

NorthWesternTM Energy

***2007
-Montana-
Electric Distribution/Transmission
Annual Reliability Report***



***April 2008
Final Report***

1.0 Executive Summary

The main goal of this report is to provide information and insight into NorthWestern Energy's (NWE) 2007 Electric Distribution and Transmission System reliability indices for the Montana region. These indices include SAIDI (System Average Interruption Duration Index – in minutes), CAIDI (Customer Average Interruption Duration Index – in minutes), SAIFI (System Average Interruption Frequency Index – in frequency) and Outage Counts.

System indices will be given for the entire Montana operating region and also broken down into the major operating areas of the state – Billings, Bozeman, Butte, Great Falls, Havre, Helena, Lewistown and Missoula. As with the previous years annual reports, the Institute of Electrical and Electronics Engineers (IEEE) Power Engineering Society Standard 1366-2003 will again be followed. This standard is directly related to the use of a statistically based definition for classification of Major Event Days (MED) – also commonly referred to as the 2.5 Beta Method. Major Event Days are days in which the regional SAIDI exceeds a statistically derived threshold value provided by IEEE and represent days in which the electric system experienced stresses beyond normal operating conditions (such as a severe weather storm).

NorthWestern Energy has an active relationship with IEEE to ensure a consistent and accurate portrayal of our utility's ability to report and benchmark reliability indices. MEDs are identified through a monthly process for each region and can be included or excluded per the data required. This report will provide all information (including and excluding MEDs) for all indices to better demonstrate and analyze normal versus emergency conditions.

2.0 General

There were four major event days in 2007. The first was caused by an April snowstorm that also coincided with the failure of the Deer Lodge Substation transformer and resulted in 20 outages. There were windstorms that affected various areas for two major event days; the first was on the 12th of November and the other was on the 13th of November. These windstorms caused 258 outages in the eight areas. The fourth major event was a snowstorm primarily in the Missoula and Hamilton areas that caused 199 outages. The total system SAIDI for these four major event days was 42.48 minutes.

For a comparison there were zero MED events in 2003-2004, four in 2005, two in 2006 and four in 2007. Therefore, the average for the period 2003-2007 is two per year.

3.0 Montana – System Reliability

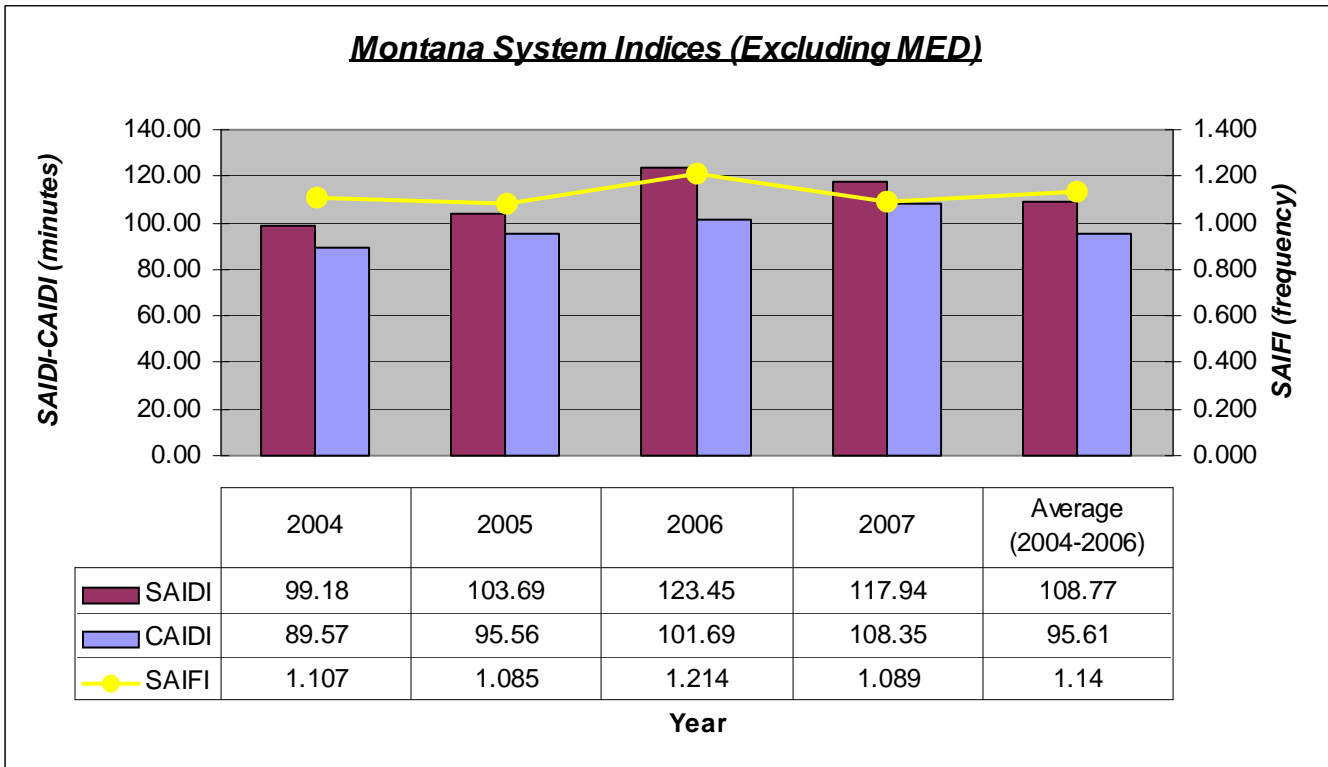


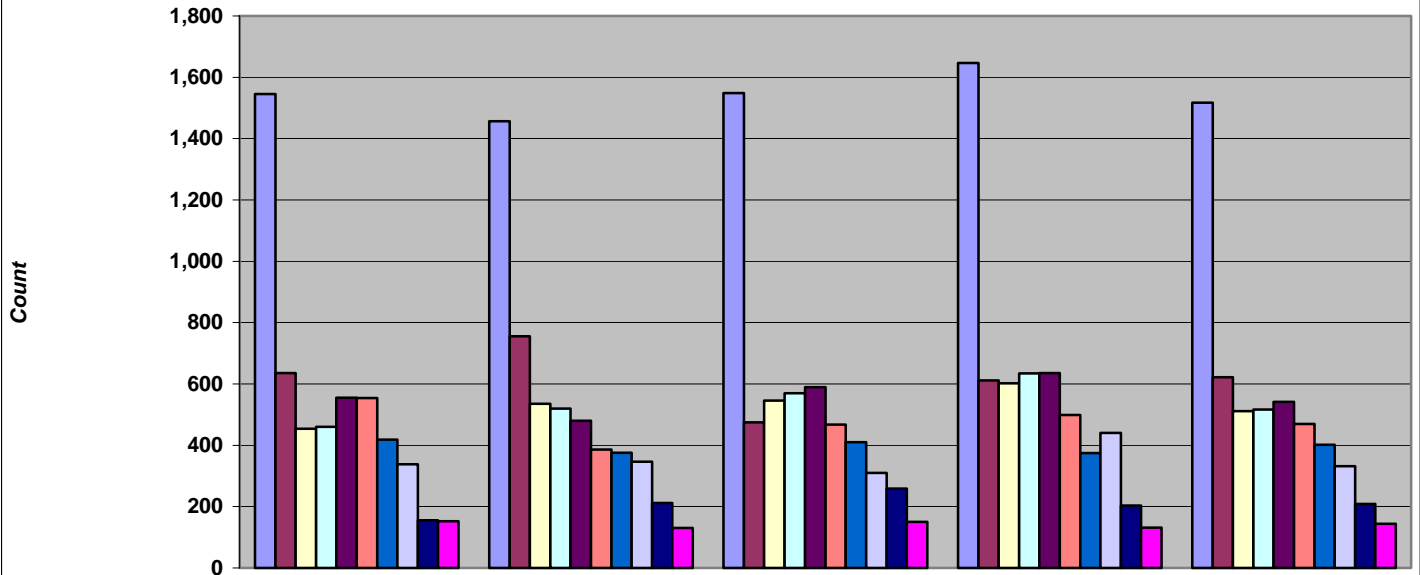
Figure 3.0a – Montana – System Indices (Excluding MED)

The figure showed above displays NorthWestern Energy’s Montana region indices and outage counts for the years 2004-2007. Region indices shown for 2004-2005 (Excluding MED) are IEEE certified and the 2006 - 2007 data was taken from year-end audited data (Excluding MED). Please note that SAIDI and CAIDI are given in minutes and SAIFI is given in the frequency of occurrence.

As can be seen by figure 3.0a, 2007 SAIDI and SAIFI indices decreased from the 2006-year end, although the 2007 SAIDI data was higher than the three-year average of (2004-2006). CAIDI increased by about 6.7 minutes. The contributing factors to this increase will be discussed later in this report and as each of the operating divisions of the Montana region are examined. Data and figures, which include identified MED information, are given in this section to demonstrate the significant increase in indices information if not removed.

Outages By Cause (Excluding MED) are also shown in a following figure 3.0b of this section.

Montana - Outages By Cause (Excluding MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	1,545	1,457	1,549	1,647	1,517
Lightning	635	755	475	612	622
Unknown	454	535	546	602	512
Tree In Line	460	520	570	634	517
Wind	555	480	590	636	542
Squirrel	554	386	468	499	469
Other Bird	418	376	410	375	401
Snow/Ice	338	346	310	440	331
Limb In Line	155	212	259	204	209
Vehicle Hit	152	130	150	132	144
TOTAL	5,266	5,197	5,327	5,781	5,263

Figure 3.0b – Montana – Outages By Cause (Excluding MED)

As can be seen in the figure above, outages increased by 454 from the 2006 operating year to the 2007 operating year which was also above the three year average (2004-2006). The outage causes represented in this table are the top ten major contributors for outages on the NorthWestern Energy Electric Distribution and Transmission system. Equipment Failure, Lightning, and Snow/Ice related outages saw the most significant increase from 2006 to 2007. Equipment Failure is the most common of the outage causes due to its broad and all-inclusive category nature. Outages can be related back to Equipment Failure in many different ways and it is the responsibility of the operations personnel to correctly identify the cause.

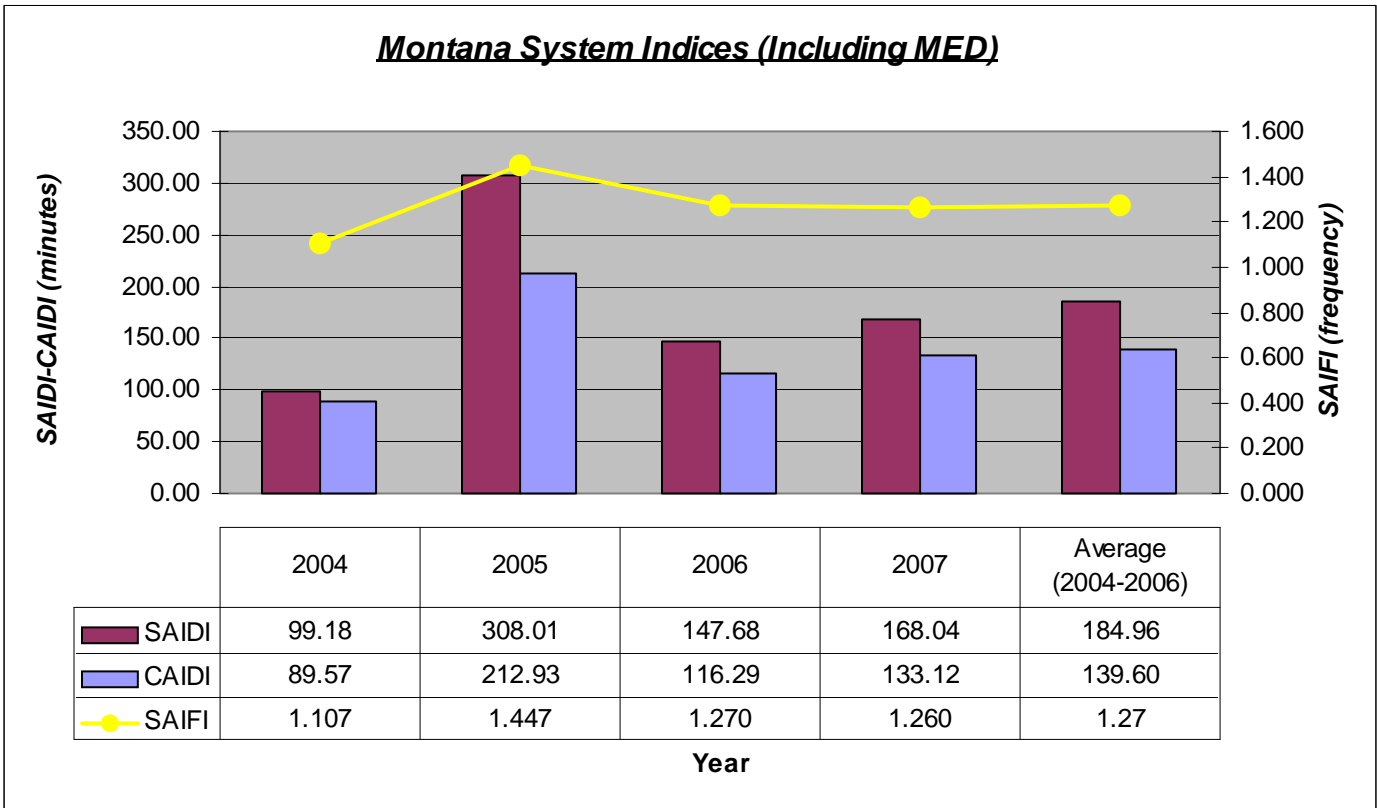
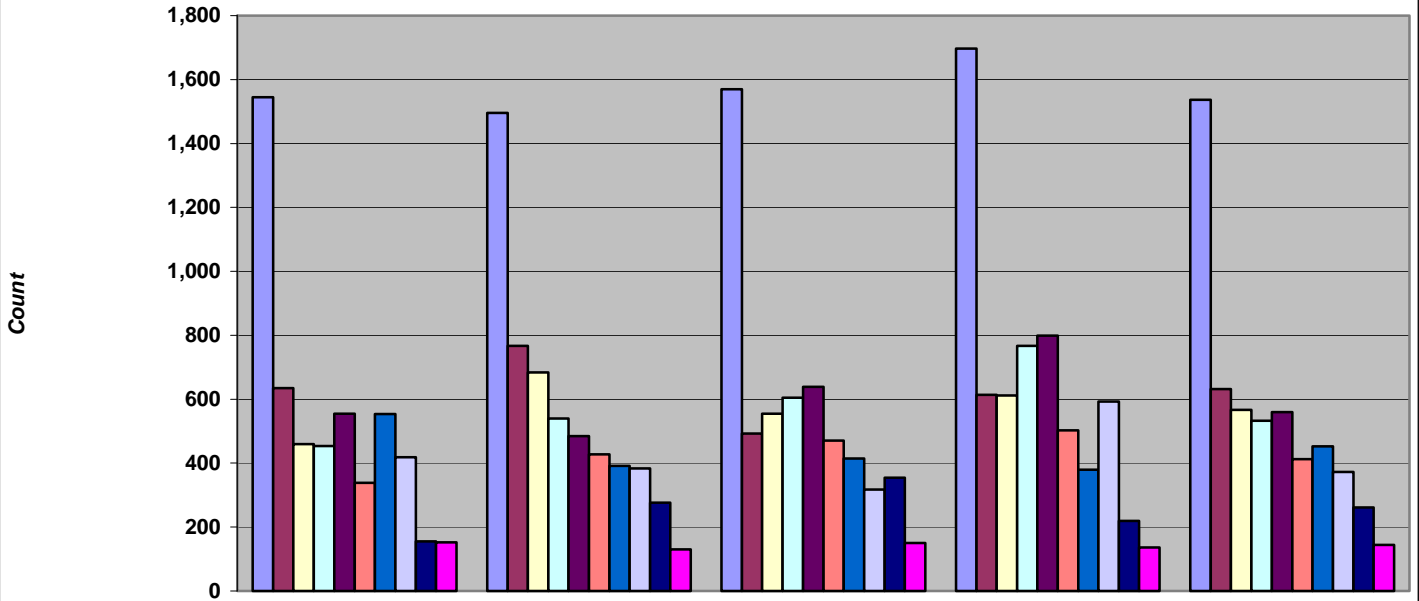


Figure 3.0c – Montana – System Indices (Including MED)

Montana - Outages By Cause (Including MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	1,545	1,496	1,570	1,697	1,537
Lightning	635	767	493	614	632
Unknown	460	684	555	612	566
Tree In Line	454	540	605	767	533
Wind	555	485	639	799	560
Squirrel	338	427	471	503	412
Other Bird	554	391	414	379	453
Snow/Ice	418	383	317	593	373
Limb In Line	155	276	354	219	262
Vehicle Hit	152	130	150	136	144
TOTAL	5,266	5,579	5,568	6,319	5,471

Figure 3.0d – Montana – Outages By Cause (Including MED)

4.0 Billings – System Reliability

4.1 Discussion: Billings Division fared well as far as storms in 2007 with only the November 12 & 13th windstorm causing a considerable number of outages, primarily on the thirteenth. Other major outages included one due to a wildfire and two from trees; one a limb in the line and the other when a tree fell through the line. Lightning, snow/ice and wind outages were up appreciably, but tree and limb outage numbers are down significantly, probably due to emphasis on the cycle trimming program.

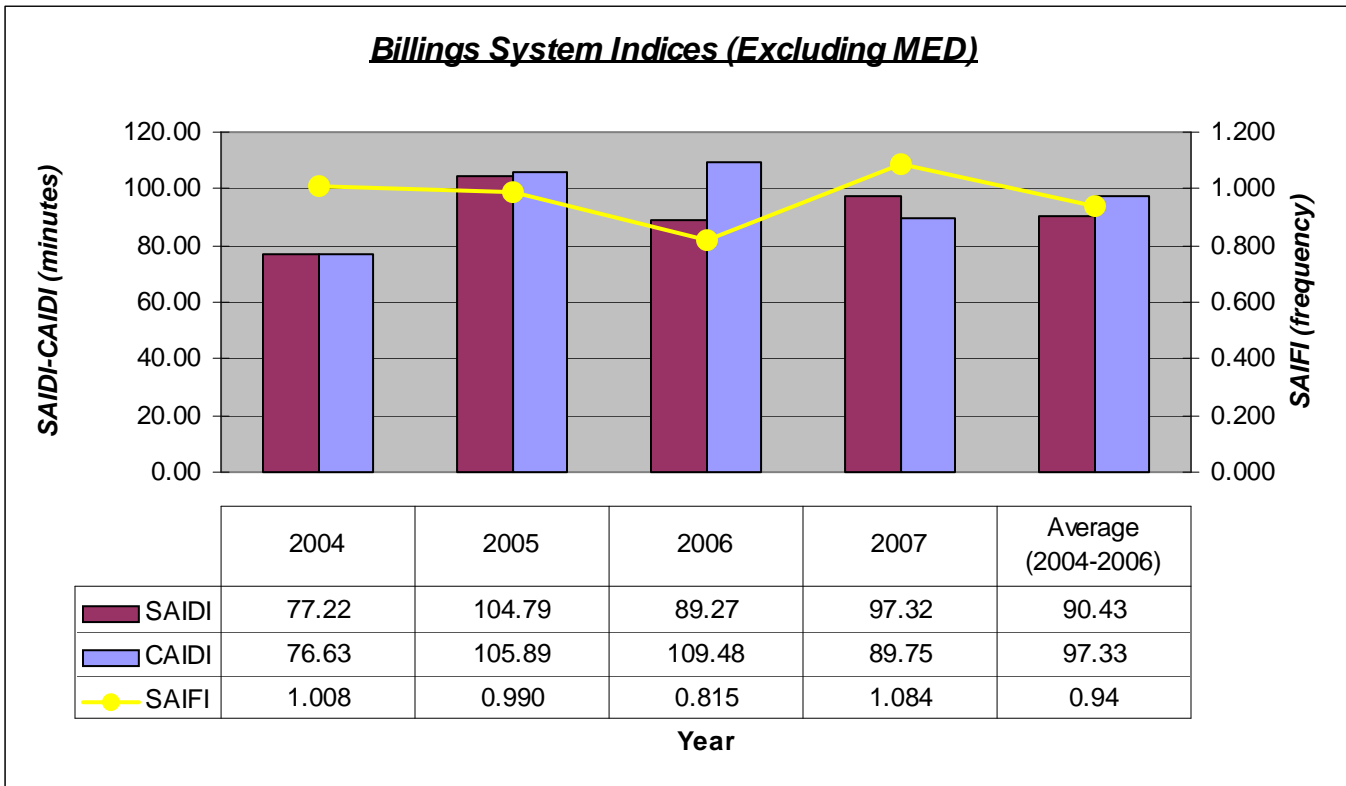


Figure 4.0a – Billings – System Indices (Excluding MED)

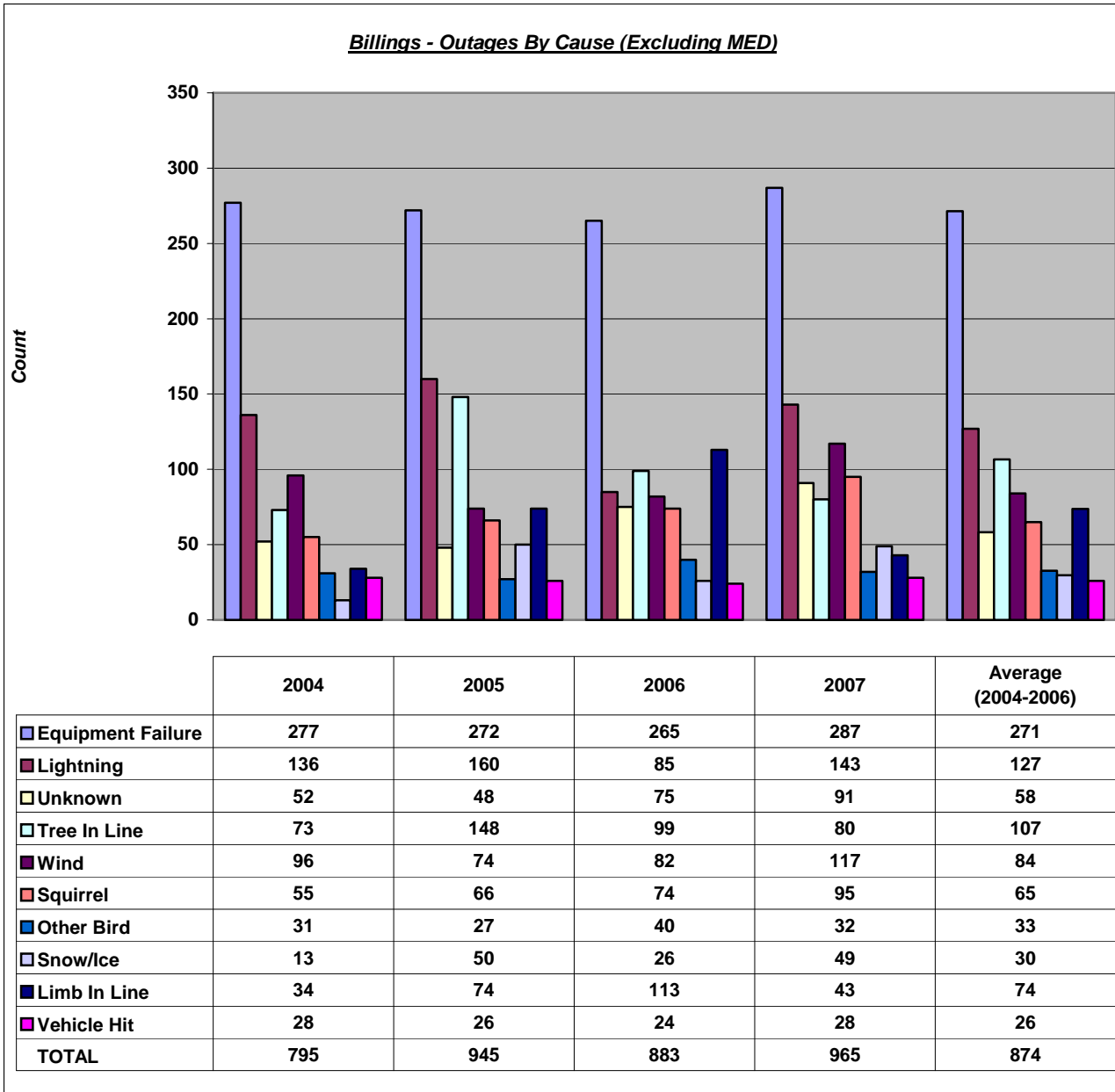


Figure 4.0b – Billings – Outages By Cause (Excluding MED)

Billings System Indices (Including MED)

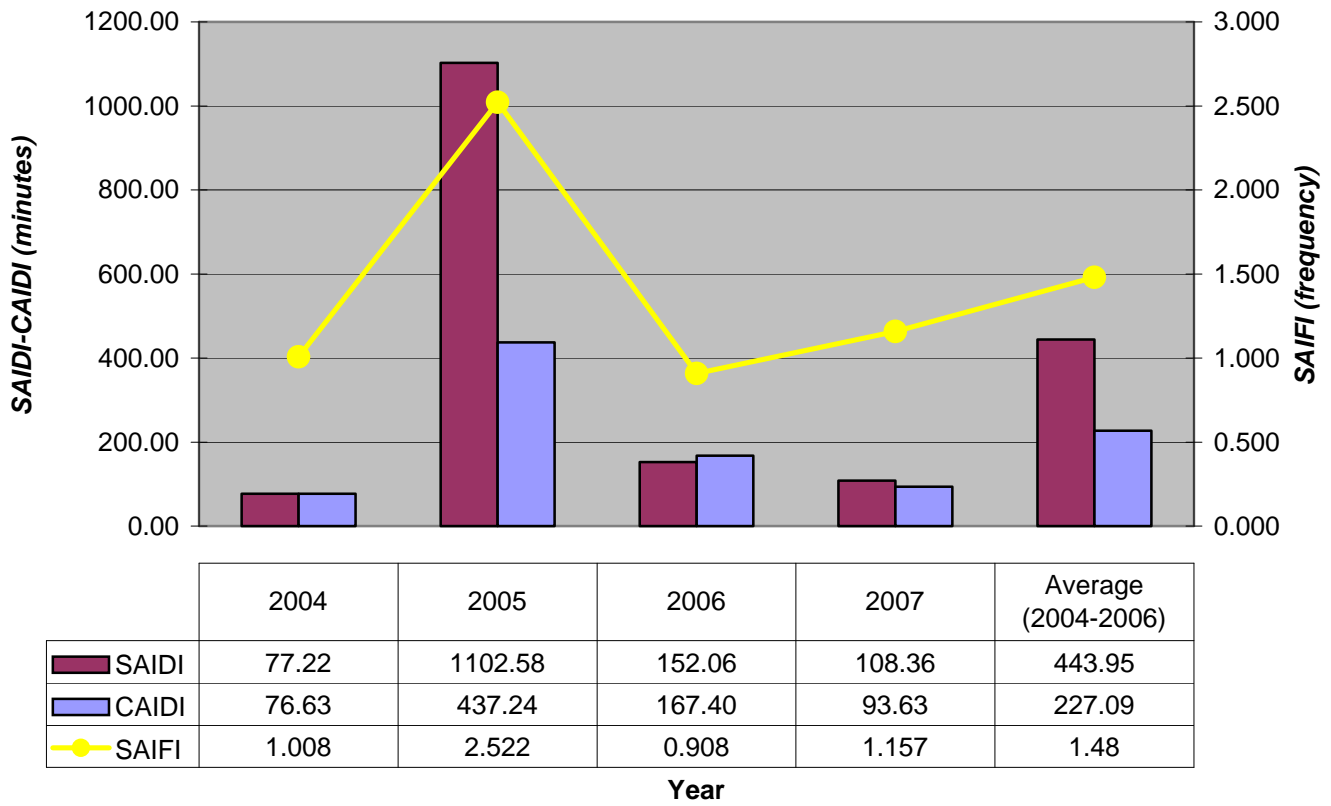


Figure 4.0c – Billings – System Indices (Including MED)

Billings - Outages By Cause (Including MED)

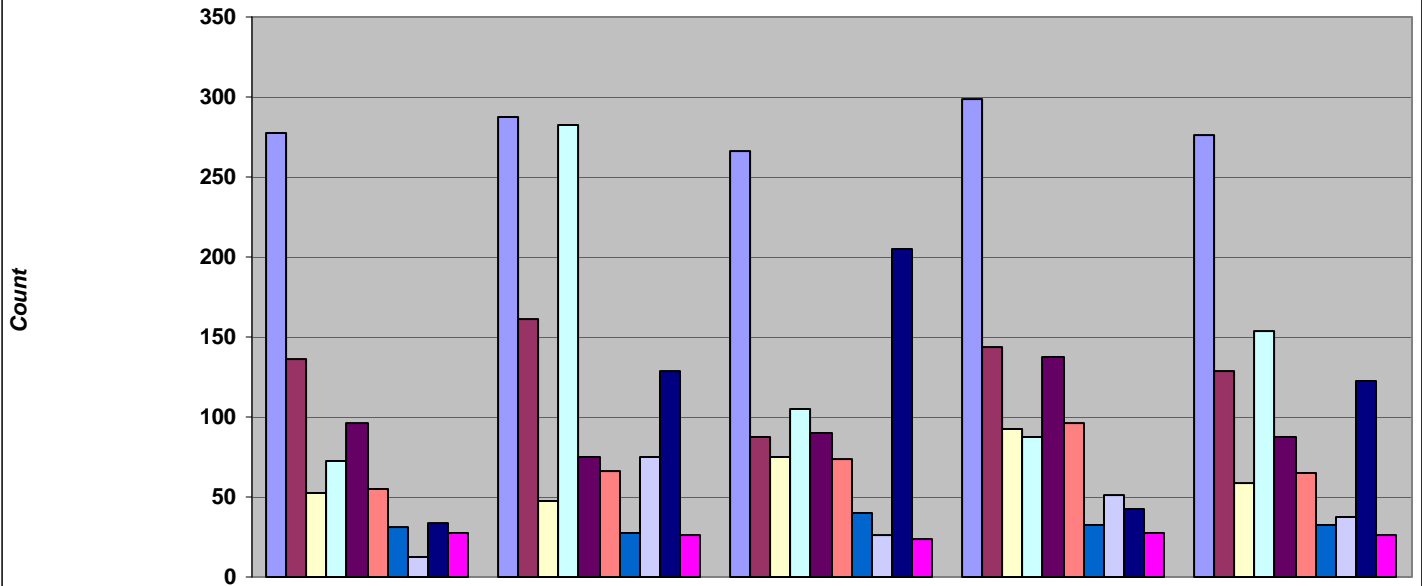


Figure 4.0d – Billings – Outages By Cause (Including MED)

5.0 Bozeman – System Reliability

5.1 Discussion: Bozeman Division had about 60 outages from the windstorm on November 12/13, but not many outages on the other two major event days. Excluding these major events, CAIDI was up, but SAIFI was down, keeping the division SAIDI about the same. Major outages in 2007 for Bozeman Division included a scheduled feeder reroute, a tree in the 50kv transmission, a broken cutout that took out the circuit, and a hit guy wire that also cleared a feeder. Equipment failures are up as well as vegetation and snow/ice outages, but there were fewer vehicle-hit poles.

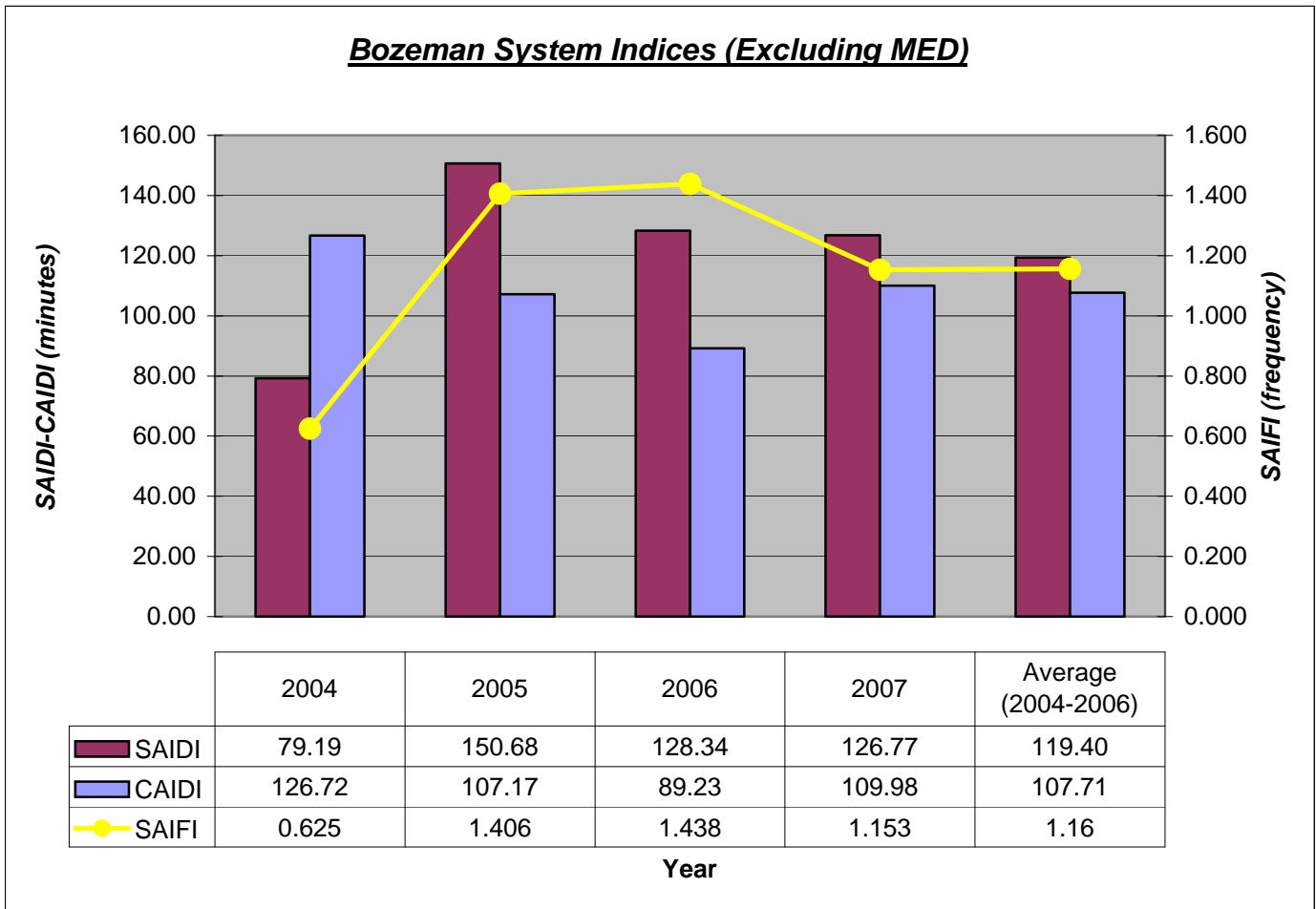
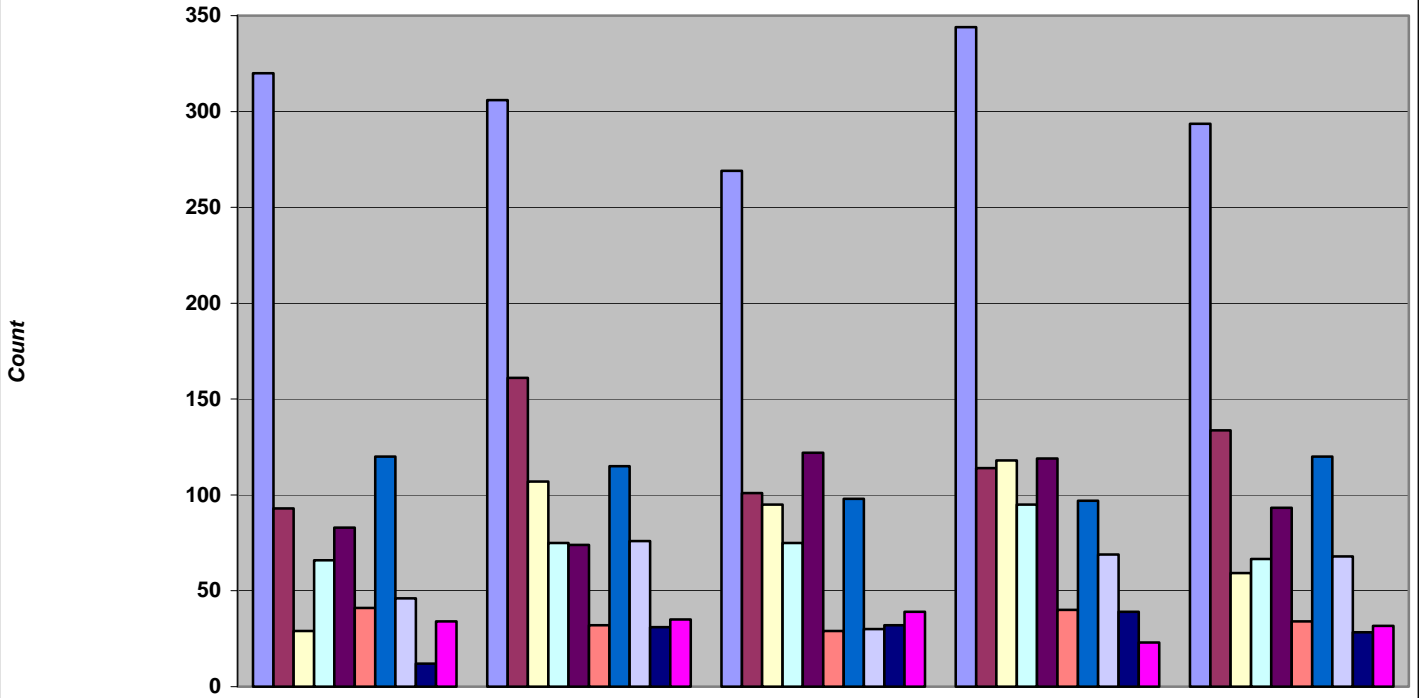


Figure 5.0a – Bozeman – System Indices (Excluding MED)

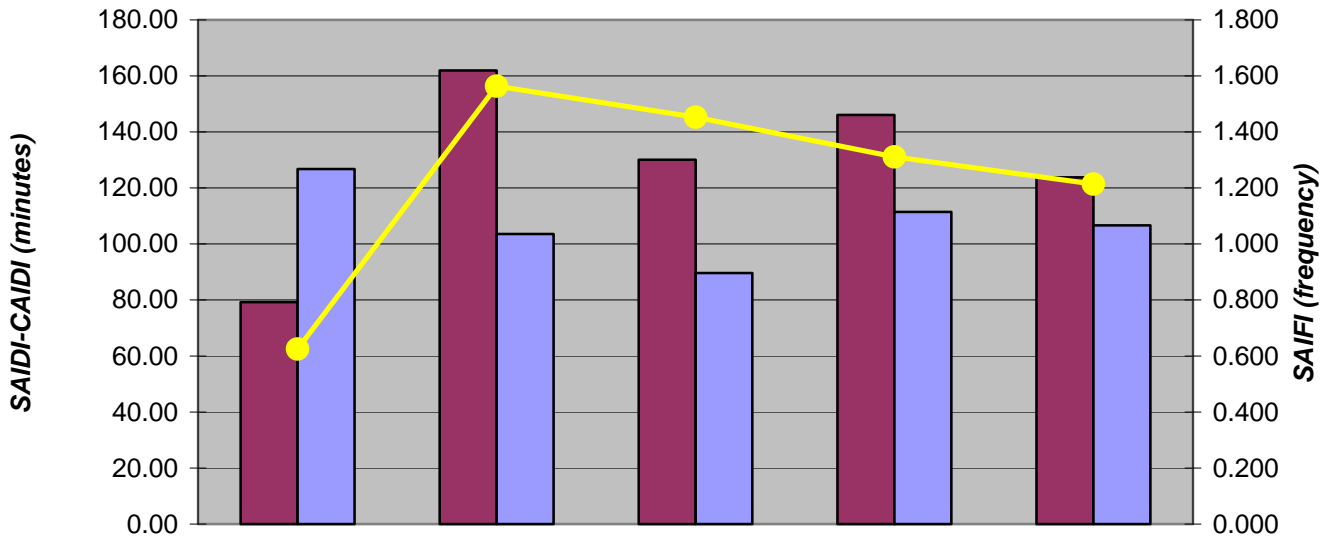
Bozeman - Outages By Cause (Excluding MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	320	306	269	344	294
Lightning	93	161	101	114	134
Unknown	29	107	95	118	59
Tree In Line	66	75	75	95	67
Wind	83	74	122	119	93
Squirrel	41	32	29	40	34
Other Bird	120	115	98	97	120
Snow/Ice	46	76	30	69	68
Limb In Line	12	31	32	39	28
Vehicle Hit	34	35	39	23	32
TOTAL	844	1,012	890	1,058	915

Figure 5.0b – Bozeman – Outages By Cause (Excluding MED)

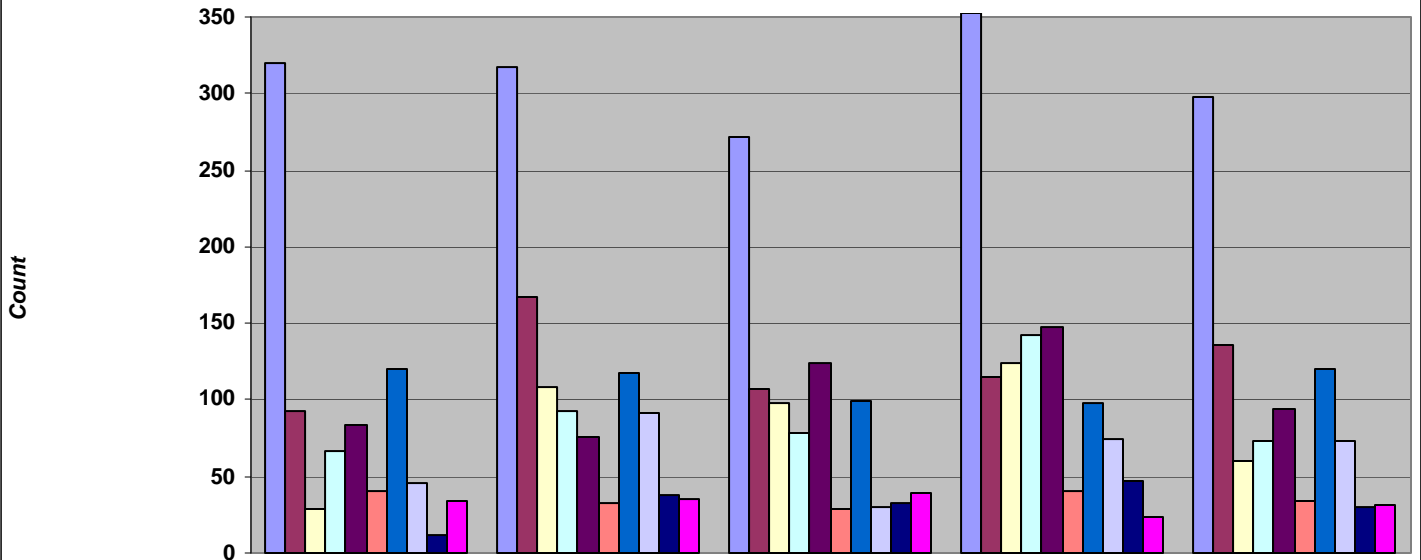
Bozeman System Indices (Including MED)



	2004	2005	2006	2007	Average (2004-2006)
SAIDI	79.19	161.9	130.11	146.04	123.73
CAIDI	126.72	103.54	89.57	111.41	106.61
SAIFI	0.625	1.564	1.453	1.311	1.21

Figure 5.0c – Bozeman – System Indices (Including MED)

Bozeman - Outages By Cause (Including MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	320	317	272	353	297
Lightning	93	167	107	115	136
Unknown	29	109	98	124	60
Tree In Line	66	93	78	143	73
Wind	83	76	124	147	94
Squirrel	41	33	29	40	34
Other Bird	120	117	99	98	121
Snow/Ice	46	91	30	74	73
Limb In Line	12	38	32	47	31
Vehicle Hit	34	35	39	24	32
TOTAL	844	1,076	908	1,165	943

Figure 5.0d – Bozeman – Outages By Cause (Including MED)

6.0 Butte – System Reliability

6.1 Discussion: After a couple good years, Butte Division was hit hard by storms in 2007. The 4/19 major event day was a combination of the Deer Lodge Substation transformer failure and a heavy, wet snowstorm in the Philipsburg and Georgetown Lake areas. In the fall, Anaconda and Butte were both impacted by the November windstorm. Butte division also had large outages on the “shoulder” days of 4/18 and 11/18 as these snowstorms came in. Other large outages in the division included three that were tree related and one from a substation differential. The increase in outage for 2007 from 2006 were largely in the storm related categories of wind, snow/ice, trees and lightning.

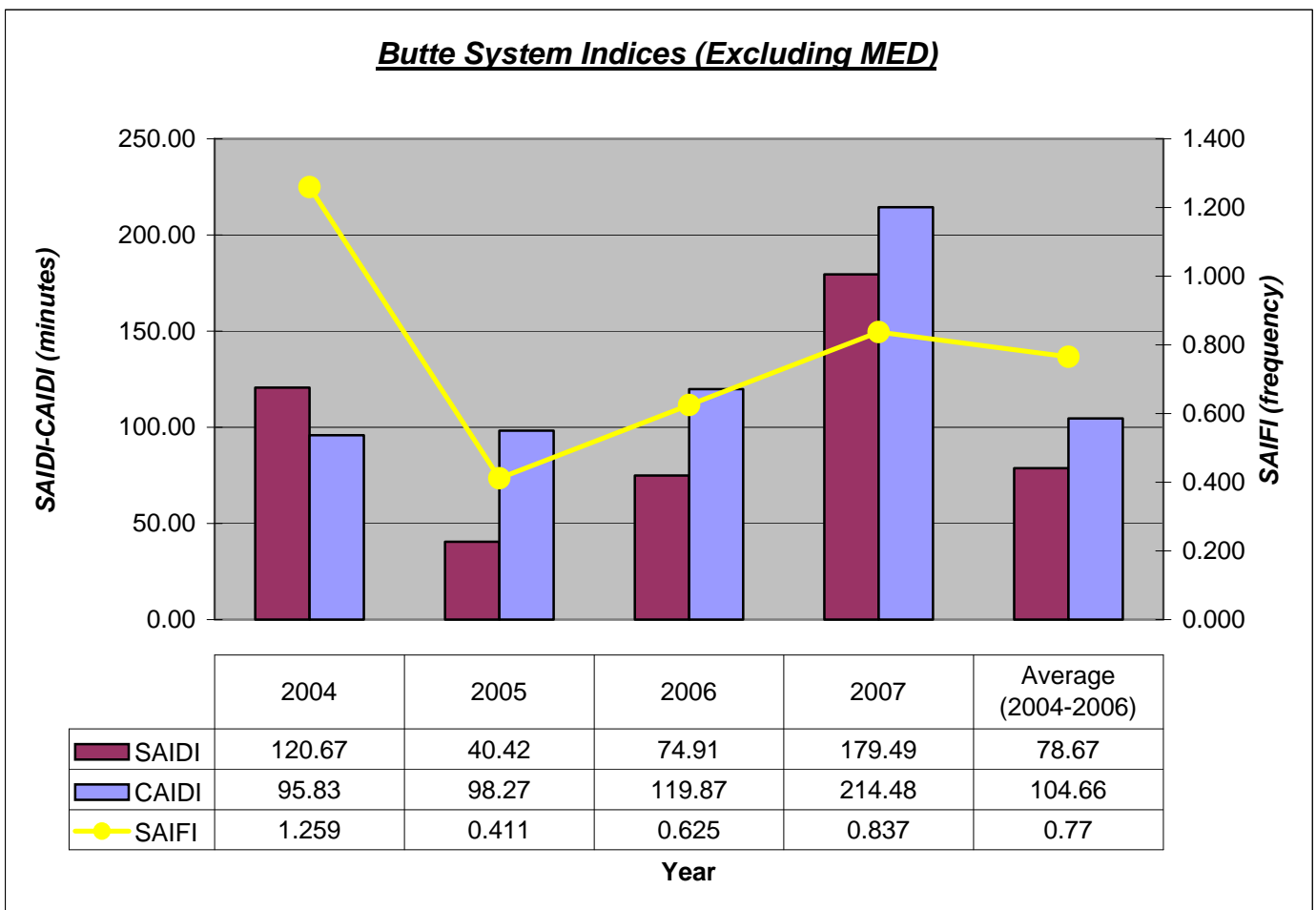
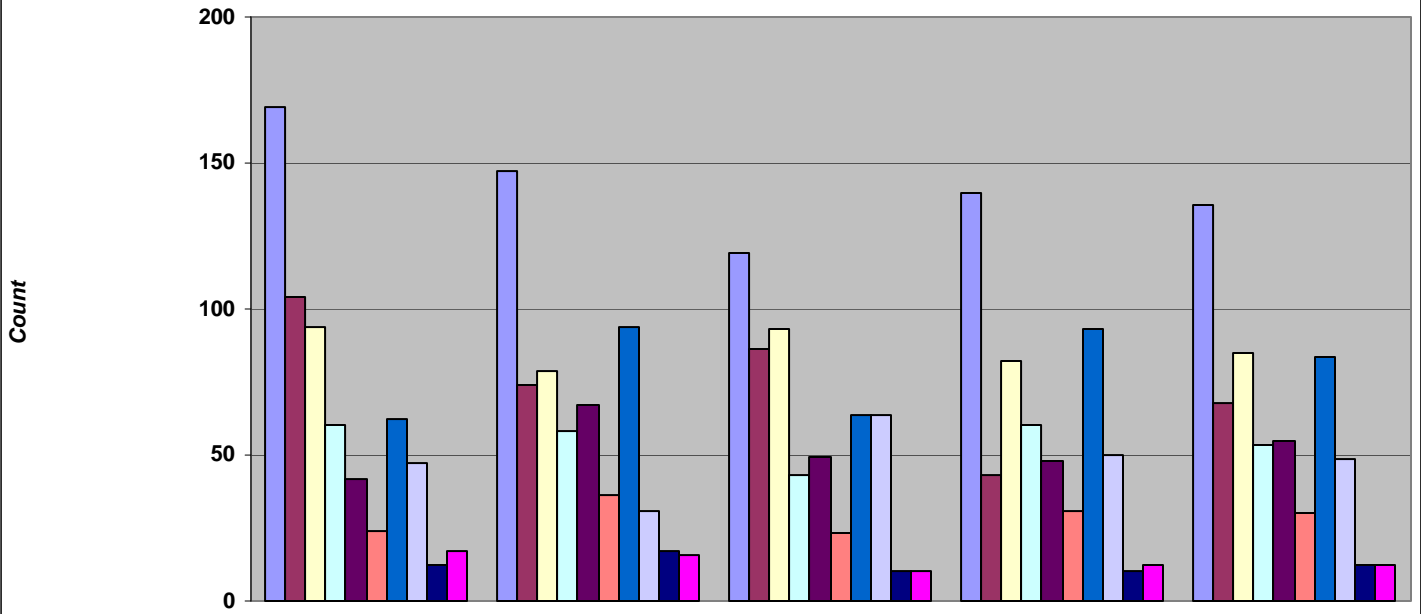


Figure 6.0a – Butte – System Indices (Excluding MED)

Butte - Outages By Cause (Excluding MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	169	147	119	140	135
Lightning	104	74	86	43	68
Unknown	94	79	93	82	85
Tree In Line	60	58	43	60	54
Wind	42	67	49	48	55
Squirrel	24	36	23	31	30
Other Bird	62	94	64	93	84
Snow/Ice	47	31	64	50	48
Limb In Line	12	17	10	10	12
Vehicle Hit	17	16	10	12	13
TOTAL	631	619	561	569	583

Figure 6.0b – Butte – Outages By Cause (Excluding MED)

Butte System Indices (Including MED)

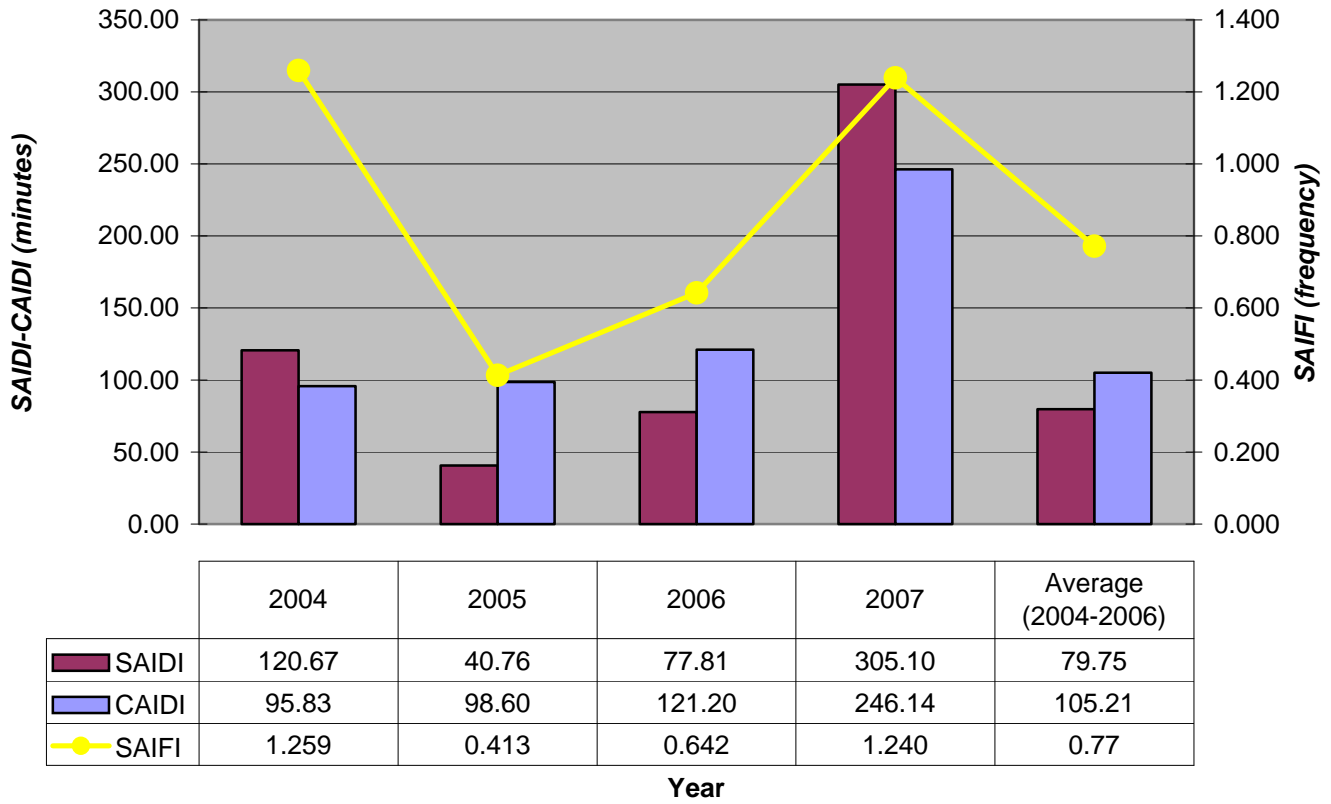
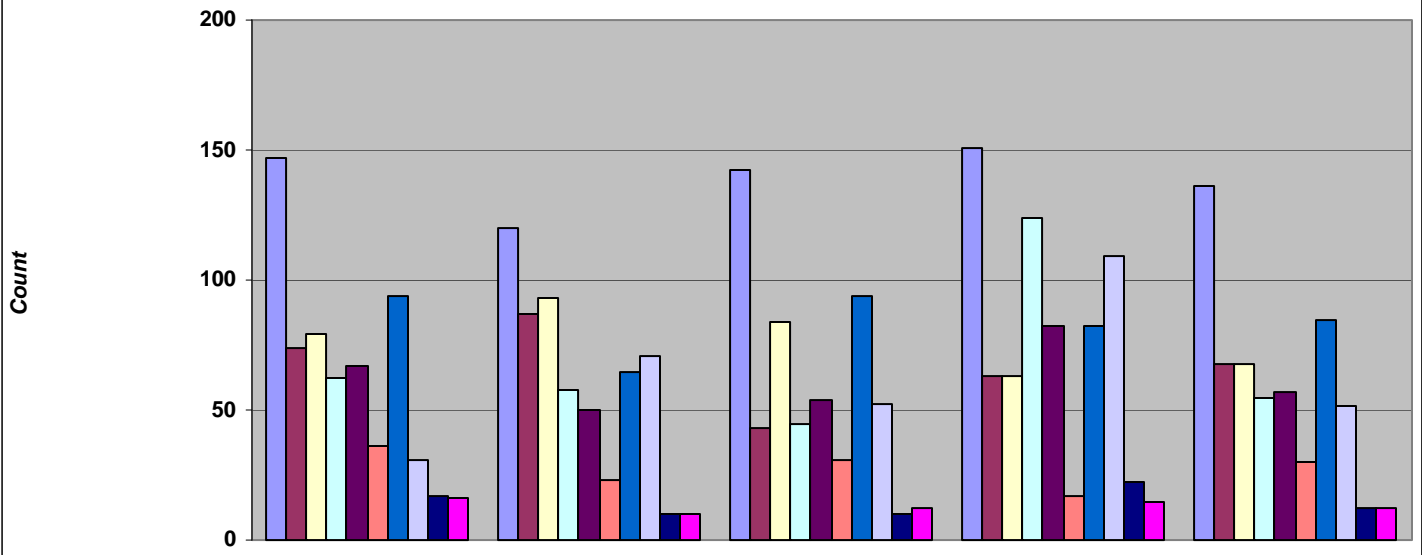


Figure 6.0c – Butte – System Indices (Including MED)

Butte - Outages By Cause (Including MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	147	120	142	151	136
Lightning	74	87	43	63	68
Unknown	79	93	84	63	68
Tree In Line	62	58	45	124	55
Wind	67	50	54	82	57
Squirrel	36	23	31	17	30
Other Bird	94	65	94	82	84
Snow/Ice	31	71	52	109	51
Limb In Line	17	10	10	22	12
Vehicle Hit	16	10	12	15	13
TOTAL	619	574	584	769	592

Figure 6.0d – Butte – Outages By Cause (Including MED)

7.0 Great Falls – System Reliability

7.1 Great Falls Division had improved reliability for 2007 with all three indices beating 2006 and three-year average numbers in both “excluding and including MED” categories. The November 12/13 windstorms were the only major event days that impacted Great Falls, causing about 43 outages. Wind and snow/ice caused four of the larger outages in the division and squirrels in a substation and on a circuit caused two large outages where power was quickly restored. Lightning, wind, and squirrels were the only cause categories showing increasing outages.

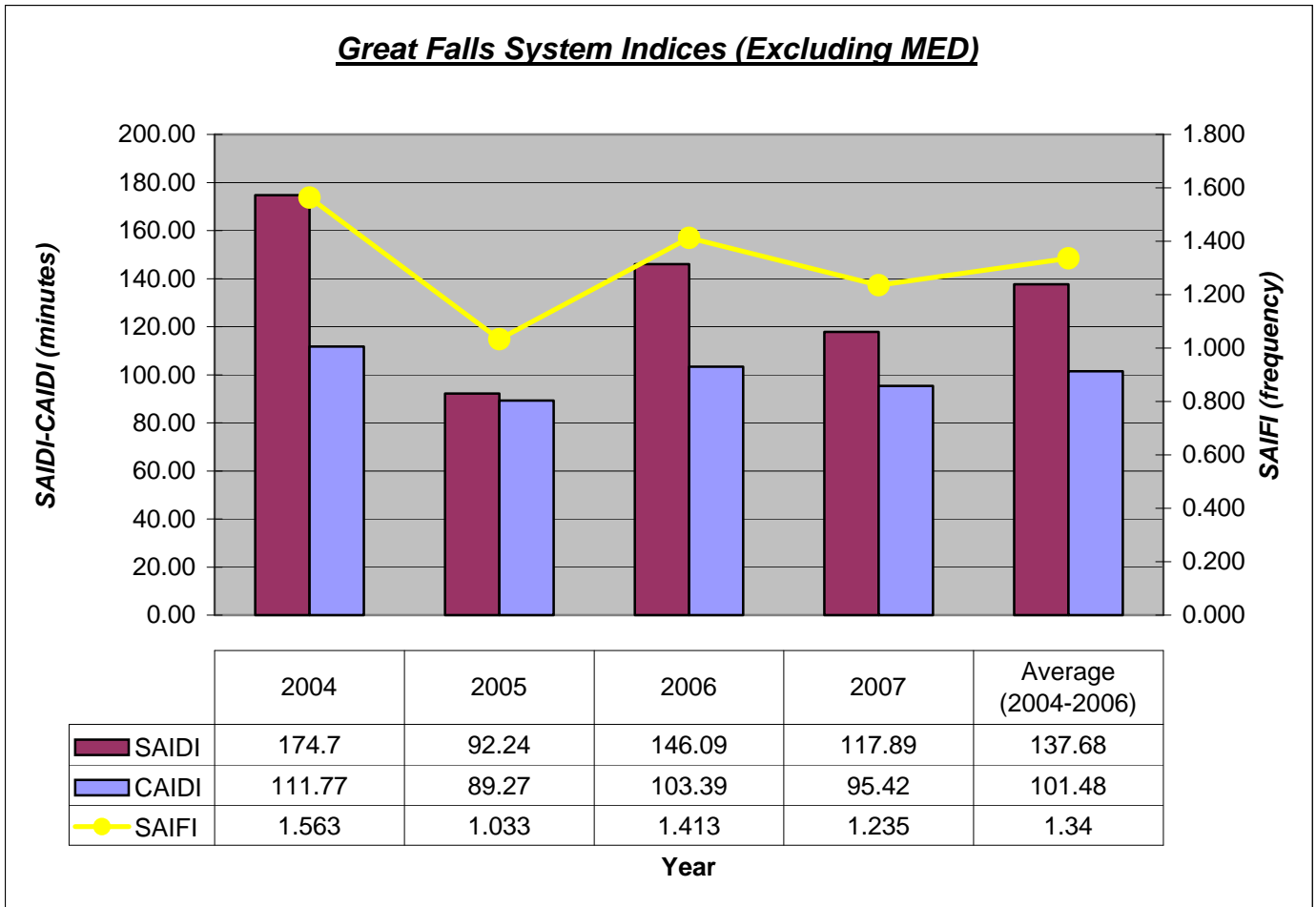
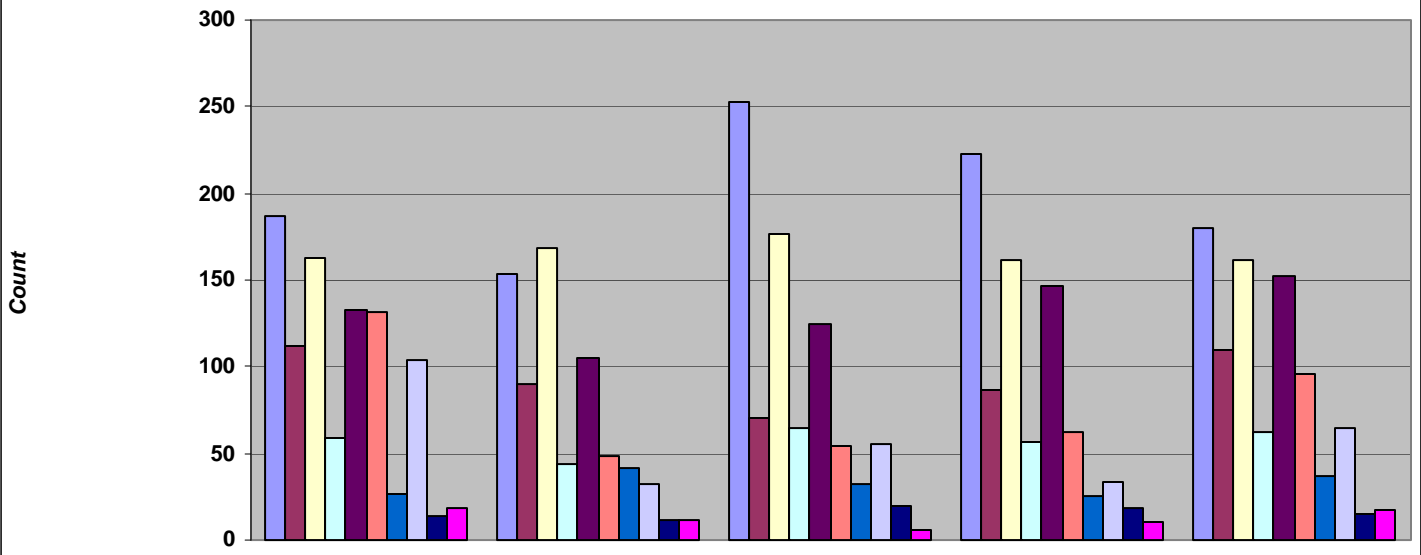


Figure 7.0a – Great Falls – System Indices (Excluding MED)

Great Falls - Outages By Cause (Excluding MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	187	154	253	223	180
Lightning	112	90	70	87	110
Unknown	163	168	176	161	162
Tree In Line	59	44	65	57	62
Wind	133	105	125	146	152
Squirrel	132	48	54	62	96
Other Bird	27	41	32	25	37
Snow/Ice	104	32	55	34	64
Limb In Line	14	12	20	19	15
Vehicle Hit	19	12	6	10	18
TOTAL	950	706	856	824	837

Figure 7.0b – Great Falls – Outages By Cause (Excluding MED)

Great Falls System Indices (Including MED)

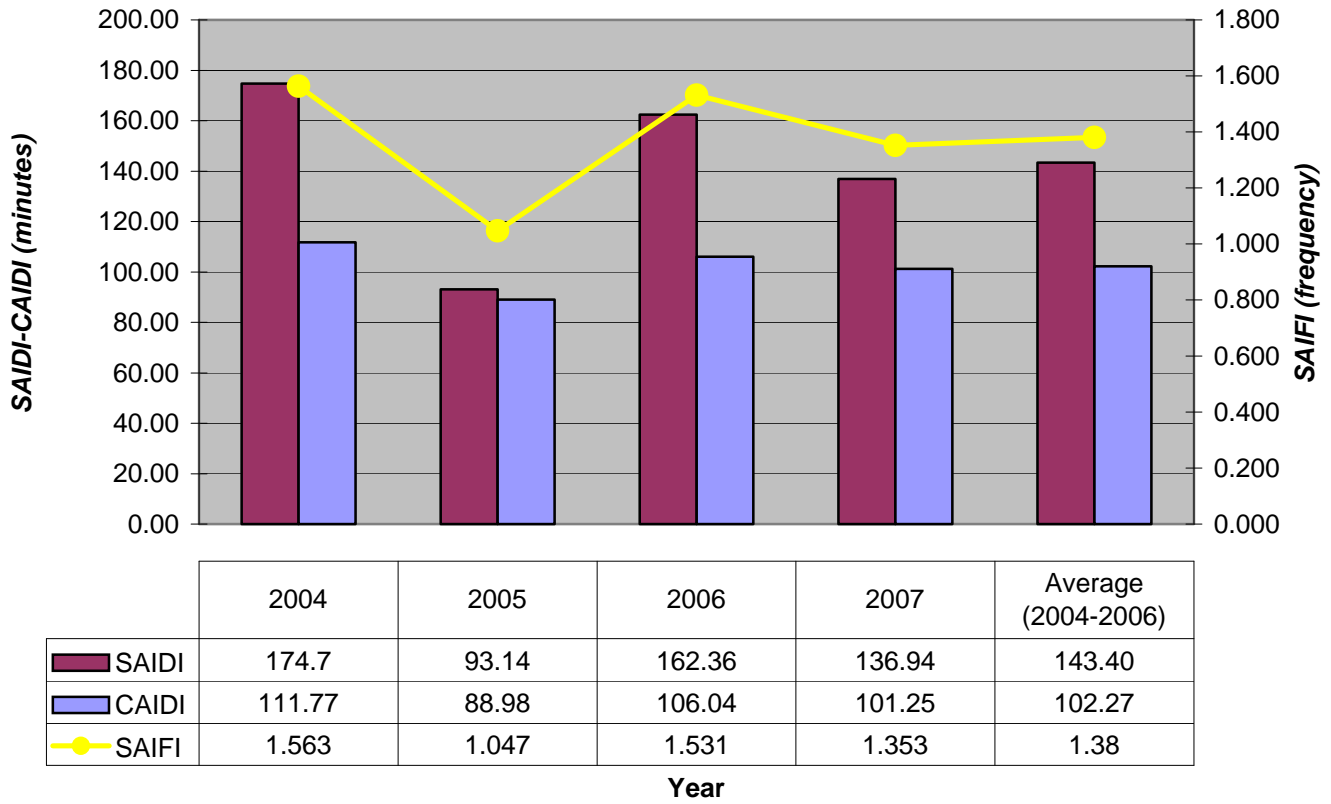
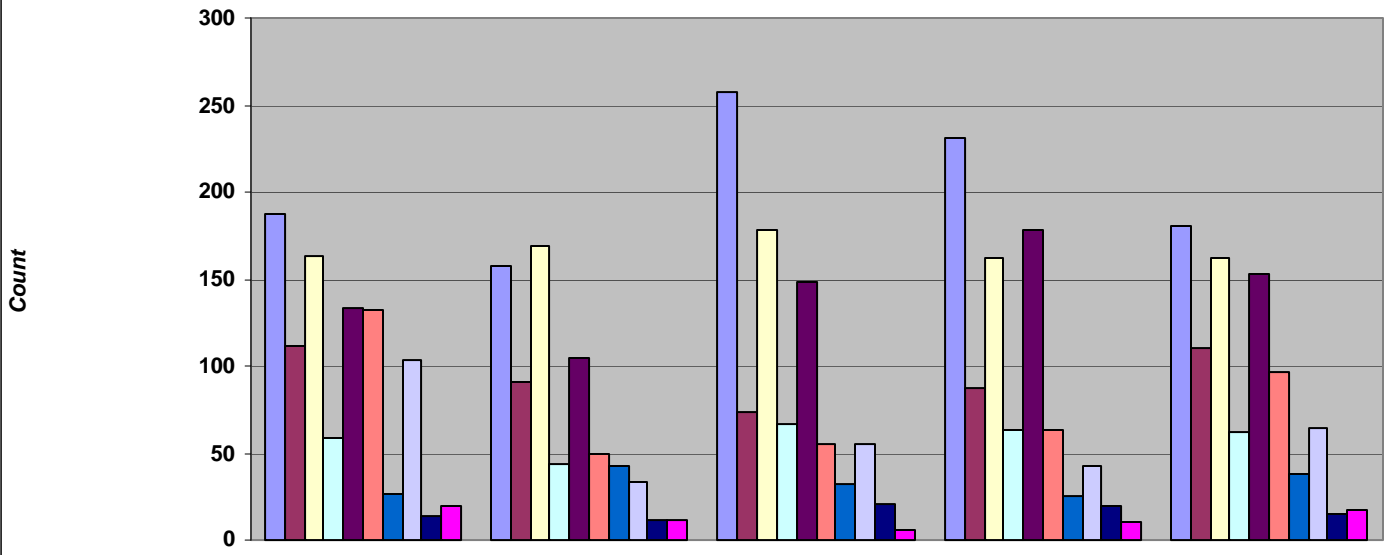


Figure 7.0c – Great Falls – System Indices (Including MED)

Great Falls - Outages By Cause (Including MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	187	157	258	231	181
Lightning	112	91	73	87	110
Unknown	163	169	178	162	162
Tree In Line	59	44	67	63	62
Wind	133	105	148	178	152
Squirrel	132	49	55	63	96
Other Bird	27	43	32	25	38
Snow/Ice	104	33	55	42	65
Limb In Line	14	12	21	19	15
Vehicle Hit	19	12	6	10	18
TOTAL	950	715	893	880	853

Figure 7.0d – Great Falls – Outages By Cause (Including MED)

8.0 Havre – System Reliability

8.1 Discussion: The only MED to effect Havre was the November 13th windstorm. Two indices (SAIDI and SAIFI) dropped in 2007, while CAIDI rose. No Havre outages were reported on the Montana Region “Top Twenty” SAIDI and SAIFI reports. Lightning, wind, and trees were the cause categories seeing significant increases over 2006 numbers.

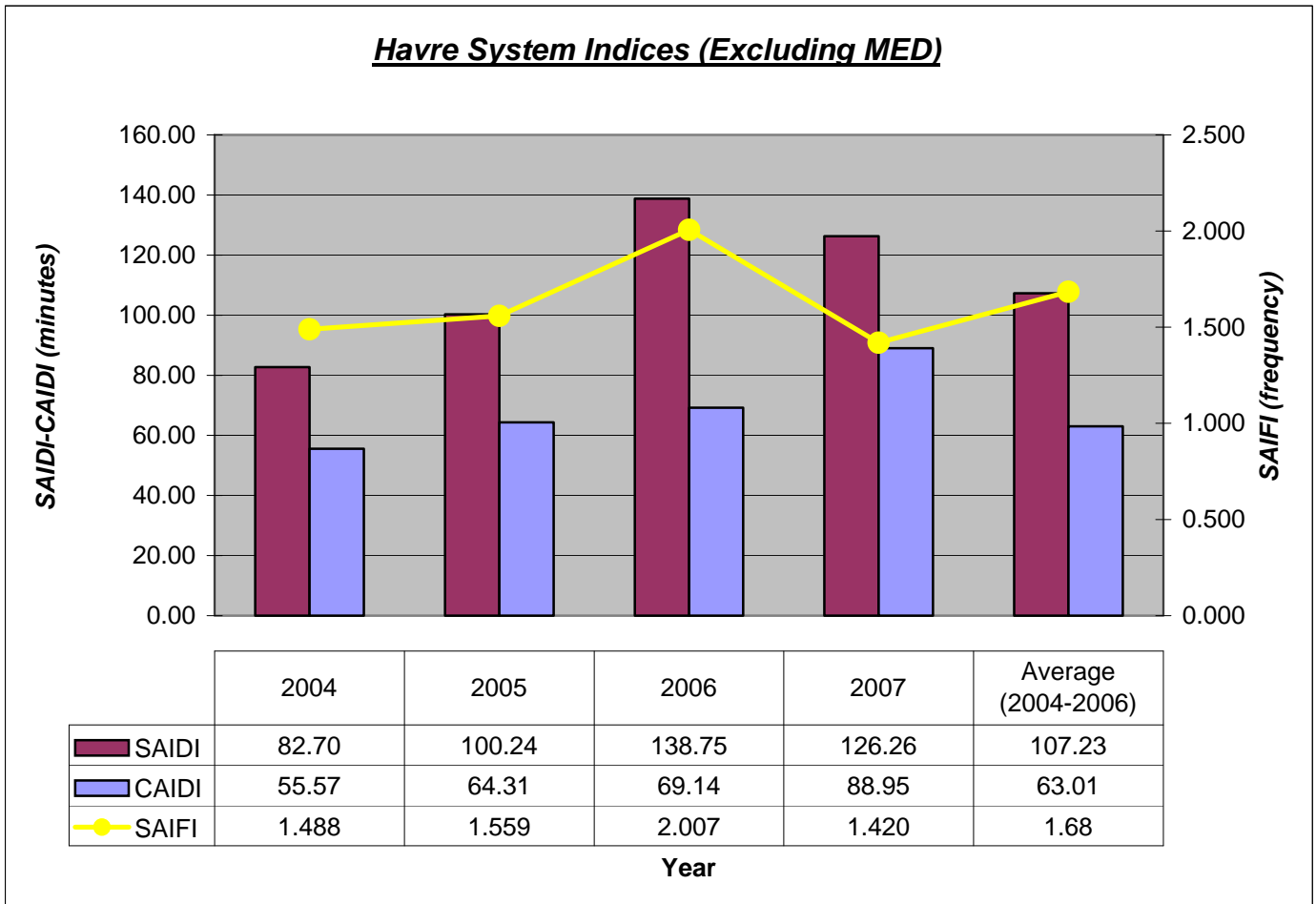


Figure 8.0a – Havre – System Indices (Excluding MED)

Havre - Outages By Cause (Excluding MED)

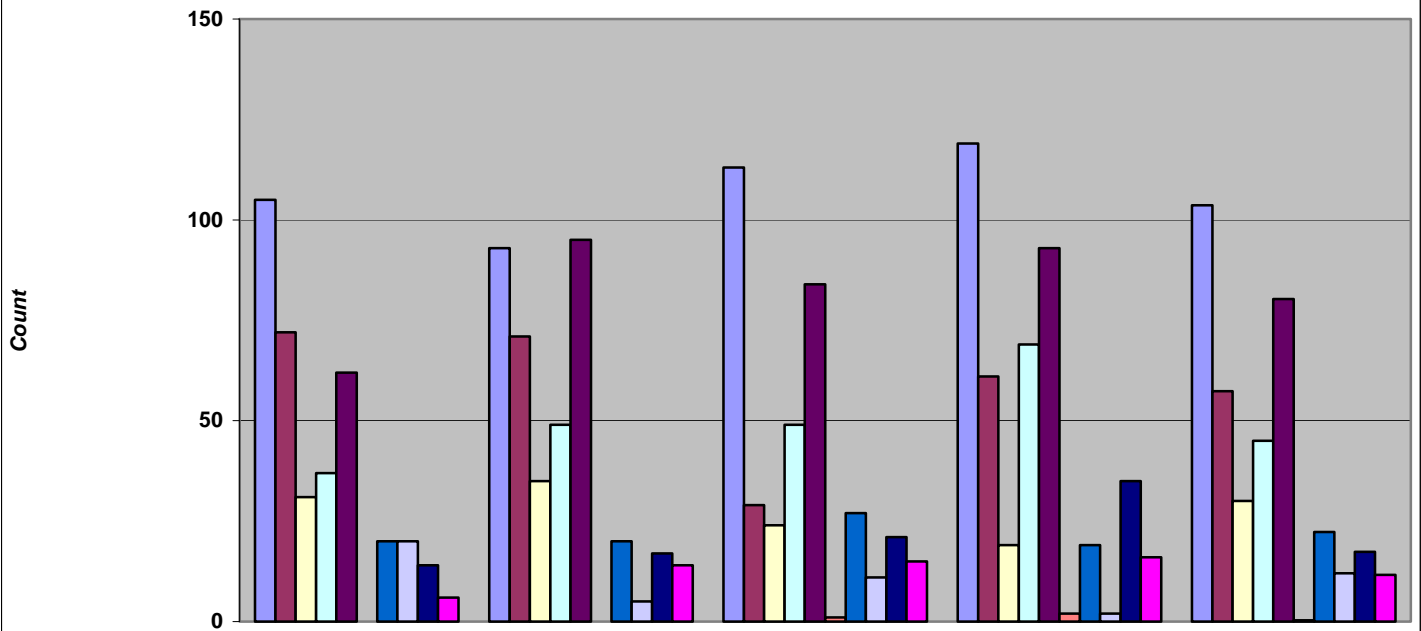


Figure 8.0b – Havre – Outages By Cause (Excluding MED)

Havre System Indices (Including MED)

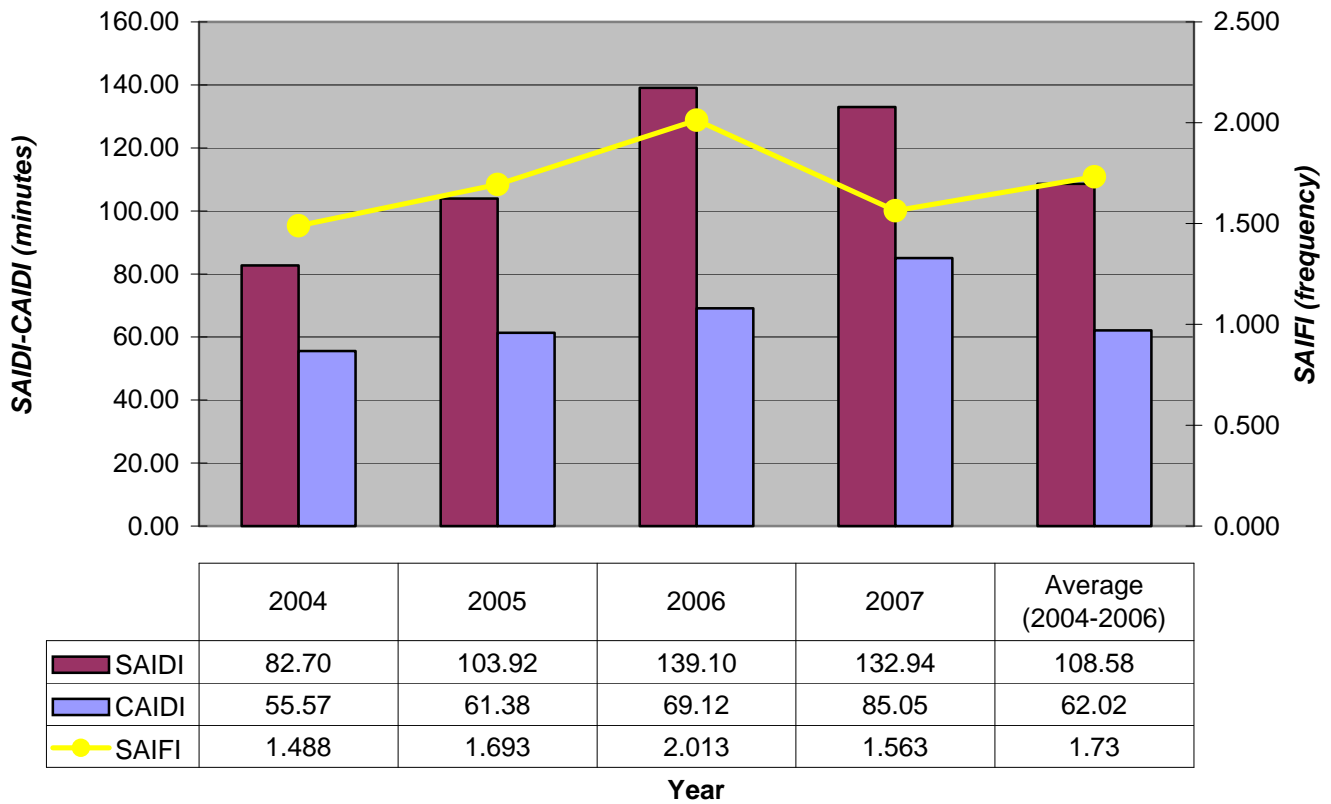
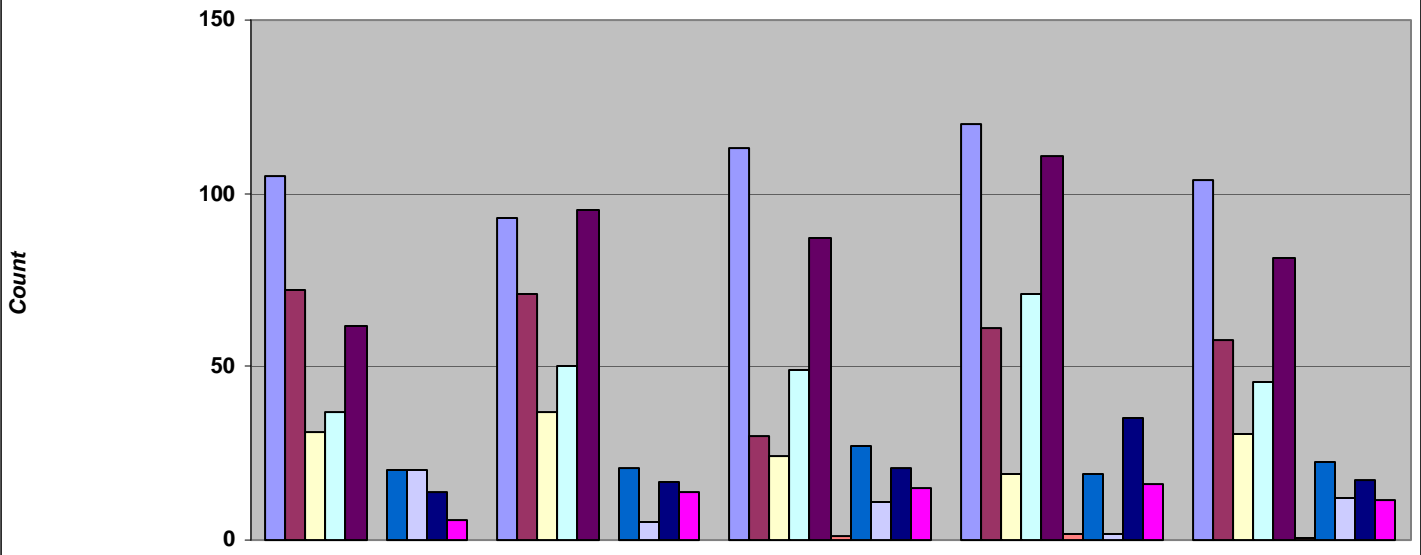


Figure 8.0c – Havre – System Indices (Including MED)

Havre - Outages By Cause (Including MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	105	93	113	120	104
Lightning	72	71	30	61	58
Unknown	31	37	24	19	31
Tree In Line	37	50	49	71	45
Wind	62	95	87	111	81
Squirrel	0	0	1	2	0
Other Bird	20	21	27	19	23
Snow/Ice	20	5	11	2	12
Limb In Line	14	17	21	35	17
Vehicle Hit	6	14	15	16	12
TOTAL	367	403	378	456	383

Figure 8.0d – Havre – Outages By Cause (Including MED)

9.0 Helena – System Reliability

9.1 Discussion: Helena Division had 43 outages due to the November windstorm and 13 from the later November snow storm, driving the reliability indices and outage count up for 2007. The largest outages were a pole fire during the November windstorm, a feeder de-energized due to a wildfire, a pole down during and also a failed insulator during strong winds in January, and two incidents where transfer equipment failed to operate correctly when the primary transmission line experienced an outage. Increased outage causers were trees, wind, and snow/ice, reflecting a fairly active storm year.

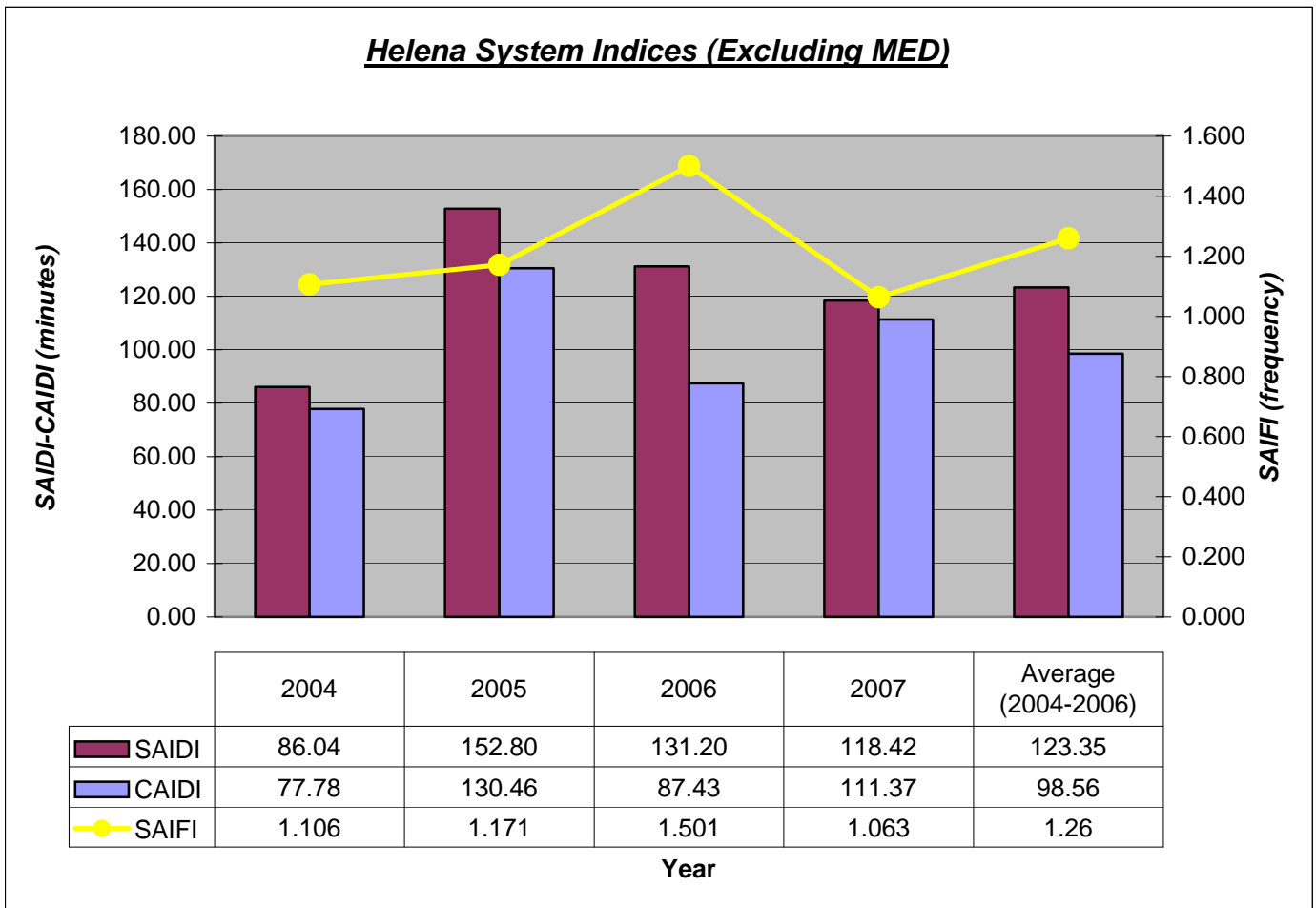
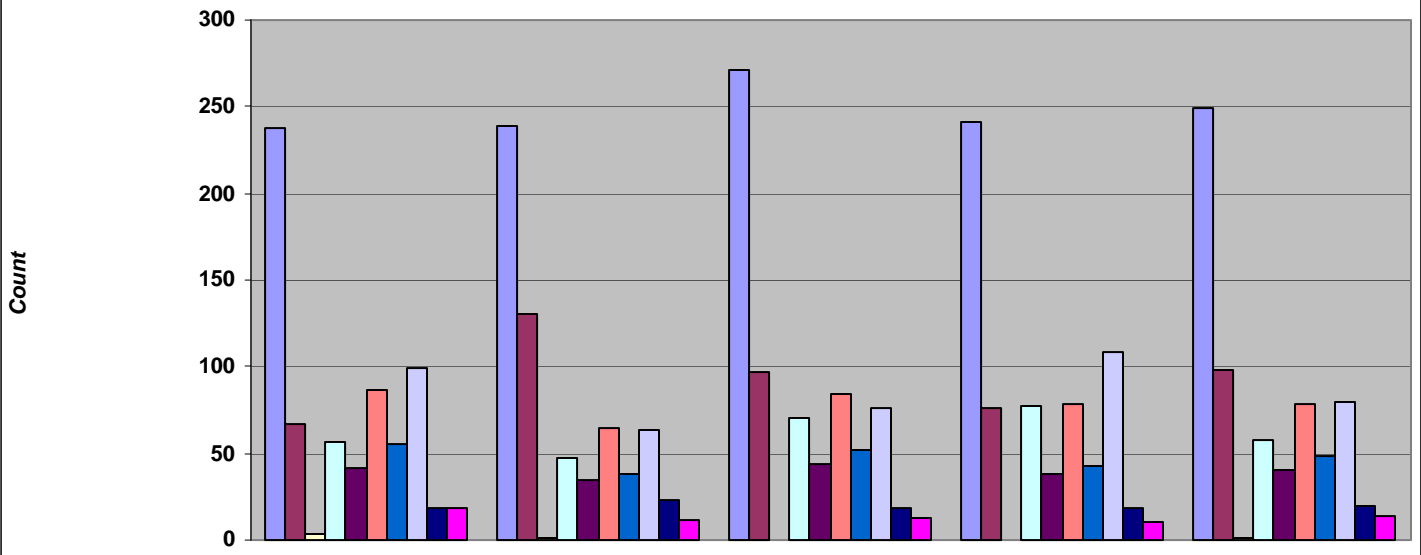


Figure 9.0a – Helena – System Indices (Excluding MED)

Helena - Outages By Cause (Excluding MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	238	239	271	241	249
Lightning	67	130	97	76	98
Unknown	4	1	0	0	2
Tree In Line	57	47	70	77	58
Wind	42	35	44	38	40
Squirrel	86	65	84	78	78
Other Bird	55	38	52	43	48
Snow/Ice	99	64	76	109	80
Limb In Line	18	23	19	18	20
Vehicle Hit	18	12	13	10	14
TOTAL	684	654	726	690	688

Figure 9.0b – Helena – Outages By Cause (Excluding MED)

Helena System Indices (Including MED)

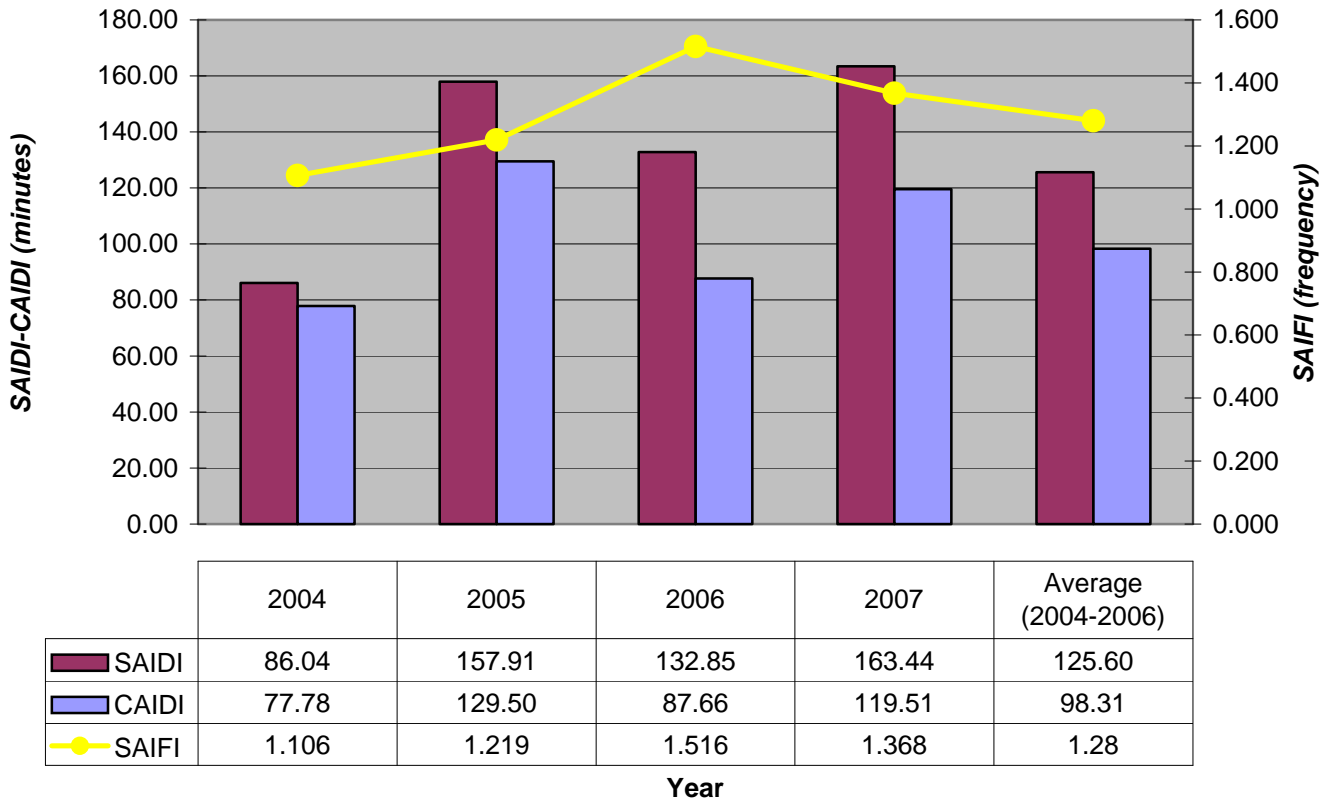
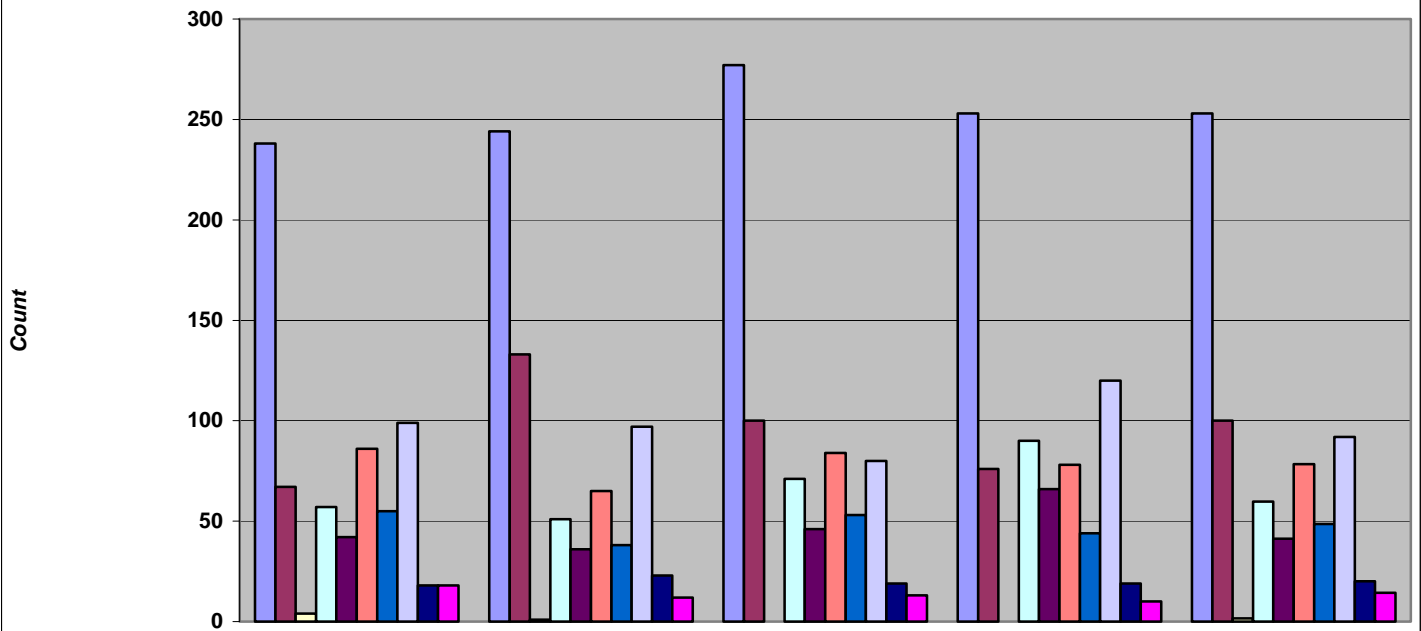


Figure 9.0c – Helena – System Indices (Including MED)

Helena - Outages By Cause (Including MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	238	244	277	253	253
Lightning	67	133	100	76	100
Unknown	4	1	0	0	2
Tree In Line	57	51	71	90	60
Wind	42	36	46	66	41
Squirrel	86	65	84	78	78
Other Bird	55	38	53	44	49
Snow/Ice	99	97	80	120	92
Limb In Line	18	23	19	19	20
Vehicle Hit	18	12	13	10	14
TOTAL	684	700	743	756	709

Figure 9.0d – Helena – Outages By Cause (Including MED)

10.0 Lewistown – System Reliability

10.1 Discussion: The November windstorm caused 18 outages in the Lewistown area and was the only major event to impact this area. All the reliability indices improved in 2007 from the bad year experienced in 2006, but were still high when compared to the three-year average that includes two very good previous years (2004-05). The worst storm and outages for Lewistown were from a fairly isolated wind and snowstorm in late March that affected the Judith Gap area. Due to very poor access from heavy snows, a small number of customers were out for multiple days. This was not a regional MED, since the customer counts were small. Equipment failures, lightning, snow/ice, and vehicle-hits are the cause factors that were up in 2007.

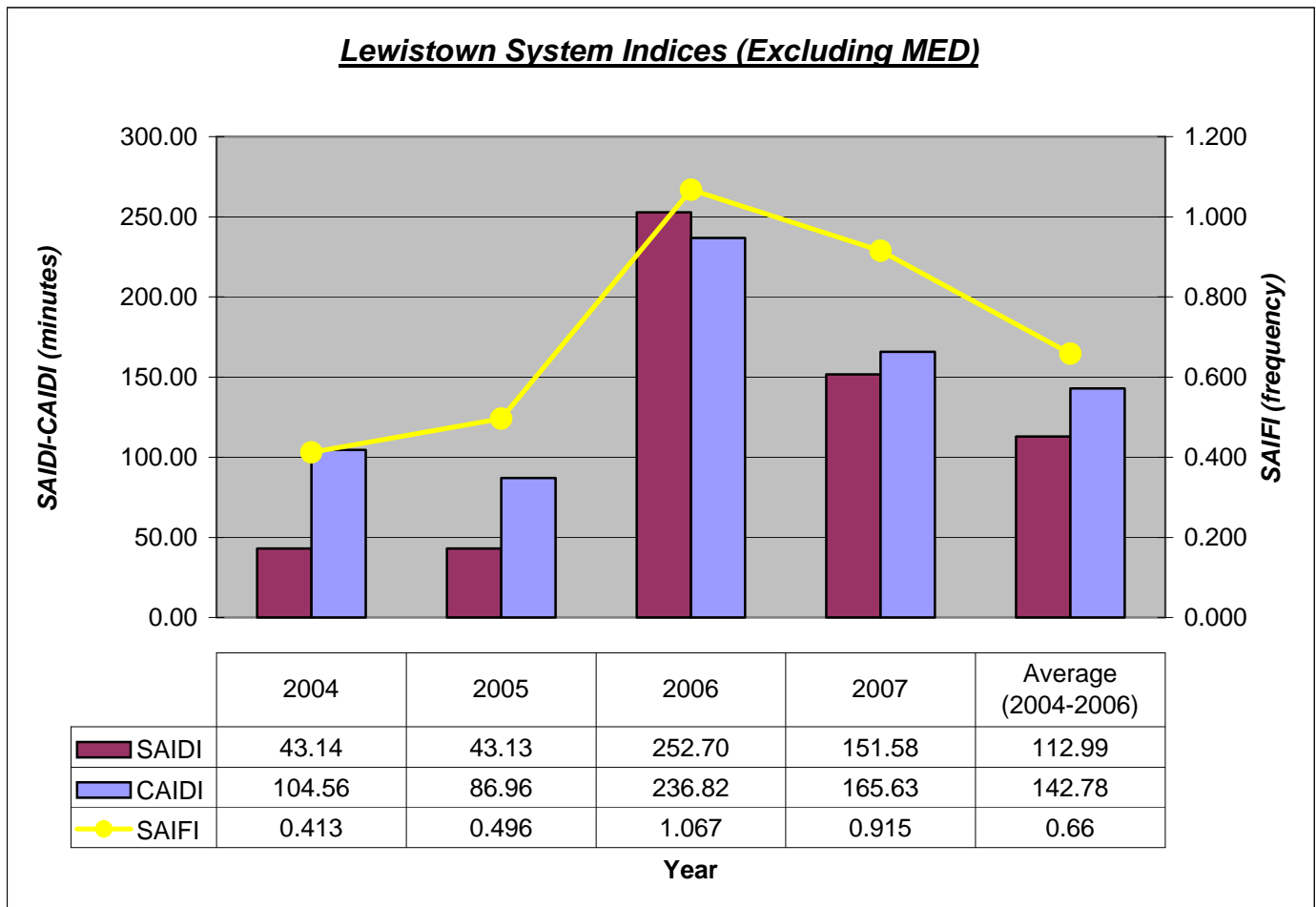
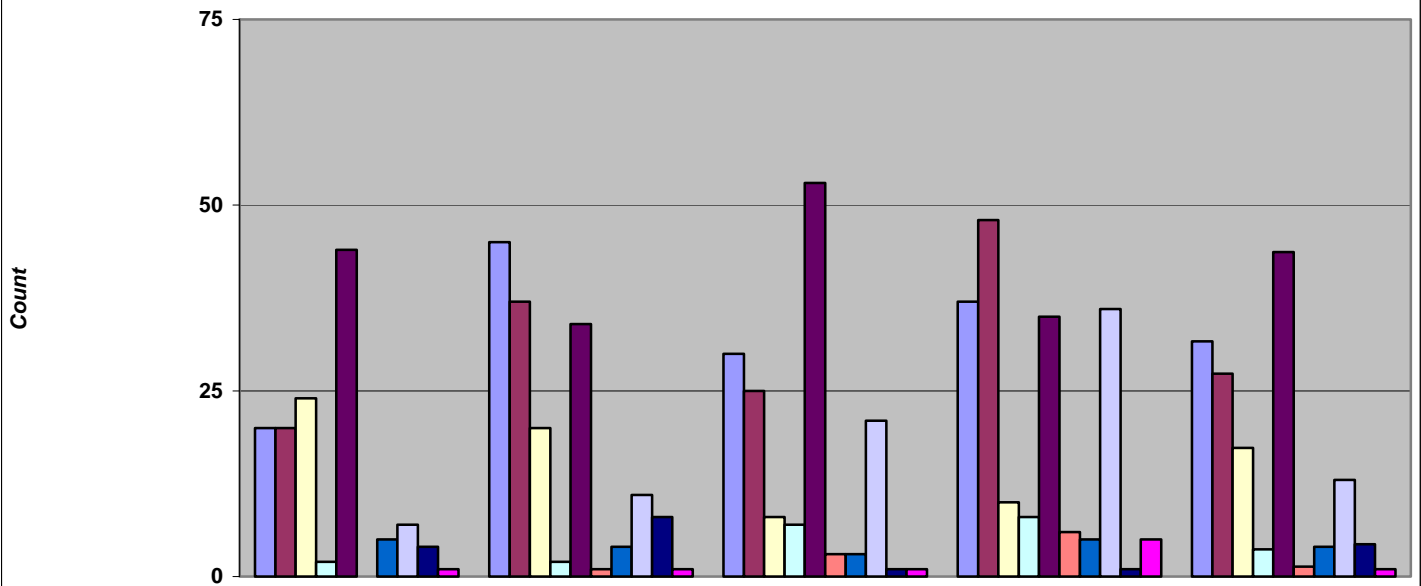


Figure 10.0a – Lewistown – System Indices (Excluding MED)

Lewistown - Outages By Cause (Excluding MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	20	45	30	37	32
Lightning	20	37	25	48	27
Unknown	24	20	8	10	17
Tree In Line	2	2	7	8	4
Wind	44	34	53	35	44
Squirrel	0	1	3	6	1
Other Bird	5	4	3	5	4
Snow/Ice	7	11	21	36	13
Limb In Line	4	8	1	1	4
Vehicle Hit	1	1	1	5	1
TOTAL	127	163	152	191	147

Figure 10.0b – Lewistown – Outages By Cause (Excluding MED)

Lewistown System Indices (Including MED)

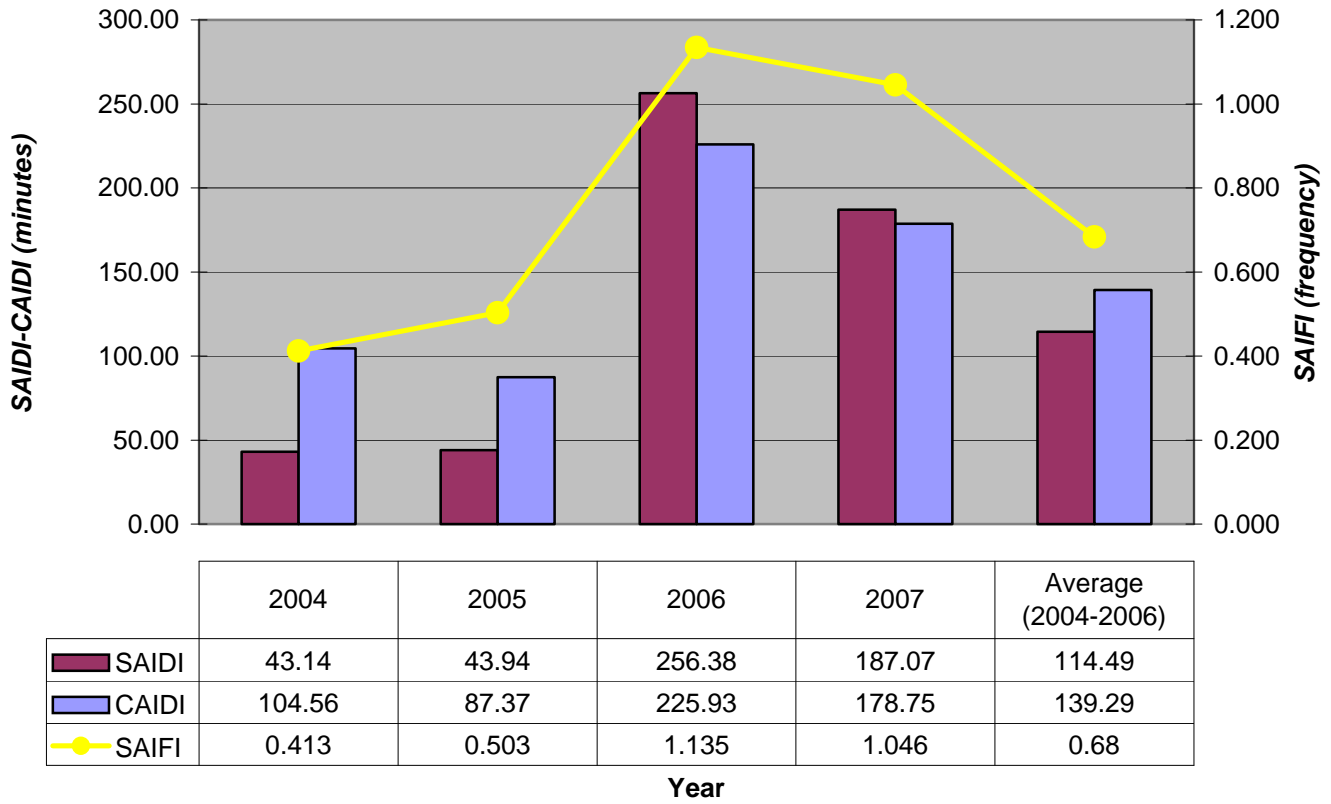
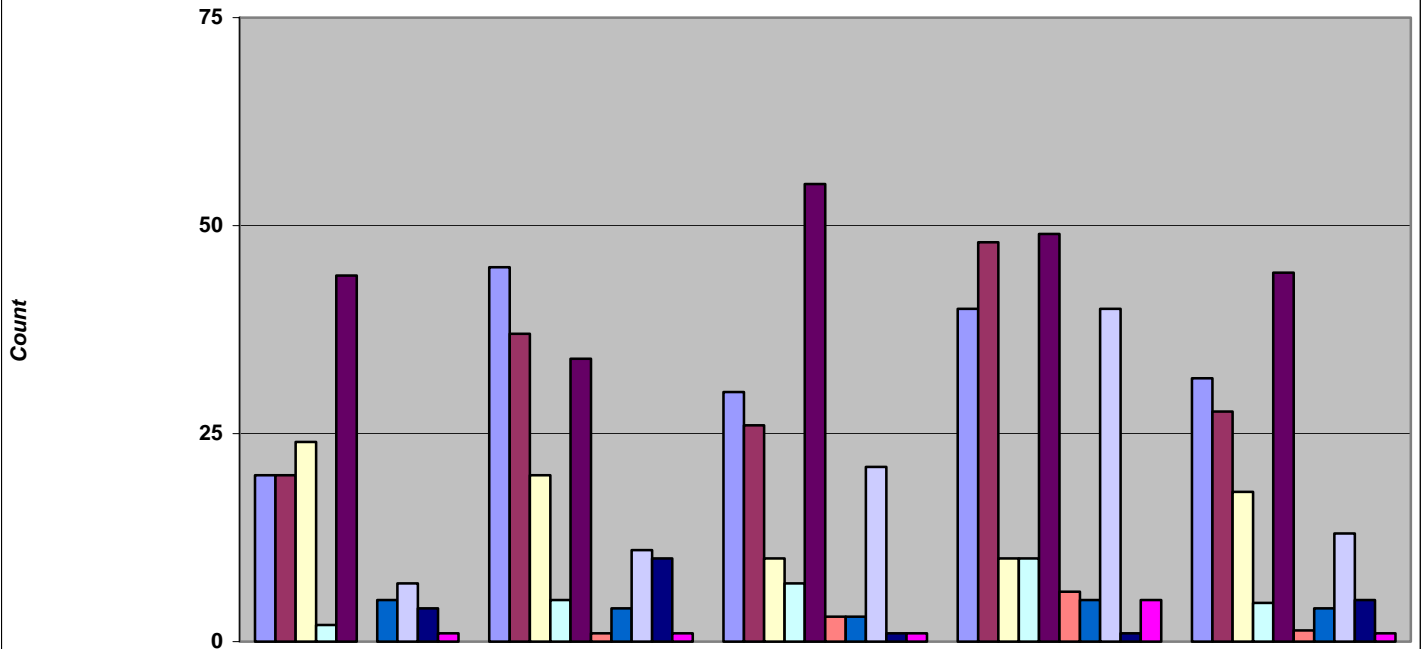


Figure 10.0c – Lewistown – System Indices (Including MED)

Lewistown - Outages By Cause (Including MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	20	45	30	40	32
Lightning	20	37	26	48	28
Unknown	24	20	10	10	18
Tree In Line	2	5	7	10	5
Wind	44	34	55	49	44
Squirrel	0	1	3	6	1
Other Bird	5	4	3	5	4
Snow/Ice	7	11	21	40	13
Limb In Line	4	10	1	1	5
Vehicle Hit	1	1	1	5	1
TOTAL	127	168	157	214	151

Figure 10.0d – Lewistown – Outages By Cause (Including MED)

11.0 Missoula – System Reliability

11.1 Discussion: Missoula Division was not impacted much from the spring snowstorm or even the November windstorm, but took the brunt of the November 19th snowstorm. Over 150 outages were recorded in the division for this MED and it drove the inclusive SAIDI value to over twice what it is with MEDs excluded. With MEDs excluded, all three indices were lower in 2007 than they were in 2006. The largest outages for Missoula were all related to this major event. Five outages from the storm made the region’s Top Twenty SAIDI list, including the highest SAIDI outage of 7.358 minutes. Missoula also had three outages on the Top Twenty SAIFI list unrelated to this storm. These affected substations and were back on relatively fast. Discounting the storm related outage causers, equipment failures were up, tree related outages were down, and squirrels continue to be a large outage cause in this division.

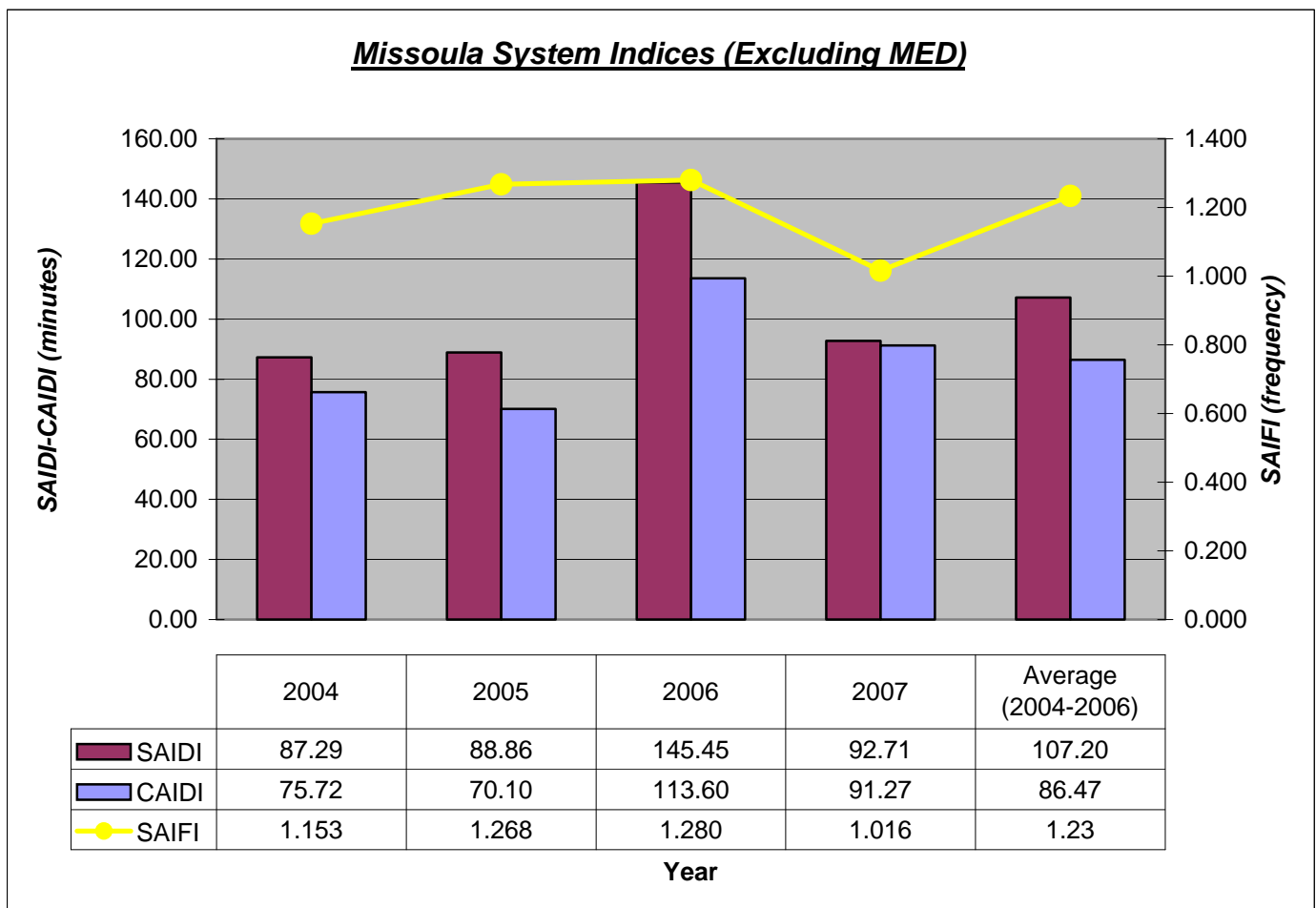
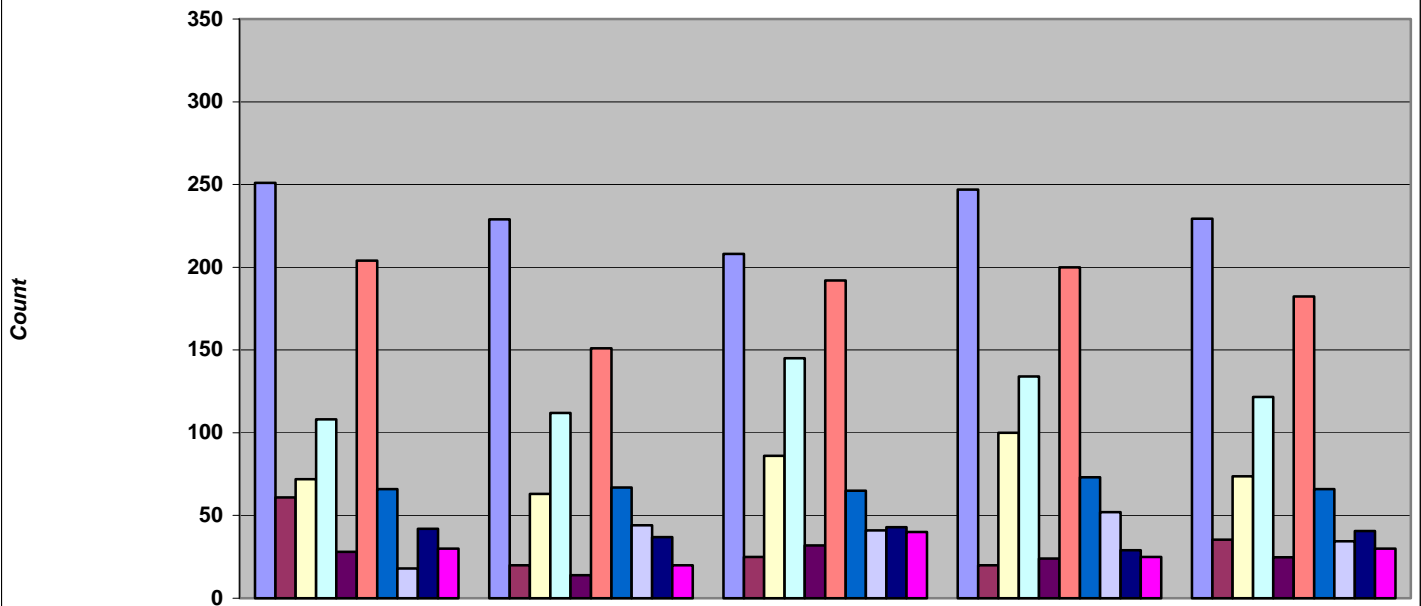


Figure 11.0a – Missoula – System Indices (Excluding MED)

Missoula - Outages By Cause (Excluding MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	251	229	208	247	229
Lightning	61	20	25	20	35
Unknown	72	63	86	100	74
Tree In Line	108	112	145	134	122
Wind	28	14	32	24	25
Squirrel	204	151	192	200	182
Other Bird	66	67	65	73	66
Snow/Ice	18	44	41	52	34
Limb In Line	42	37	43	29	41
Vehicle Hit	30	20	40	25	30
TOTAL	880	757	877	904	838

Figure 11.0b – Missoula – Outages By Cause (Excluding MED)

Missoula System Indices (Including MED)

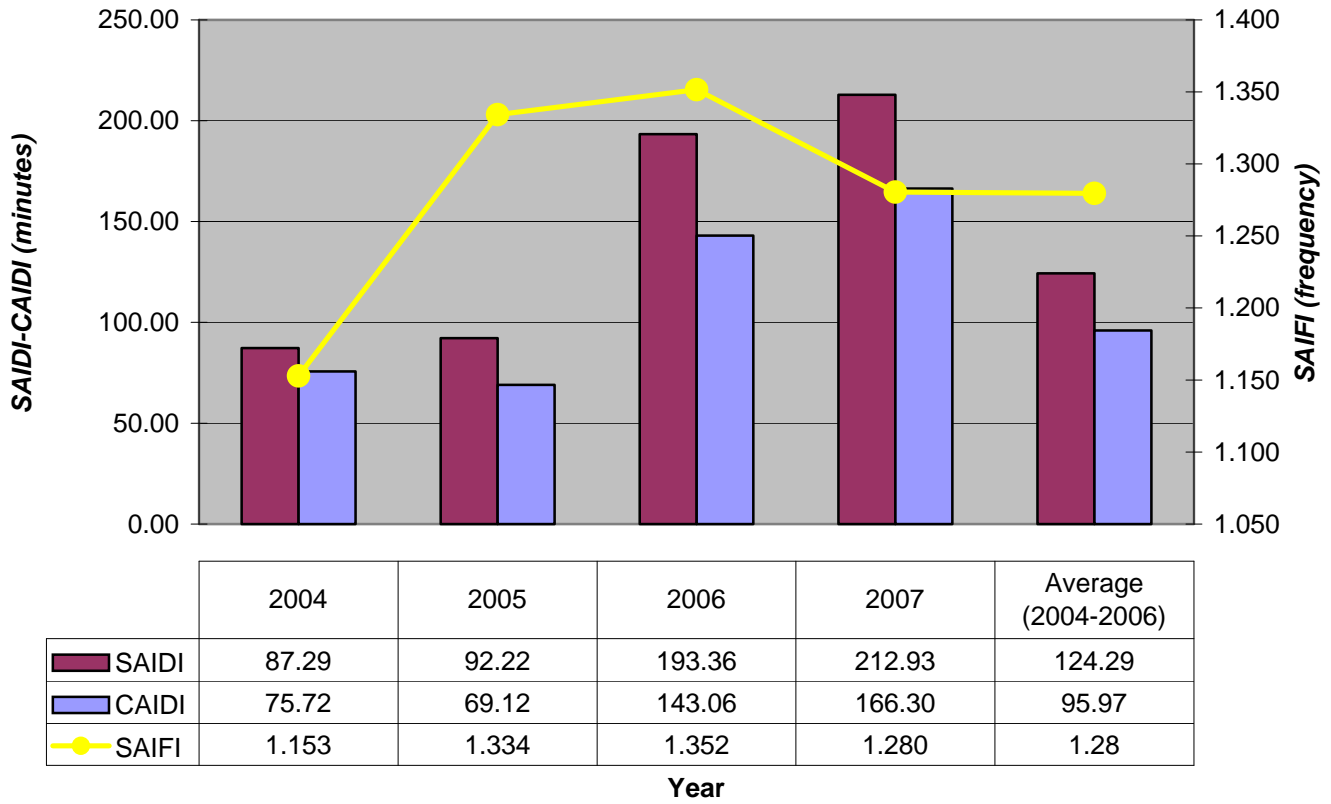
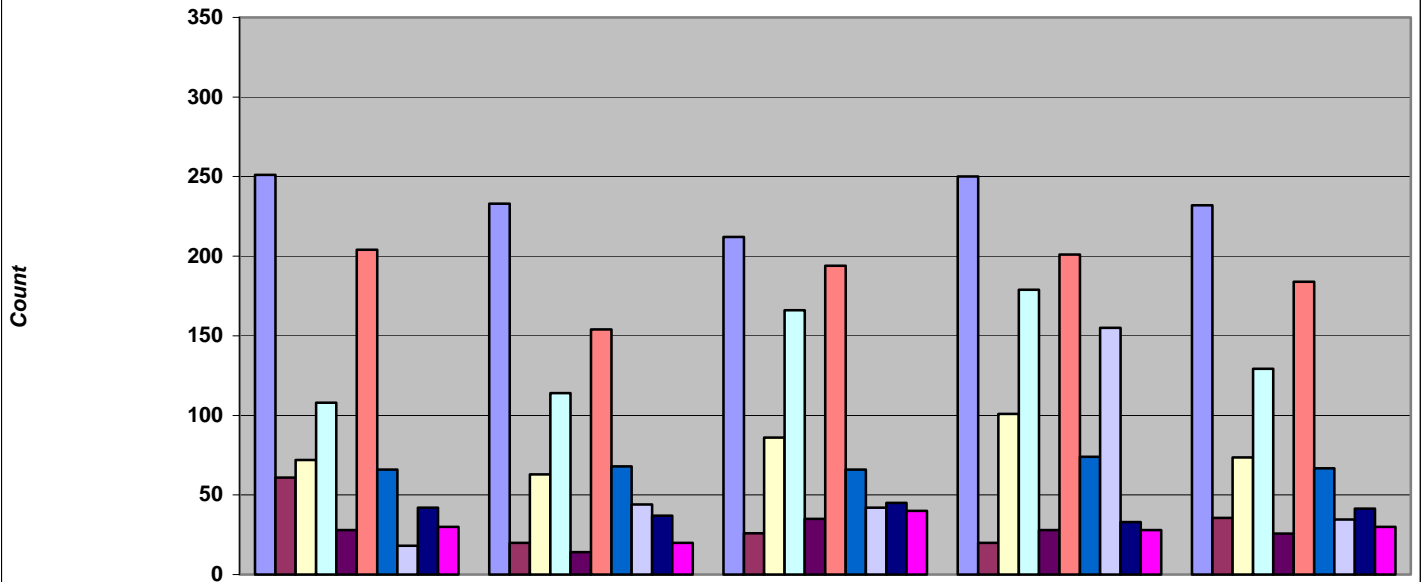


Figure 11.0c – Missoula – System Indices (Including MED)

Missoula - Outages By Cause (Including MED)



	2004	2005	2006	2007	Average (2004-2006)
Equipment Failure	251	233	212	250	232
Lightning	61	20	26	20	36
Unknown	72	63	86	101	74
Tree In Line	108	114	166	179	129
Wind	28	14	35	28	26
Squirrel	204	154	194	201	184
Other Bird	66	68	66	74	67
Snow/Ice	18	44	42	155	35
Limb In Line	42	37	45	33	41
Vehicle Hit	30	20	40	28	30
TOTAL	880	767	912	1,069	853

Figure 11.0d – Missoula – Outages By Cause (Including MED)

12.0 Conclusion

The four major event day (MED) snow and windstorms contributed over 42 minutes to the Montana Region SAIDI this year, causing some long outages and inconvenience to our customers, as well as long, hard working conditions for the line forces. The Missoula/Hamilton storm had the largest SAIDI of nearly 20 minutes, but the earlier November windstorms were wider spread. The Deer Lodge transformer failure was the largest substation outage, as most other substation and transmission occurrences were quickly restored, often due to the redundant system.

With major events excluded, both SAIDI and SAIFI were lower for 2007 than the 2006 values. The CAIDI value though increased from the previous year. Some of this is due to long storm related outages in the lightly populated rural areas of Judith Gap and Philipsburg. These outages did not become MEDs due to the small number of customers affected. Also, there were fewer large urban outages, which tend to be restored quickly because of redundant systems and consequently drive the CAIDI value down. Due to the increasing trend in CAIDI, Retail Operations has been tasked with analyzing outages and implementing methods to reduce this facet of the reliability equation.

Areas where cycle tree trimming efforts were concentrated saw reductions in outage numbers from tree related causes. Equipment failures were up slightly, probably from the system aging, but also probably mitigated some from the line inspection program. Wind and snow/ice outages increased, even after excluding MEDs, largely due to “shoulder” days and a few large but primarily rural storms. Lightning outages were also up. This cause category may take some engineering analysis to see if our lightning protection could be improved in some areas.