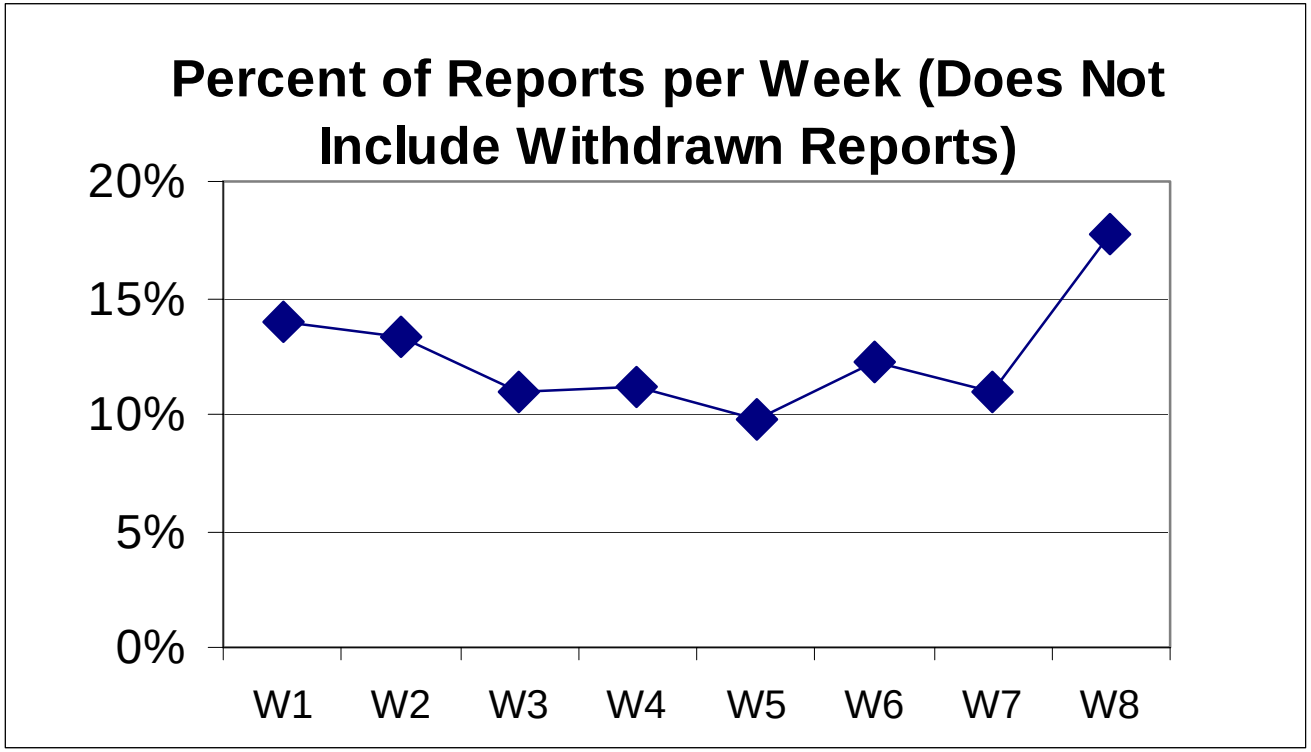


- Discuss individual reports with individual companies
- Have meetings with groups of companies
- Send out e-mails to Outage Coordinators

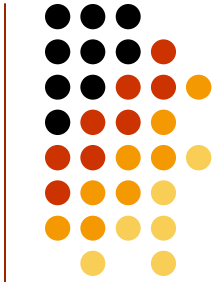
Preliminary Results: Percent of Reports by Notification Date



Percent of Reports per Week

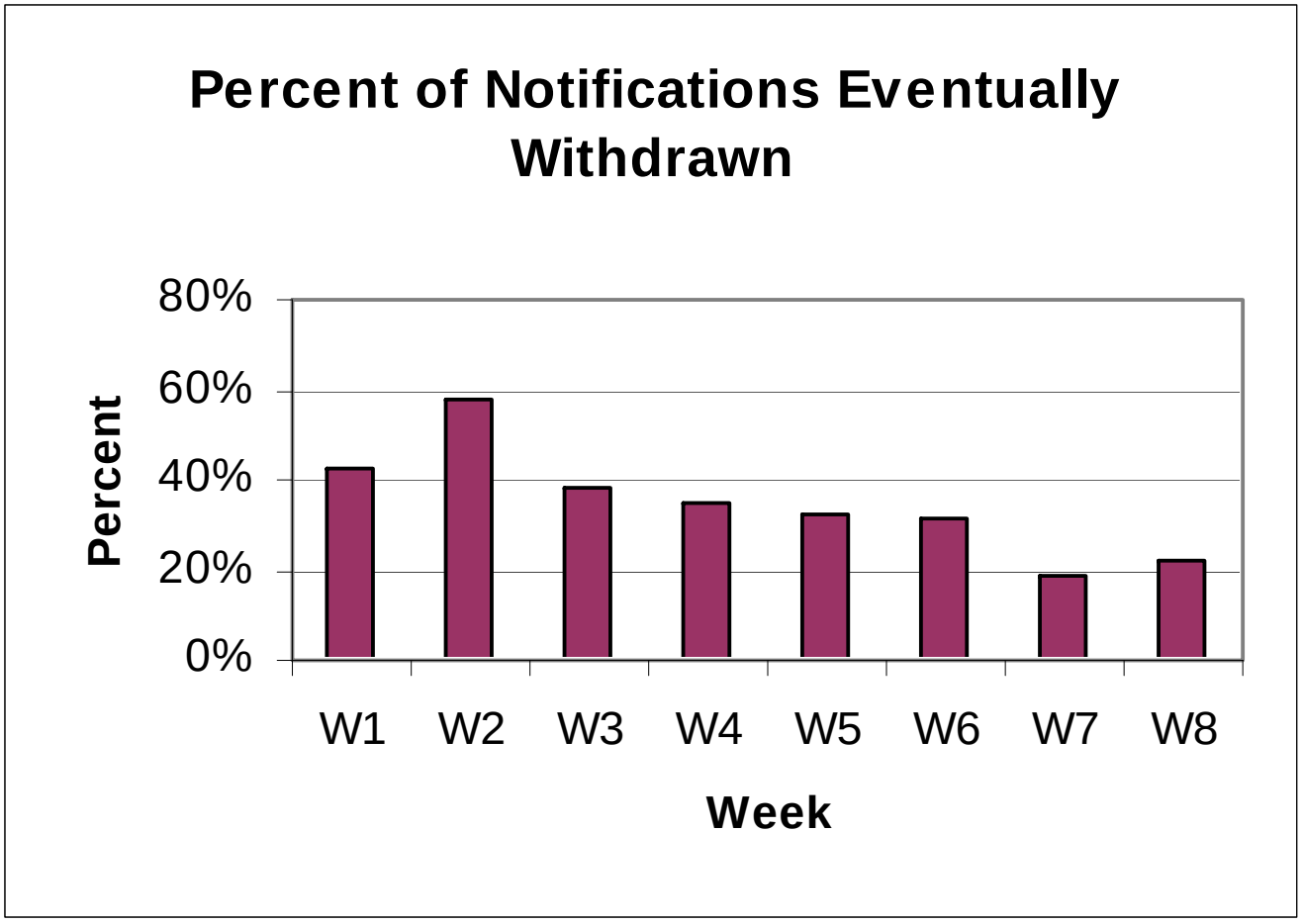


Comments on Withdrawn Reports

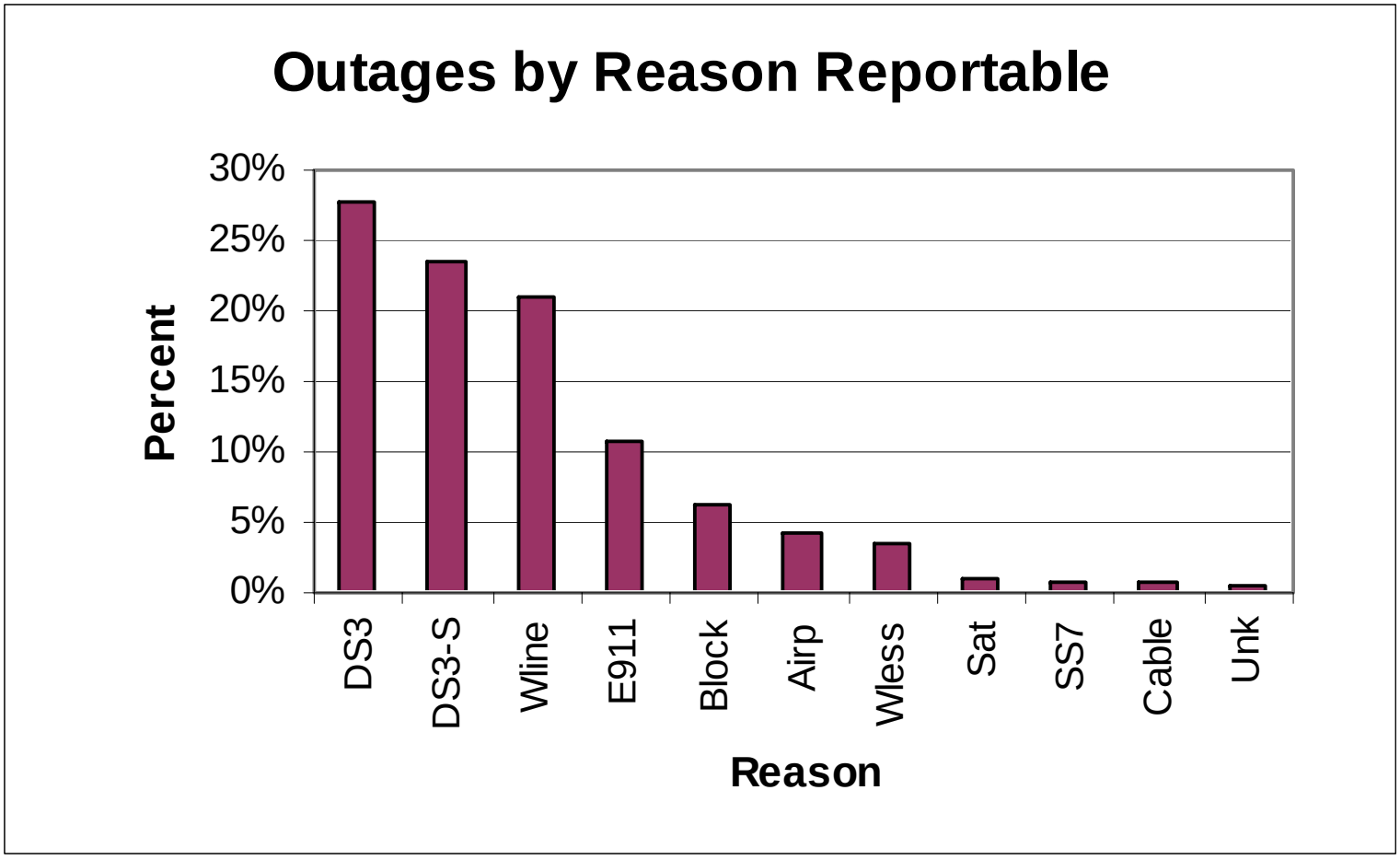


- The FCC expected that the new ruling (and the 2 hour deadline for notifications) would result in more withdrawn reports
- The FCC expected that initially there would be more withdrawn reports than weeks later
- Most often, the reason for withdrawal is filled out quite well

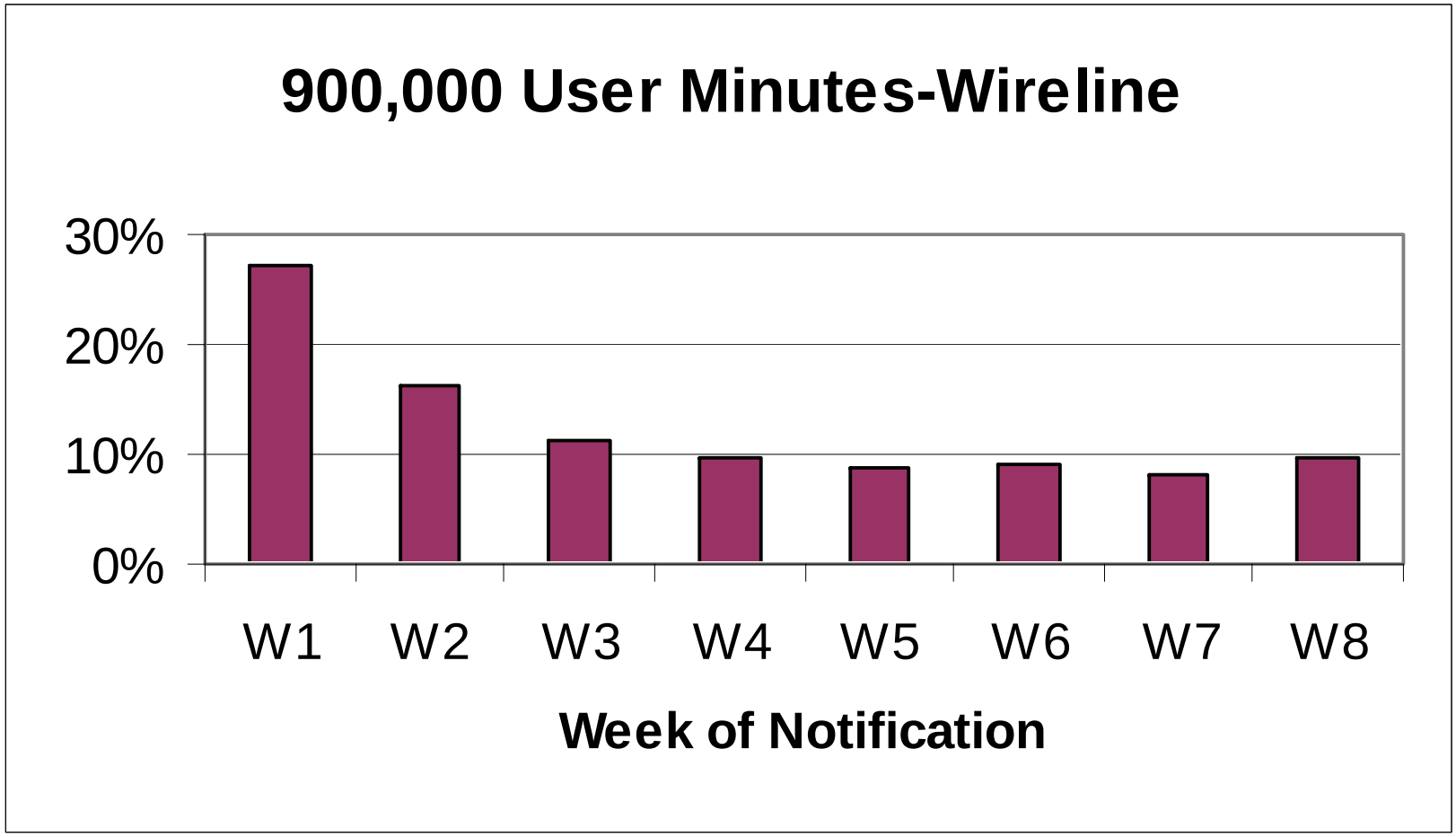
Trend for Percent of All Notifications Eventually Withdrawn



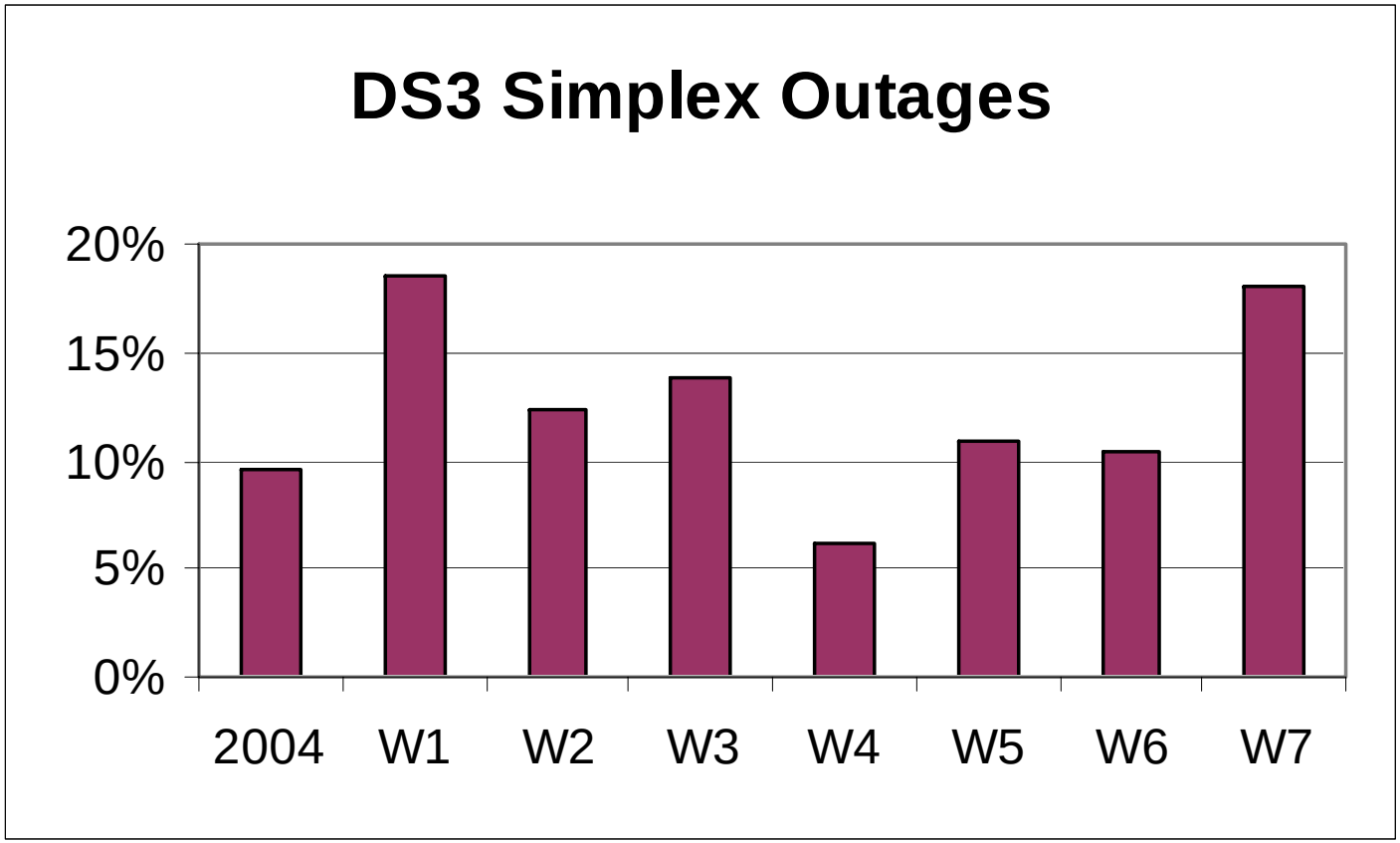
Percent of Outages by Reason



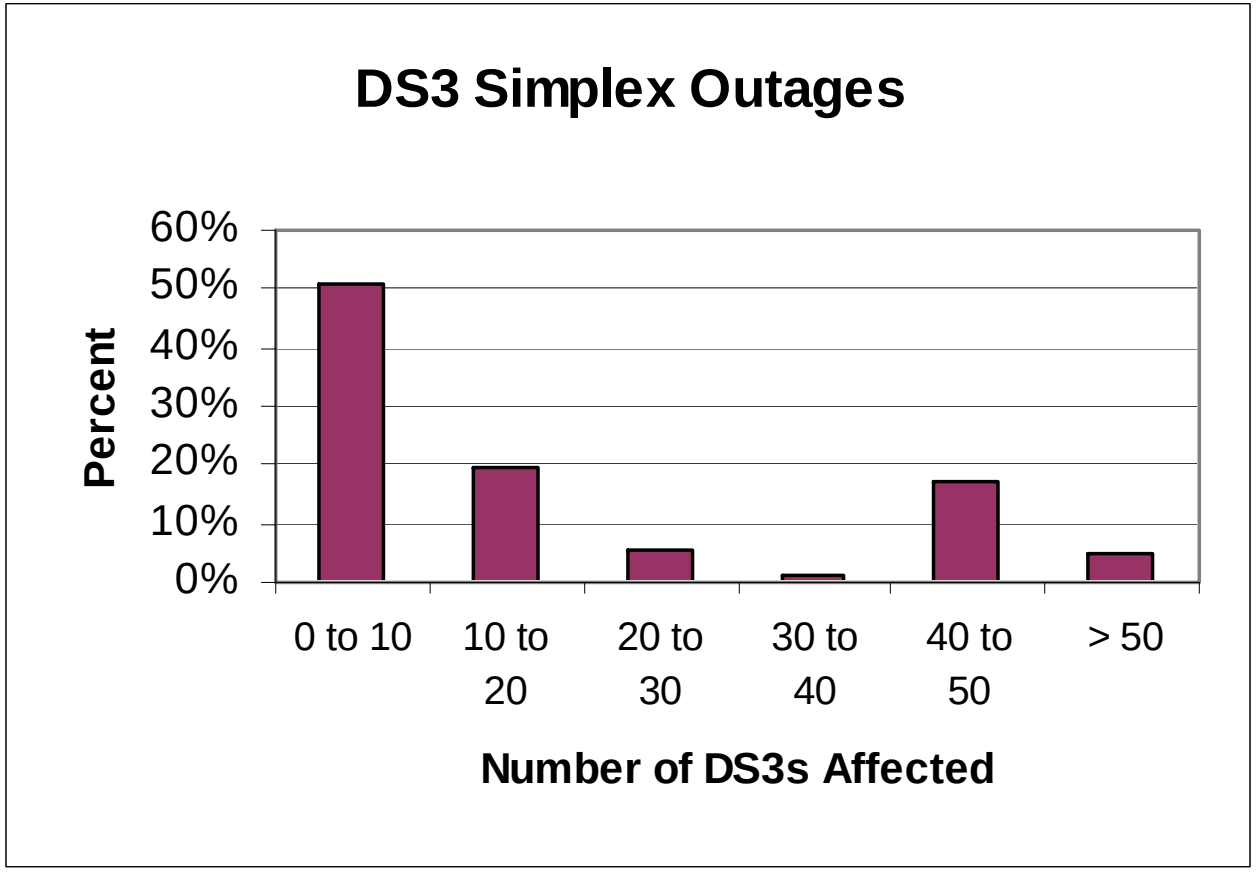
Trend for Outages Reportable Using 900,000 User-Minutes(Wireline) Criterion



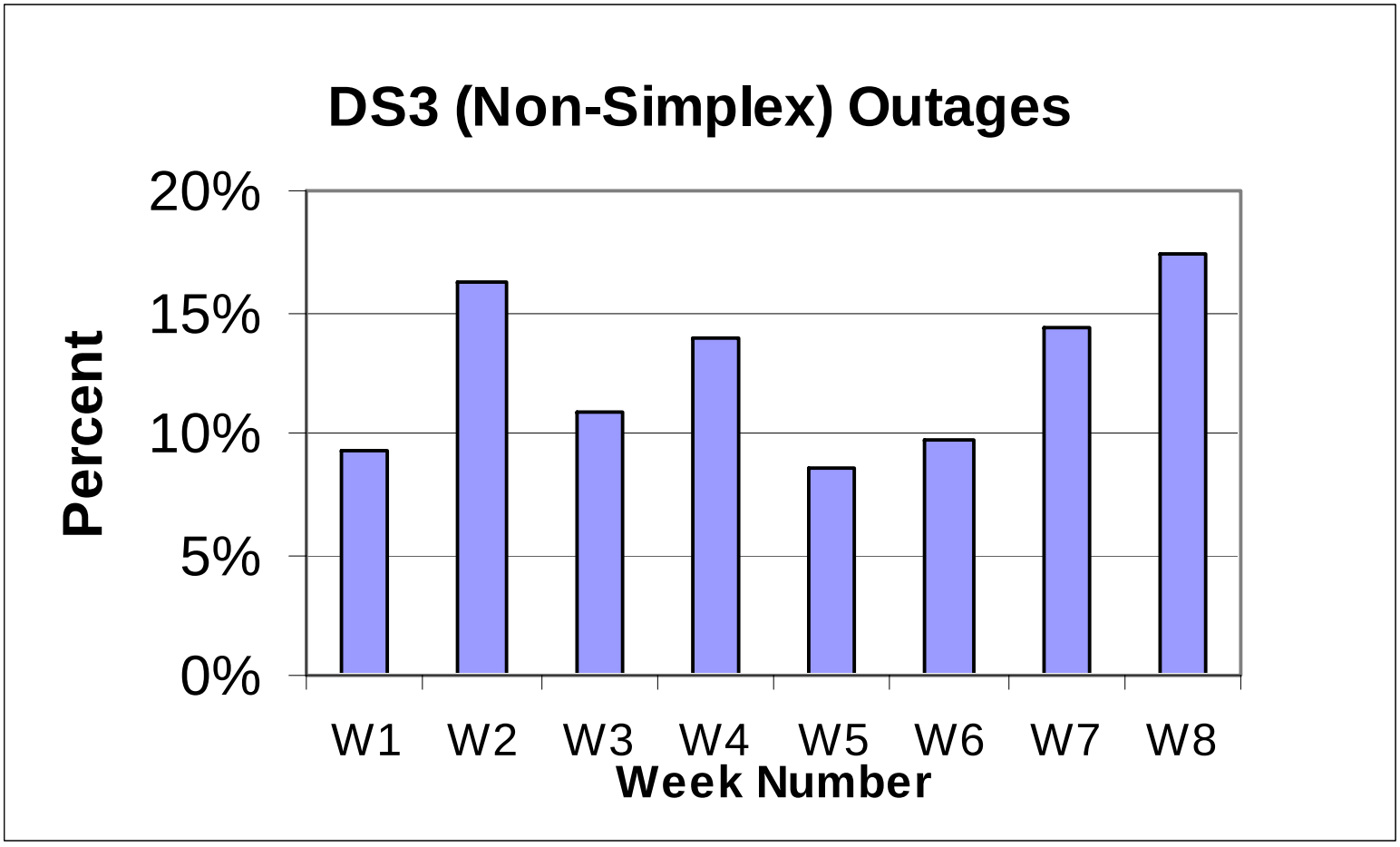
Percent of DS3 Simplex Outages by Outage Date



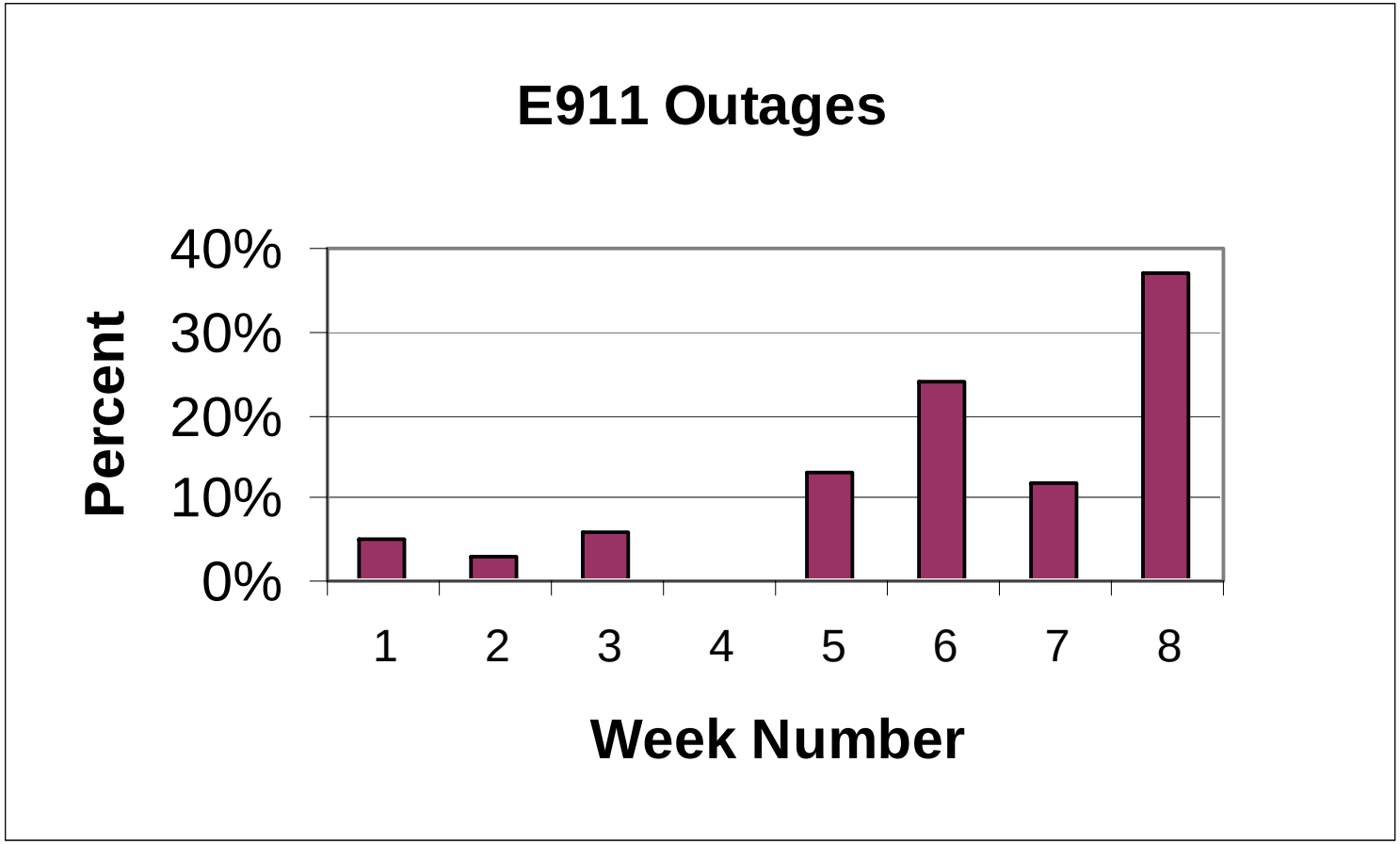
Histogram of Number of DS3 Affected for DS3 – Simplex Outages



Trend for DS3 Outages by Outage Week



E911 Outages by Notification Date



E911 Outages

- 56% involved Phase II failures (most were planned outages) – Software upgrades
- An additional 29% involved ALI failures (non Phase II)

Need subteam aimed at reducing E911 outages

Possible NRSC Subteams

- Outage Reporting Advisory Team
  - Improvements to the NORS System
  - Improvements to the template
  - Recommended ways to communicate information
- DS3-Simplex
  - Reducing the number of DS3-Simplex events
- E911 Team
  - Examining E911 non-Phase II outages – reducing ALI outages
  - Eliminating outages for software upgrades for Phase II

Alliance for Telecommunications
Industry Solutions

NETWORK RELIABILITY STEERING COMMITTEE

FOURTH QUARTER 2004 MACRO-ANALYSIS

NETWORK RELIABILITY STEERING COMMITTEE

ALLIANCE FOR TELECOMMUNICATIONS INDUSTRY SOLUTIONS

NETWORK RELIABILITY STEERING COMMITTEE

Macro-Analysis: Fourth Quarter 2004

Archie McCain
Chair, NRSC

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1.0 Executive Summary

The Network Reliability Steering Committee (NRSC), under the auspices of the Alliance for Telecommunications Industry Solutions (ATIS), was formed to monitor network reliability utilizing major outage reports filed with the Federal Communications Commission (FCC) per Docket 91-273. The Committee's mission is to analyze network outage data reported by companies, identify trends, make recommendations aimed at improving network reliability, and make the results publicly available, in order to help ensure a continued high level of network reliability[1].

Beginning with its first quarter 2001 analysis, the NRSC has made two significant changes in its reporting. The first is that the baseline for comparison has been changed to better reflect the impact of technological changes that have occurred during the past eleven years and to preserve the impact of the outages that have occurred during that period. Beginning with the first quarter of 2001, the Baseline Period covered the years 1993-2000. Starting with the first quarter of 2004, the Baseline Period will cover the years 1993-2003. The second change is that the "annual" reporting period used by the NRSC has been changed from "mid-year to mid-year" to a calendar year basis. The reader is urged to take these changes into consideration when making direct comparisons to prior reports.

Considering only data for the fourth quarter of 2004 ("4Q04"), both the total number of reported outages while and the impact of these outages, as measured by the Network Performance, Reliability and Quality of Service Committee (formerly T1A1) developed outage index[2], were within the Baseline Period (1993-2003) control limits (the "Green" region). In addition, the number of reported outages in all failure categories fell within or below the "Green" region of the corresponding control chart (sees Figures 2-3 to 2-8). (Note: "Green" is below the upper 95% tolerance limit, "Yellow" is between the upper 95% and 99% tolerance limits, and "Red" is above the upper 99% tolerance limit.)

Analysis of the outages for 4Q04 indicates:

- The number (15) of outages was significantly lower than the Baseline Level. The outage index for 4Q04 (101) was the lowest of any quarter since the start of the Baseline Period and significantly lower than the Baseline Level.
- The number (5) and aggregated outage index (25) of Facility outages were significantly lower than their Baseline Levels.
- The aggregated outage index (3) of Local Switch outages was significantly lower than the Baseline Level.
- No Tandem Switch outages were reported, significantly lower than the Baseline Level.
- The number (3) and aggregated outage index (4) of outages with Procedural Error as the root cause were significantly lower than their Baseline Levels.

Analysis of the outages for 2004 indicates:

- The total number of outages (87) is lower than any year since the start of the Baseline Period.

[1] Addendum A (last revised February 1998) to this report contains additional background on the Network Reliability Council (NRC), outage reporting per FCC Docket 91-273, and the analysis methodology. Addendum A may be found on the NRSC web site at www.atis.org.

[2] This is a measure of the customer impact based on the number of customers affected, outage duration, and services affected. See Committee T1 Report No. 42, "A Technical Report on Enhanced Analysis of FCC-Reportable Service Outage Data," August, 1995.

- The number of Facility outages (29) was the lowest of any four consecutive quarters and the Facility aggregated outage index (275) was the lowest of any year since the start of the Baseline Period.
- The number of Local Switch outages (9) was at the lowest level for any year since the start of the Baseline Period.
- The number of Tandem Switch outages (6) and their aggregated outage index (81) were at their lowest levels for any four consecutive quarters since the start of the Baseline Period.
- The number of outages with Procedural Error as the root cause (25) was the lowest of any year since the start of the Baseline Period.

Based upon analysis of all outages reported from 1Q93 through 4Q04, the NRSC notes that:

- The frequency of Common Channel Signaling (CCS) outages exhibits a statistically significant decreasing trend since 3Q00.
- Tandem Switch outages exhibit statistically significant decreasing trends in both frequency and aggregated outage index since 2000.
- DCS outages exhibit a statistically significant decreasing trend in frequency since 1999.
- Outages with Procedural Error as a root cause exhibit statistically significant decreasing trends in both frequency and aggregated outage index since 2000.
- There are no significant overall trends in the aggregated outage indexes for CO Power and DCS outages.
- Over the past few years, there have been no significant trends in either outage frequency or aggregated outage index for Facility, CO Power, or Local Switch outages.

2.0 Quarterly Macro-Analysis

There were 19 initial outage reports filed with the FCC in 4Q04 pursuant to the requirements established in FCC Docket 91-273. Upon further analysis, the reporting carriers eventually withdrew two (2) of these reports because they did not meet the reporting threshold criteria. One (1) additional report fell below the 30 minute/30,000-customer threshold and was not included in this analysis because including it would have introduced inconsistent data into the analysis. There was one (1) instance where multiple reports were received for the same incident; these reports were combined for analysis purposes. Taking into consideration the above, the total number of outages analyzed for 4Q04 is 15.

2.1 Summary Statistics

The Baseline Period for this analysis is 1/1/93 to 12/31/03 and was established to benchmark network reliability. Summary statistics for the years 1993 through 2003, and 4Q04 are shown in Table 1.

Table 1: Summary Statistics

Year	Total number of outages	Mean time between outages	Median duration of outages	Median outage index	Mean outage index
1993	157	2.32 days	2.58 hours	3.33	10.07
1994	160	2.28 days	2.50 hours	3.33	10.33
1995	169	2.16 days	3.72 hours	4.84	9.64
1996	174	2.10 days	2.93 hours	3.16	7.64
1997	185	1.97 days	3.38 hours	3.72	8.69
1998	181	2.02 days	2.98 hours	4.02	10.93
1999	176	2.07 days	2.62 hours	4.00	7.59
2000	184	1.99 days	2.23 hours	3.90	8.51
2001	154	2.37 days	3.06 hours	4.99	12.38
2002	117	3.12 days	3.42 hours	4.55	11.09
2003	91	4.01 days	3.48 hours	4.84	12.83
11-year Average	159	2.30 days	2.95 hours	4.00	9.76
Current Quarter (10/1/04 - 12/31/04)	15	5.75 days	3.72 hours	1.53	6.36

For 4Q04, the Mean Time Between Outages (5.75 days) was longer than the 11-year average of 2.30 days and its average in any individual year. Similarly, the Median Outage Index (1.53) and the Mean Outage Index (6.36) were less than their respective 11 year averages and their average in any individual year. However, while comparison of quarterly results with the yearly averages may be of interest, it must be noted that quarterly data is much more variable and subject to greater fluctuation than annual data and as such, significant direct comparisons are not easily made. Table 2 summarizes the 4Q04 outage frequency and outage index by failure category and compares these to their associated quarterly average.

Table 2: Failure Category Summary (4Q04)

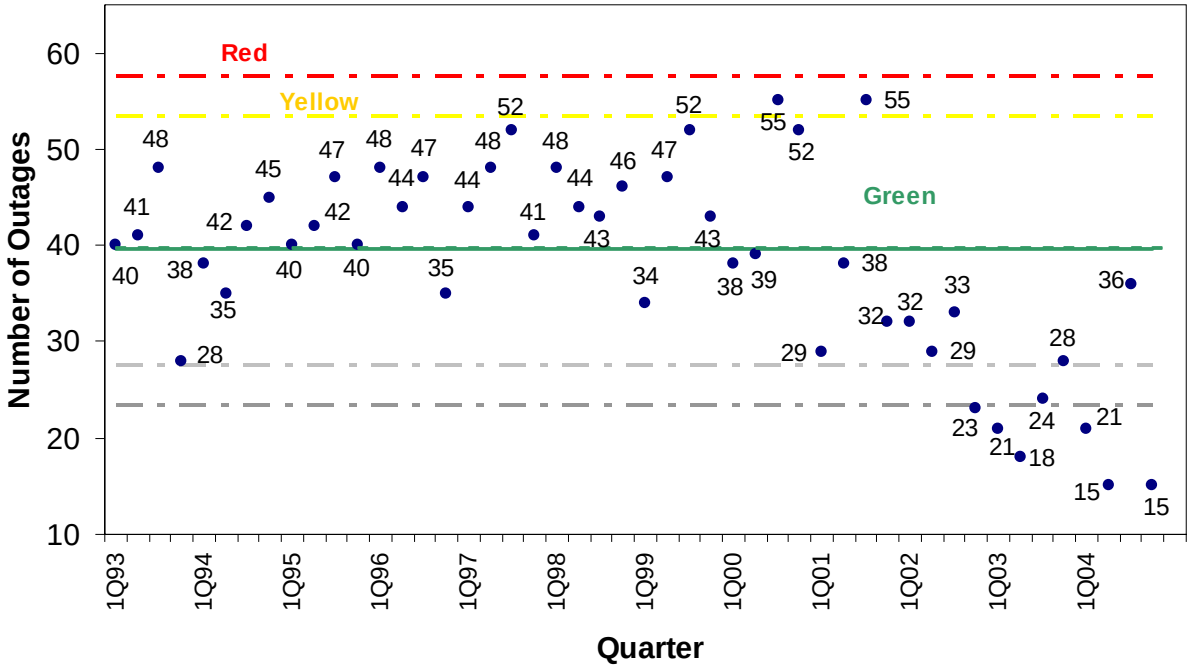
	Frequency		***Outage Index***	
Failure Category:	4Q04	Quarterly Average	4Q04	Quarterly Average
Local Switch	2	4.8	3	24
Tandem Switch	0	3.1	0	42
Facility	5	16.4	25	174
CO Power	2	2.1	40	29
CCS	5	7.0	34	59
DCS	0	1.2	0	20
Other	1	1.2	0	19
Total:	15	35.8	102	367

2.2 Total Incidents

Figure 2-1 depicts total incidents by quarter for the Baseline Period and 2004. The number of outages in 4Q04 (15) is below the Baseline Level of 39.7, a statistically significant difference. It is also below the third quarter average of 35.8. By comparison, the first quarter average is 36.1, the second quarter 36.7, and the third quarter 44.5. The number of outages (87) in 2004 is lower than any year since the beginning of the Baseline Period. While there has been a decreasing trend in total incidents since 2000, there has been no significant trend exhibited since the fourth quarter of 2002.

Figure 2-1

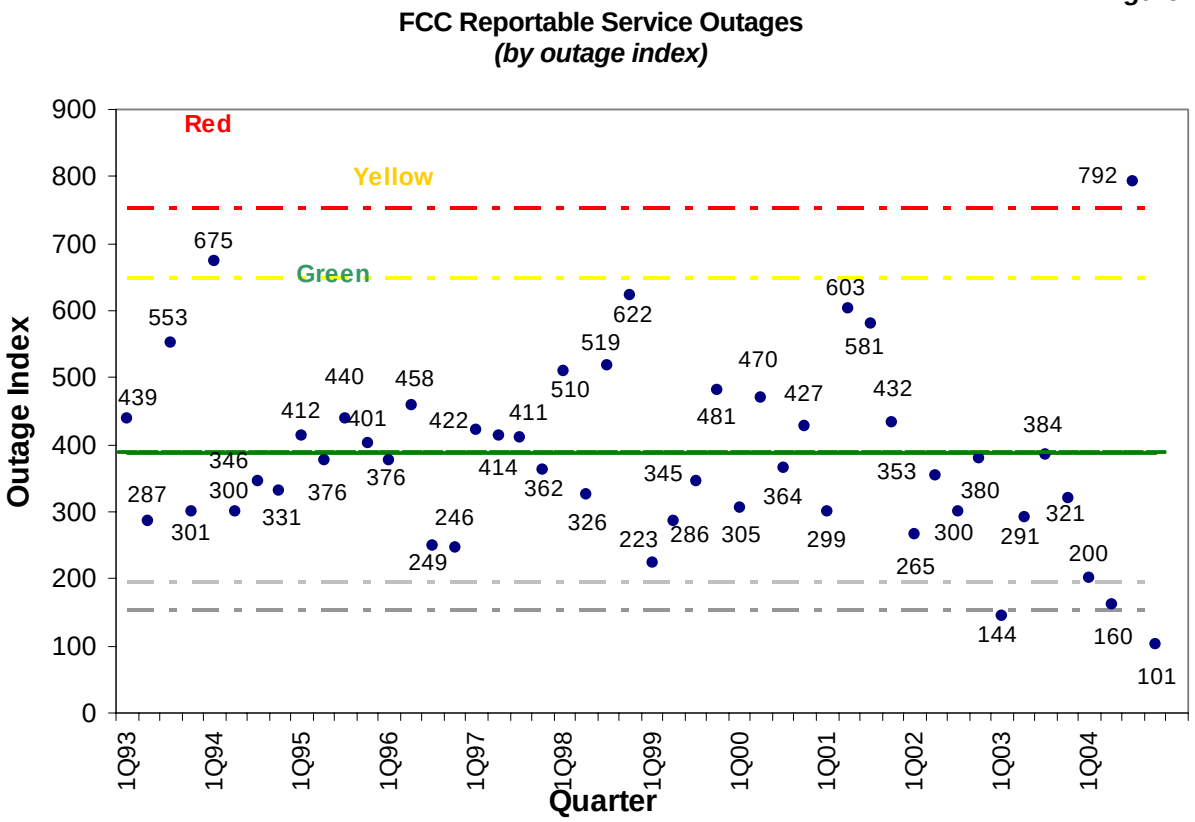
FCC Reportable Service Outages
(by number of events)



2.3 Outage Index

Figure 2-2 depicts the aggregated quarterly outage indexes for the Baseline Period and 2004. The aggregated outage index for this quarter (101) is below the Baseline Period average (388), a statistically significant difference. It is also below the average fourth quarter aggregated outage index (367), and is the lowest of any quarter since the start of the Baseline Period. By comparison, the average aggregated outage index in the first quarter is 356, the second quarter 359, and the third quarter 440. The overall aggregated outage index exhibits no statistically significant overall trend.

Figure 2-2



2.4 Failure Category

For 4Q04, all failure categories are within the "Green" control region. The sources of disruptions during this report period were Facility (33%), CCS (33%), Local Switch (13%), CO Power (13%), and Other (7%).

2.5 Facility Outages[3]

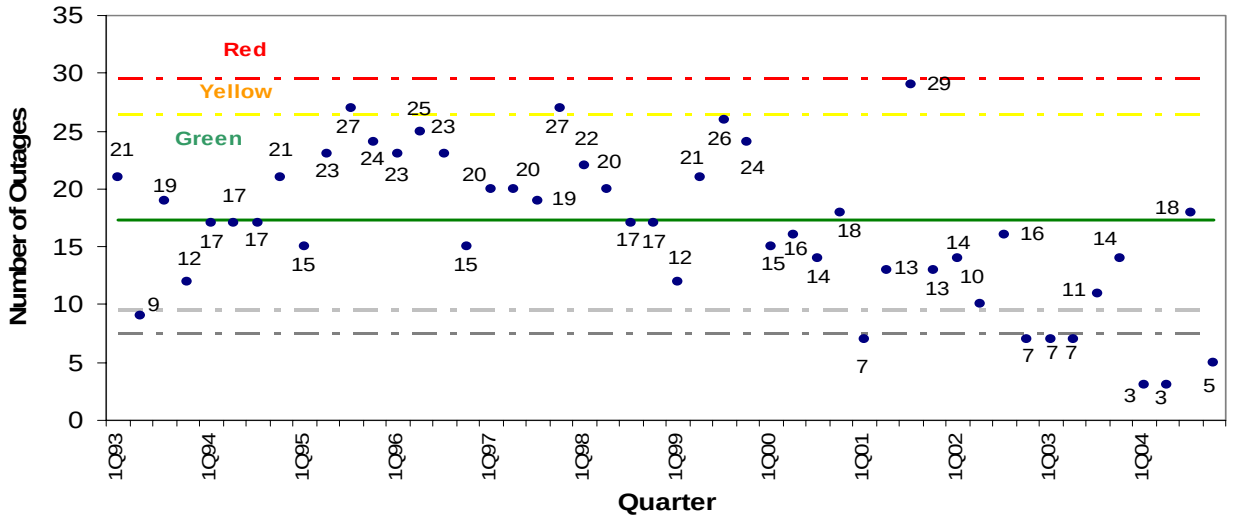
The frequency of Facility outages was in the "Green" region in 4Q04 (see Figure 2-3). The number of Facility outages in 4Q04 (5) is below the Baseline Level of 17.4, a statistically significant difference, and also below the fourth quarter average of 16.4. The frequency of Facility outages was at its lowest level for any four consecutive quarters (29) since the start of the Baseline Period. The frequency of Facility outages demonstrates a statistically significant decreasing trend since 1995, however there is no significant trend over the last two years. The aggregated outage index for Facility outages in 4Q04 was 25, below both the Baseline Level (172) (a statistically significant difference) and the fourth quarter average of 174. The aggregated outage index for 4Q04 was the lowest of any fourth quarter since the start of the Baseline Period. For 2004, the aggregated outage index for Facility outages (275) was the

[3] The NRSC defines "Facility" outages as those involving all wiring/cable, associated electronics and hardware (excluding DCSs) and any related work activities associated with these items, from the switch itself to the main frame and from there to and including all outside plant. Some specific examples include but are not limited to: aerial, underground and submarine cable, radio facilities, repeaters, multiplexers, demultiplexers, regenerators, timing source interface unit, "bits" interface card, and voltage control oscillator fuses.

lowest of any year since the start of the Baseline Period. Since the start of the Baseline Period there has been a statistically significant decreasing trend in the outage index attributable to Facility outages. However, again, no significant trend in aggregated outage index exists over the last two years.

Figure 2-3

Incidents by Failure Category
(Facility)

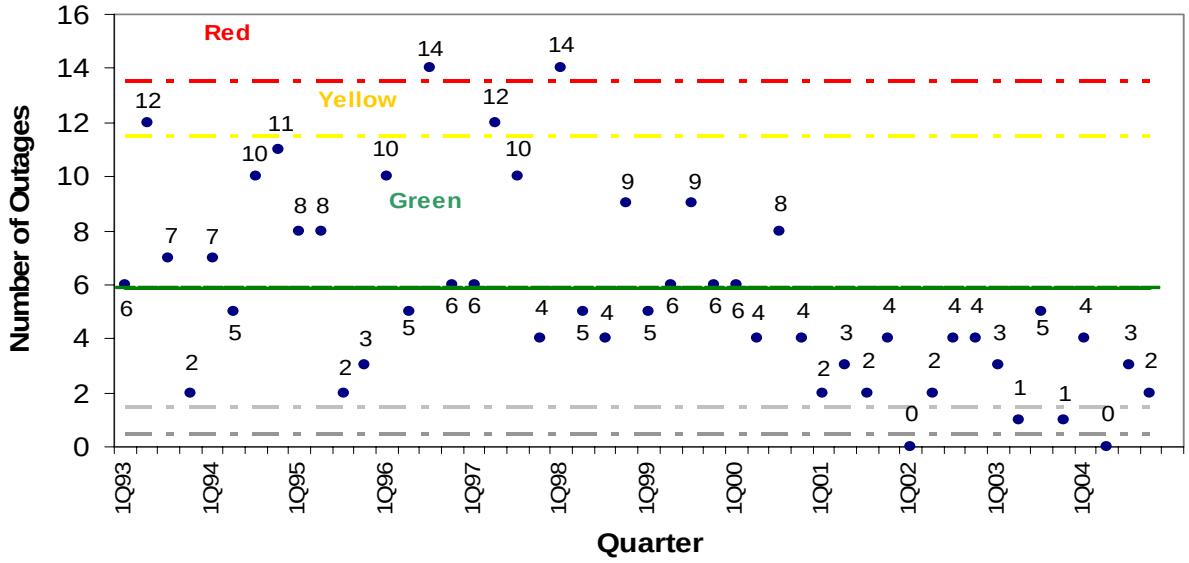


2.6 Local Switch Outages

There were two (2) Local Switch outages reported in 4Q04 (see Figure 2-4). This is below the fourth quarter average of 4.8, and lower than the Baseline level of 5.9. The frequency of Local Switch outages in 2004 (9) is the lowest level of any year since the start of the Baseline Period. The aggregated outage index for Local Switch in 4Q04 was 3 versus the fourth quarter average of 24; it was significantly lower than the Baseline Level (30). While Local Switch outage frequency has decreased significantly since 1997, it has no significant trend since 1Q01. While Local Switch aggregated outage index has decreased significantly since 1994, it has no significant trend since 2000.

Figure 2-4

Incidents by Failure Category
(Local Switch)

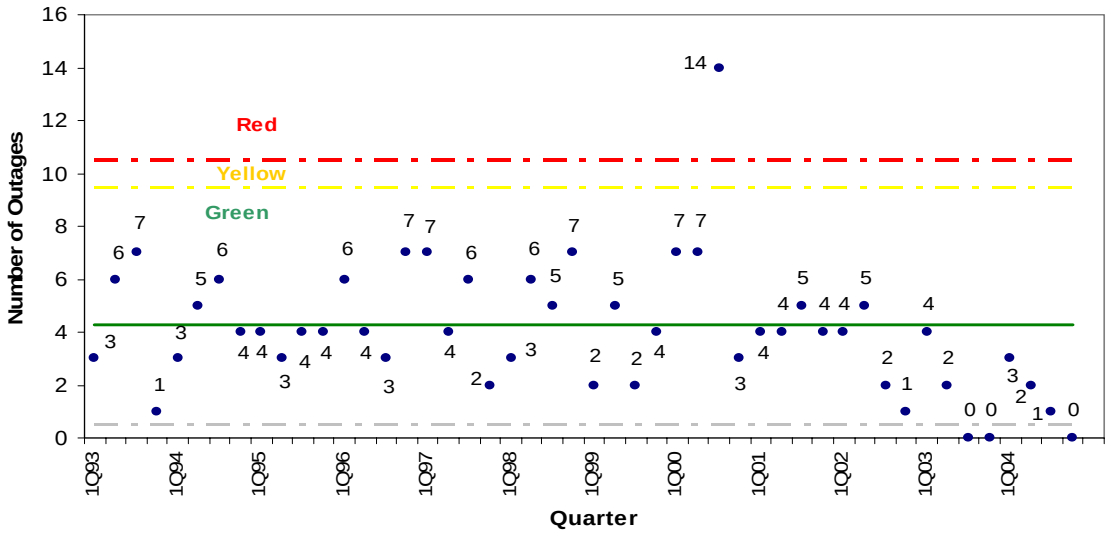


2.7 Tandem Switch Outages

There were no Tandem Switch outages reported in 4Q04, below the fourth quarter average (3.1) and significantly below the Baseline Level (4.3) (see Figure 2-5). The number of Tandem Switch outages (6) matched the lowest level of any four consecutive quarters since the start of the Baseline Period. The frequency of Tandem Switch outages has declined significantly since 2000. The aggregated outage index for Tandem Switch outages in 4Q04 was zero versus the fourth quarter average of 42. The aggregated outage index (81) was the lowest of any four consecutive quarters since the start of the Baseline Period. The aggregated outage index for Tandem Switch outages has a statistically significant decreasing trend since 2000.

Figure 2-5

Incidents by Failure Category
(Tandem Switch)

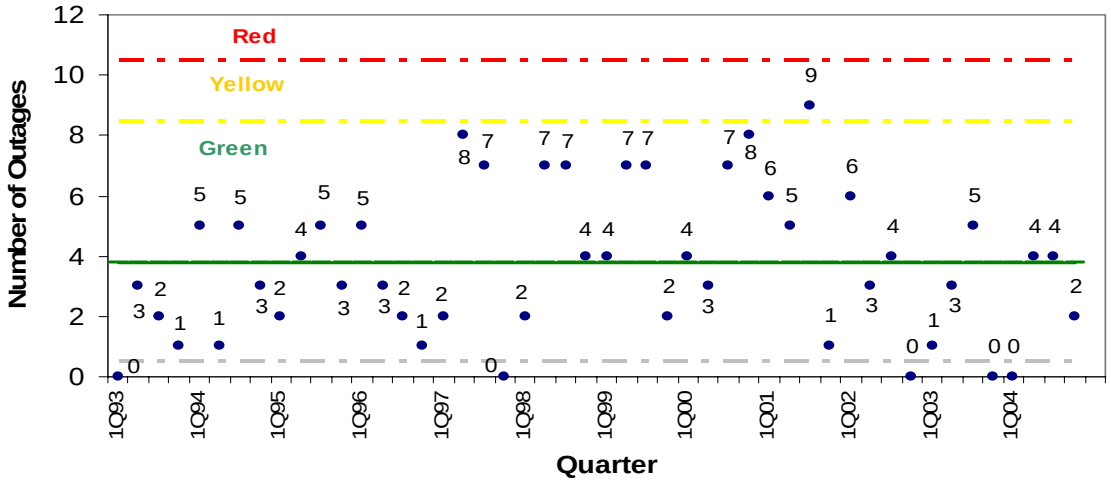


2.8 CO Power Outages

There were two (2) CO Power outages reported in 4Q04; below the Baseline Level of 3.80 and the fourth quarter average of 2.1 (see Figure 2-6). CO Power outage frequency during the second and third quarters of the year is significantly higher than in the first and fourth quarters of the year. While the frequency of CO Power outages has declined significantly since the beginning of 2001, there has been no trend over the last two years. The aggregated outage index for CO Power outages in 4Q04 was 40 versus the fourth quarter average of 29. The outage index associated with CO Power outages has no statistically significant overall trend.

Figure 2-6

Incidents by Failure Category
(CO Power)

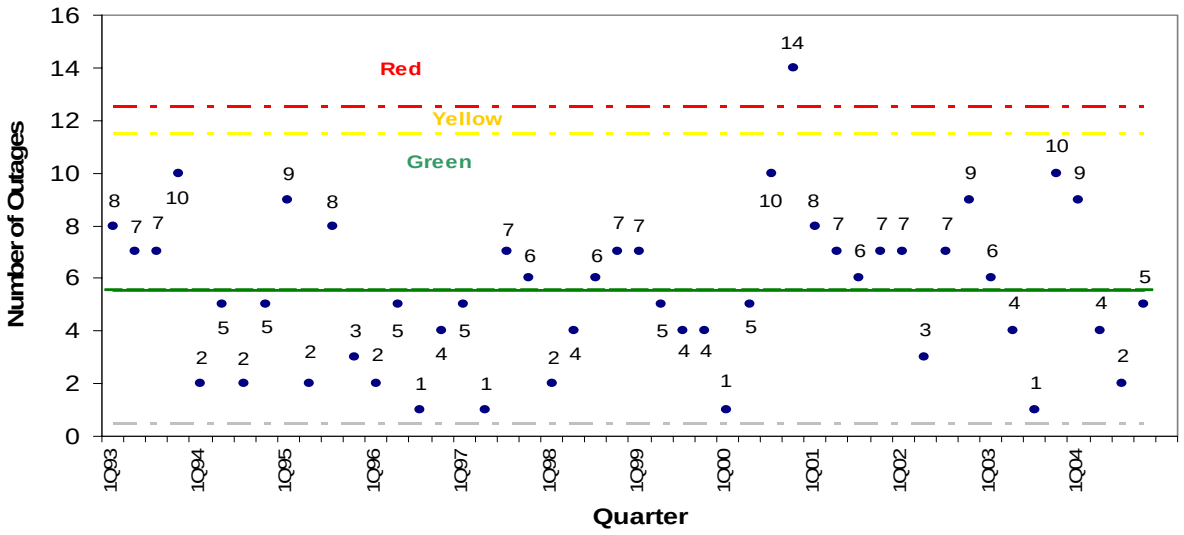


2.9 Common Channel Signaling Outages

There were five (5) Common Channel Signaling (CCS) outages reported in 4Q04; this is below the Baseline Period mean of 5.5 and the fourth quarter average of 7.0 (see Figure 2-7). In addition to the CCS outages reported in 4Q04, there was one (1) additional outage that impacted signaling capability. The aggregated outage index for CCS outages in 4Q04 was 34 versus the fourth quarter average of 59. CCS outage frequency exhibits a statistically significant decreasing trend since 3Q00. While the aggregated outage index associated with CO Power outages has a statistically significant increasing trend since 3Q93, no trend exists over the last five years.

Figure 2-7

Incidents by Failure Category
(Common Channel Signaling)

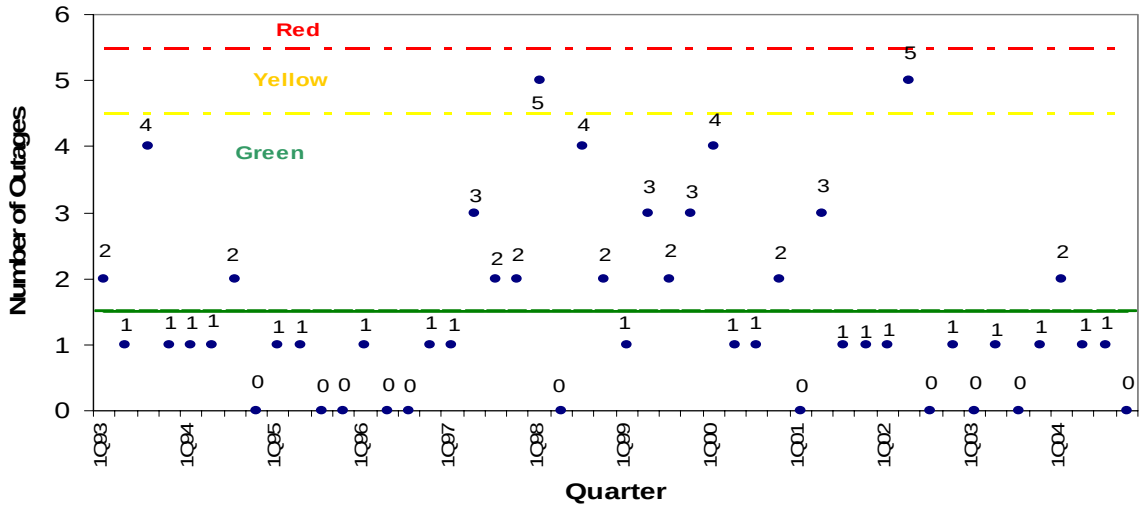


2.10 Digital Cross-Connect System Outages

There were no DCS outages reported in 4Q04 (see Figure 2-8), below the Baseline Period average of 1.5 and the fourth quarter average of 1.2. DCS outages historically have been a small fraction of outages (3.9% over all quarters). The aggregated outage index for DCS outages in 4Q04 was zero versus the fourth quarter average of 20. DCS outages exhibit a statistically significant decreasing trend in frequency since 1999. The aggregated outage index for DCS exhibits no statistically significant overall trend.

Figure 2-8

Incidents by Failure Category
(Digital Cross-Connect Systems)



2.11 Other Results

There was one (1) outage classified as "Other" in 4Q04. In this incident, circuit packs in collocation space were removed from the rack by thieves.

3.0 Procedural Errors

In addition to categorizing outages by Failure Category and Subcategory, the ATIS/NRSC also categorizes each outage according to its root cause. Among these root causes are Procedural Errors attributable to Service Providers, System Vendors, and Other Vendors.

Figure 3-1 is a quarterly control chart for Procedural Error outage frequency with control limits derived from Baseline Period data. The 4Q04 Procedural Error outage frequency (3) was below the Baseline Period mean of 15.6, a statistically significant difference. It was also below the fourth quarter average of 12.8. Procedural Error outage frequency in 2004 (24) was the lowest of any year since the start of the Baseline Period. The frequency of Procedural Error outages has demonstrated a statistically significant decline since 2000.

Figure 3-2 is a quarterly control chart for Procedural Error aggregated outage index. The Procedural Error outage index for 4Q04 (4) was below the Baseline Period mean of 134, a statistically significant difference. It was also below the fourth quarter average of 112, and is the lowest of any quarter since the start of the Baseline Period. Procedural Error aggregated outage index displays a statistically significant decreasing trend since 2000.

Figure 3-1

Procedural Error Attributed Outages
(by number of events)

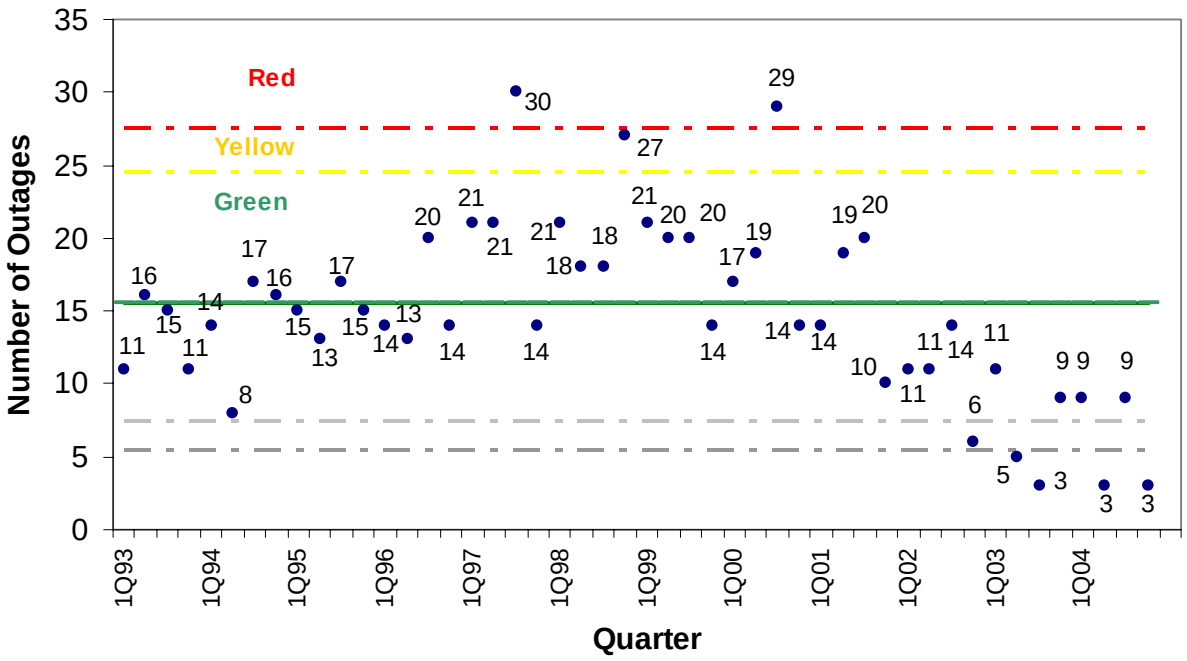
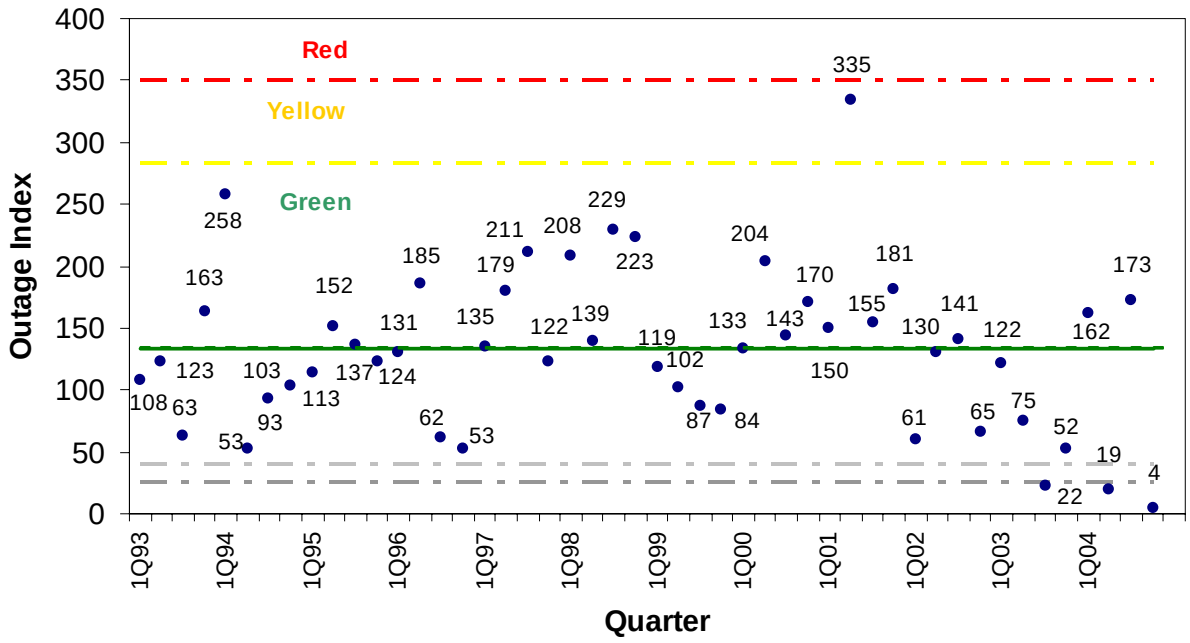


Figure 3-2

Procedural Error Attributed Outages
(by outage index)



4.0 Further Observations

In addition to the data on outage frequency and outage impact provided above, the NRSC also makes the following observation as regards outages during the fourth quarter of 2004:

- Since the third quarter of 2000, the NRSC has been noting those outages where timing failure was a factor in the outage. The NRSC has investigated the continuing timing problems and made several recommendations for their prevention. There were no such outages this quarter:

5.0 Conclusion

4Q04 marks the 13th consecutive quarter where overall outage frequency has been below the Baseline level; and, 2004 had the lowest number of any year to date. Frequency was also below Baseline levels in all failure categories and in procedural error outages. 4Q04 also had the lowest quarterly aggregated outage index since the beginning of the Baseline period. While the NRSC in its 2002 Annual report identified a number of potential factors other than application of Best Practices that may influence outage frequency and outage index, it remains convinced that implementation of Best Practices is the single most effective means to reduce and/or mitigate the impact of outages.

As such, **THE NRSC ONCE AGAIN URGES ALL SERVICE PROVIDERS AND EQUIPMENT VENDORS TO REVIEW ALL BEST PRACTICES FOR APPLICATION IN THEIR OPERATIONS.** The most current and complete list of Best Practices may be found at www.nric.org.

This report is the final one in a series started in 1993. The goal of the report was to provide a current snapshot view of the reliability of the wireline PSTN based on outage reports made to the FCC. The purpose was to convey this quantitative information to the public and to guide the telecommunications industry (carriers and suppliers) in identifying areas of PSTN reliability that required further study. The NRSC categorized the data contained in the reports (based on the broad experience of the NRSC participants), implemented metrics (the outage index), and employed accepted statistical techniques (control charts) in order to provide thorough, unbiased analysis, results, and recommendations. In later years, the goal of the report was expanded to identify trends in reliability over time. Based on the conclusions from these reports, the NRSC formed focus groups for several areas including central office (CO) power and procedural errors. One such group for facility outages was instrumental in the passage of One Call legislation. The downward trends in outage reports in recent years are an indication that the industry has absorbed lessons learned from this process.

With the conclusion of this series of reports totaling 44 quarters and over 1800 outages reviewed, the Network Reliability Steering Committee would like to take an opportunity to reflect on the past 11 years and to acknowledge the leadership, participants, and companies responsible for production of the Macro-Analysis reports and findings.

The NRSC wishes to acknowledge and thank the Chairs and Vice Chairs who have provided leadership and focus for the committee over the years. Their expertise and knowledge of the telecommunications industry was paramount to the NRSC fulfilling its charter.

NRSC Chair	**Company**	**Years Served**
Ray Albers	Verizon	1993 – 1999
P.J. Aduskevicz	AT&T	2000 – 2004
Jim Lankford	SBC	2004
Archie McCain	Bellsouth	2005 – Present

NRSC Vice Chair	**Company**	**Years Served**
P.J. Aduskevicz	AT&T	1993 – 1999
Karl Rauscher	Lucent	2000 – Present

The committee also recognizes the Alliance for Telecommunications Industry Solutions (ATIS) for its support and efforts throughout the years in organizing and producing valuable public information on industry issues. Additionally, the analysis provided by Telcordia Technologies Jay Bennett, Spilios Makris, and John Healy set the focus for wireline network reliability.

We thank our FCC partners, particularly Whitey Thayer, for their guidance; and our consumer representative Kathleen O'Reilly for her efforts and participation in making this public forum successful.

And finally, we acknowledge the participation of current and past companies and organizations that have provided subject matter experts throughout the years:

AT&T*	**NARUC**	**Sprint***
Bellsouth*	**NCS***	**Telcordia Technologies***
CTIA	**Nortel***	**USTA**
ICA	**Qwest***	**Verizon***
Lucent Technologies*	**Siemens**	
MCI	**SBC***	

* Current Members

Starting in 2005, the FCC initiated a new set of outage reporting requirements. The new process for collecting and administering the reports does not allow making the reports available to the public. The NRSC has expressed its willingness to continue its quarterly statistical analysis of these outage reports, and potential procedures that would provide relevant data based on the outage reports are currently being investigated. Regardless of the success of these investigations, the accomplishments and lessons learned from the NRSC quarterly reports will provide a solid foundation for moving forward in maintaining reliability in telecommunications networks.