Energy Division Central Files Document Coversheet

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Today's Date (Date of Submittal) 7/15/2019

Name:

1. Utility Name: SDG&E
2. Document Submission Frequency (Annual, Quarterly, Monthly, Weekly, Once, Ad Hoc): Annual
3. Report Name: Electric System Reliability Report
4. Reporting Interval (the date(s) covered by the data, e.g. 2015 Q1): 2018
5. Name Suffix: **Cov** (for an Energy Division Cover Letter), Conf (for a confidential doc), Ltr (for a letter from utility)
6. Document File Name (format as 1+2 + 3 + 4 + 5): SDG&E Annual Electric System Reliability Report 2018 Cov
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All submittals should reference both a proceeding and a decision, if applicable. If not applicable, leave blank and fill out Section C.

Proceeding Number (starts with R, I, C, A, or P plus 7 numbers): R1412014

1. Decision Number (starts with D plus 7 numbers): D1601008
2. Ordering Paragraph (OP) Number from the decision: OP 1

C. Documents Submitted as Requested by Other Requirements

If the document submitted is in compliance with something other than a proceeding, (e.g. Resolution, Ruling, Staff Letter, Public Utilities Code, or sender's own motion), please explain: N/A

D. Document Summary

Provide a Document Summary that explains why this report is being filed with the Energy Division. This information is often contained in the cover letter, introduction, or executive summary, so you may want copy it from there and paste it here.

This report has been prepared in response to CPUC Decision 16-01-008, which was approved January 20, 2016. Decision 16-01-008 established reliability recording, calculation, and reporting requirements for SDG&E.

E. Sender Contact Information

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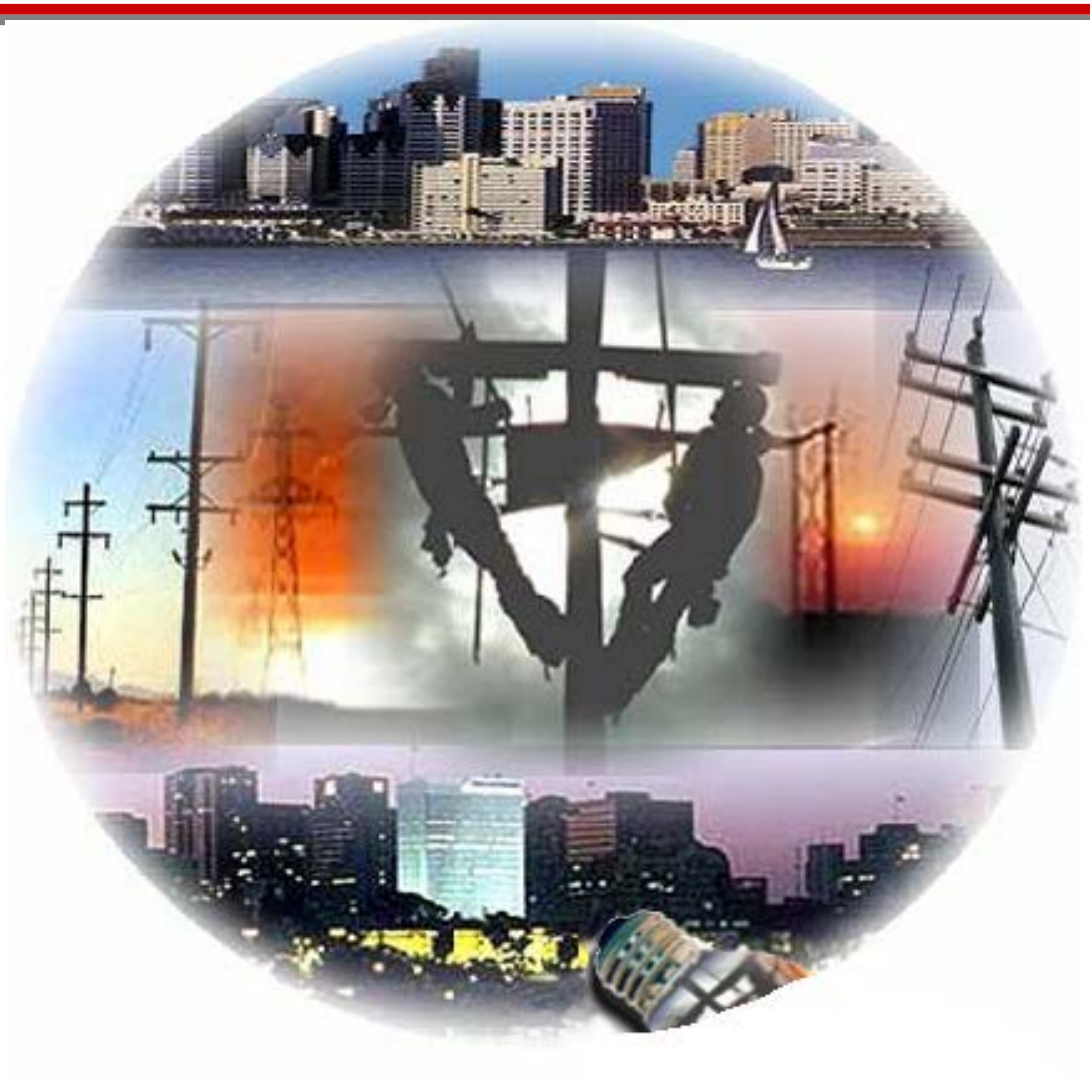
1. Names of Commission staff that sender copied on the submittal of this Document: David Lee, Gabe Petlin



SDGE

A Sempra Energy utility®

ELECTRIC SYSTEM RELIABILITY ANNUAL REPORT 2018

Prepared for
California Public Utilities Commission
(Per Decision16-01-008)

July 15, 2019

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EXECUTIVE SUMMARY

Background:

The Electric System Reliability Annual Report for 2018 has been prepared in response to California Public Utility Commission (CPUC) Decision 16-01-008 (Decision). This Decision, which is effective January 14, 2016, established reliability recording, calculation, and reporting requirements for San Diego Gas & Electric (SDG&E).

The data in this report is primarily presented in tabular and graphical form. All statistics and calculations include unplanned transmission, substation, and distribution outages, and exclude planned outages and California Independent System Operator (CAISO) mandated load curtailment outages unless otherwise specified. Unplanned outages are those that are not prearranged. For the purposes of this report, sustained outages are outages that lasted more than five minutes in duration, while momentary outages are outages that lasted five minutes or less in duration.

2018 Reliability Indices

Overview:

SDG&E's 2018 SAIDI and SAIFI numbers were well above system average for the past 5-years. The 2018 year-end result was due to an increase in underground connector failures, impacts from substation outages, increased fire impacts not caused by SDG&E, increased failures due to coastal corrosion on electric infrastructure, and increased mylar balloon contacts. While mostly excluded from SAIDI and SAIFI numbers reported in this report, Public Safety Power Shutoff (PSPS) de-energizations contributed approximately 6.62 SAIDI minutes and 0.004 SAIFI, which represents a major impact to the annual totals.

San Diego Gas & Electric continued to experience extremely dry conditions combined with high Santa Ana winds in both the 1st and 4th quarter of 2018, which triggered PSPS de-energization of lines for community safety in high risk wildfire areas. Outage impacts from PSPS de-energization events in 2018 totaled 43.57 system SAIDI minutes. and 0.020 system SAIFI. Most of these unplanned outage impacts meet Major Event Day exclusion criteria, but as mentioned above, the PSPS impacts that are not excluded in this report represent a major impact to the annual totals. Additionally, PSPS de-energizations largely contributed to the SAIDI and SAIFI values for eight of SDG&E's nine repeat worst performing circuits. SDG&E internally tracks its indices, excluding impacts from PSPS de-energization events to compare performance to past years, since wide-scale PSPS events are relatively new. The totals excluding PSPS de-energization events are listed below for reference.

	MED, Planned and Proactive De-energization Excluded			
Year	**SAIDI**	**SAIFI**	**CAIDI**	**MAIFI**
2018	71.13	0.624	113.99	0.318

Identified Mitigation/Efforts to Improve System Reliability

SDG&E is dedicated to providing strong electric reliability to its customers. To do so, in 2018, SDG&E focused on the following:

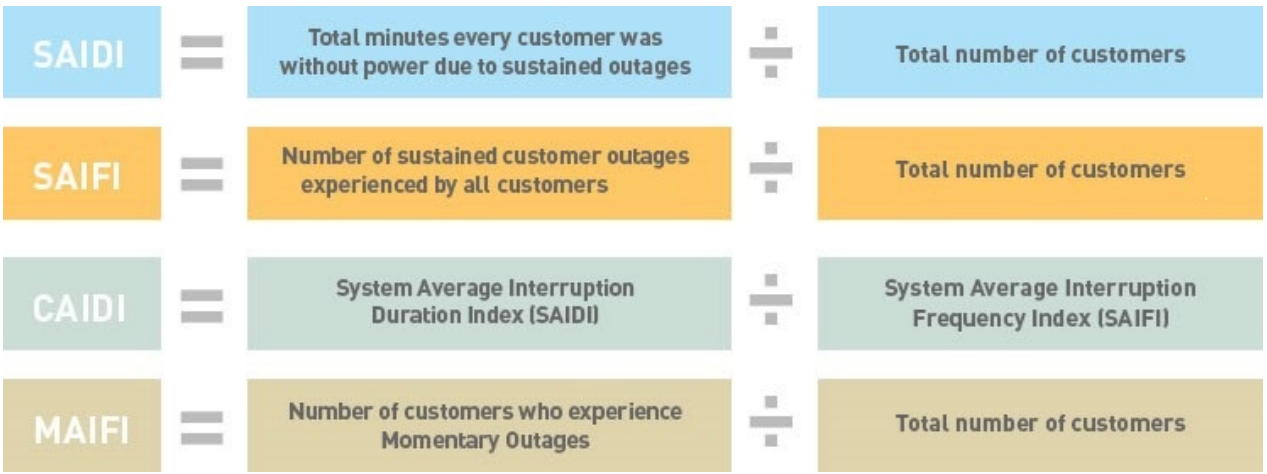
- Implementing a new system-wide electric underground connector enhancement program that both proactively replaces underground connectors prone to failure and adds sectionalizing capabilities to the electric system, enabling faster customer restoration after an outage occurs.
- Adding more system automation, enabling for faster outage restoration of customers.
- Reducing the time to restore service to our customers after they experience an outage through:
    - Better use of data analytics to aide in determining when and where to send repair crews.
    - Using new underground de-watering technologies and tools to improve emergency access to underground facilities.
    - Development of drone gathered data to more quickly find and then fix problems.
- Developing data analytics to aide in identify infrastructure that has a high likelihood of failure and replacing it before it impacts customers.
- Continuing deployment of the underground cable enhancement program, which replaces aging cable that is prone to failure and past its useful life.

How SDG&E Measures Reliability

SDG&E uses four metrics commonly used in the electric utility industry to measure reliability.

The reliability indicators that are tracked are as follows:

1. **SAIDI** (**S**ystem **A**verage **I**nterruption **D**uration **I**ndex) - minutes of sustained outages per customer per year.
2. **SAIFI** (**S**ystem **A**verage **I**nterruption **F**requency **I**ndex) - number of sustained outages per customer per year.
3. **CAIDI** (**C**ustomer **A**verage **I**nterruption **D**uration **I**ndex) – is the average time required to restore service to a utility customer.
4. **MAIFI** (**M**omentary **A**verage **I**nterruption **F**requency **I**ndex) - number of momentary outages per customer per year.



Prior to 2013, the measurement of each reliability performance indicator excluded CPUC Major Event and events that are the direct result of failures in the CAISO-controlled bulk power market, or non-SDG&E owned transmission and distribution facilities. A CPUC Major Event is defined in CPUC Decision 96-09-045 as an event that meets at least one of the following criteria:

(a) The event is caused by earthquake, fire, or storms of sufficient intensity to give rise to a state of emergency being declared by the government, or

(b) Any other disaster not in (a) that affects more than 15% of the system facilities or 10% of the utility's customers, whichever is less for each event.

Outages involving restricted access by a governmental agency that precluded or otherwise delayed outage restoration times were also considered CPUC Major Events and excluded from reliability results.

Beginning in 2013, the measurement of each reliability performance indicator excludes Major Event Days (MED) as defined in The Institute for Electrical and Electronic Engineers (IEEE) Guide for Electric Power Distribution Reliability Indices, aka IEEE Std 1366, instead of CPUC Major Events. A Major Event Day is defined in IEEE Std 1366 - 2012, Section 2 as a day in which the daily system SAIDI exceeds a threshold value. These threshold major event days are referred to as "TMED". Thus, any day in which the total system SAIDI exceeds TMED is excluded from SDG&E's reliability results. The applicable TMED value is calculated at the end of each year using SDG&E's daily SAIDI values for the prior five years. SDG&E's TMED value for 2018 was 4.58 minutes of daily system SAIDI. Other reliability indices in this report are not calculated using methodologies or formulas exactly as described in the IEEE Std 1366.

For purposes in understanding this report, the division between Distribution equipment and Transmission equipment is at the distribution substation power transformer high-side bus disconnect. Transmission equipment is defined as all assets rated 69kV and above. The substation power transformer high-side bus disconnect and all equipment on the load-side of the substation power transformer high-side bus disconnect are defined as Distribution equipment.

SECTION 1 - SYSTEM INDICES FOR THE LAST 10 YEARS

SEPARATE TABLES WITH SAIDI, SAIFI, MAIFI AND CAIDI.
MAJOR EVENT DAY'S (MED) INCLUDED AND EXCLUDED

Table 1-1: System Indices (MED included and excluded)

San Diego Gas & Electric **System Reliability Data 2009 - 2018**								
MED Included						MED Excluded		
Year	**SAIDI**	**SAIFI**	**CAIDI**	**MAIFI**	**SAIDI**	**SAIFI**	**CAIDI**	**MAIFI**
2009	67.06	0.542	123.74	0.380	49.71	0.466	106.60	0.362
2010	85.37	0.652	130.99	0.510	63.36	0.520	121.80	0.444
2011	567.59	1.472	385.63	0.239	53.43	0.471	113.44	0.239
2012	64.36	0.533	120.78	0.301	64.36	0.533	120.78	0.301
2013	75.03	0.561	133.84	0.211	59.96	0.472	127.03	0.211
2014	75.81	0.632	119.88	0.262	64.60	0.603	107.16	0.244
2015	58.11	0.530	109.68	0.347	57.92	0.526	110.09	0.347
2016	86.01	0.677	126.99	0.443	72.75	0.620	117.43	0.386
2017	117.49	0.585	200.87	0.344	64.51	0.512	125.92	0.311
2018	121.02	0.658	183.88	0.319	77.76	0.628	123.84	0.319

Table 1-2: Distribution System Indices (MED included and Excluded)

San Diego Gas & Electric **Distribution System Reliability Data 2009 - 2018**								
MED Included					MED Excluded			
Year	**SAIDI**	**SAIFI**	**CAIDI**	**MAIFI**	**SAIDI**	**SAIFI**	**CAIDI**	**MAIFI**
2009	61.85	0.514	120.34	0.350	48.98	0.454	107.84	0.332
2010	84.49	0.638	132.50	0.468	62.65	0.512	122.25	0.403
2011	52.87	0.435	121.63	0.216	52.11	0.433	120.47	0.216
2012	63.32	0.510	124.20	0.289	63.32	0.510	124.20	0.289
2013	54.75	0.452	121.17	0.206	54.53	0.450	121.08	0.206
2014	74.73	0.613	121.86	0.255	63.52	0.584	108.82	0.237
2015	57.90	0.525	110.28	0.323	57.71	0.521	110.70	0.323
2016	83.93	0.647	129.67	0.438	70.67	0.590	119.88	0.380
2017	115.62	0.576	200.63	0.337	62.66	0.504	124.38	0.304
2018	120.30	0.652	184.51	0.314	77.05	0.622	123.93	0.314

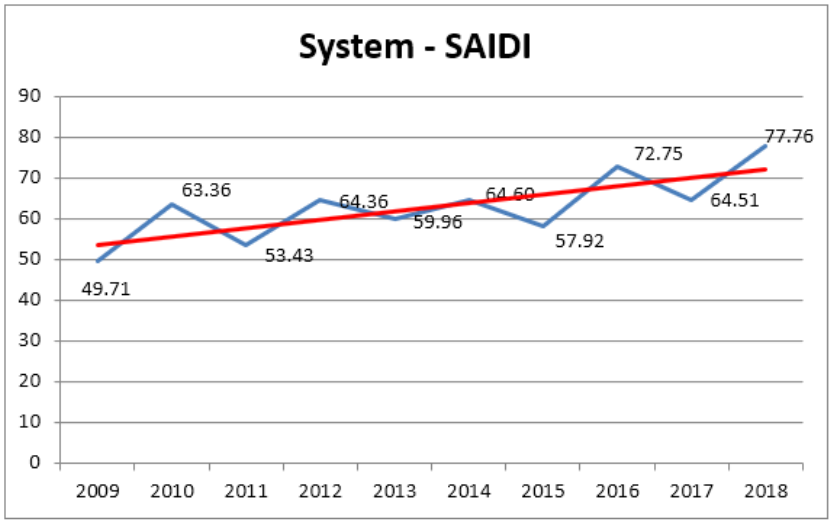
Note: Distribution System Indices includes substation distribution.

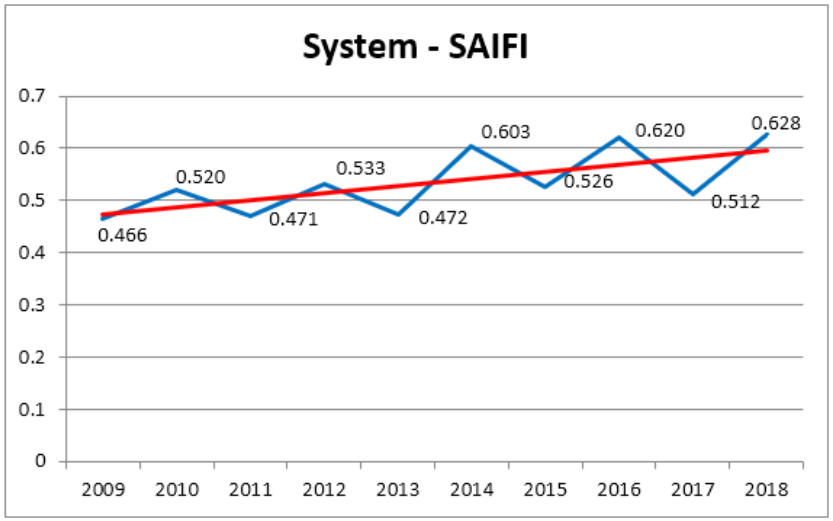
Table 1-3: Transmission System Indices (MED included and excluded)

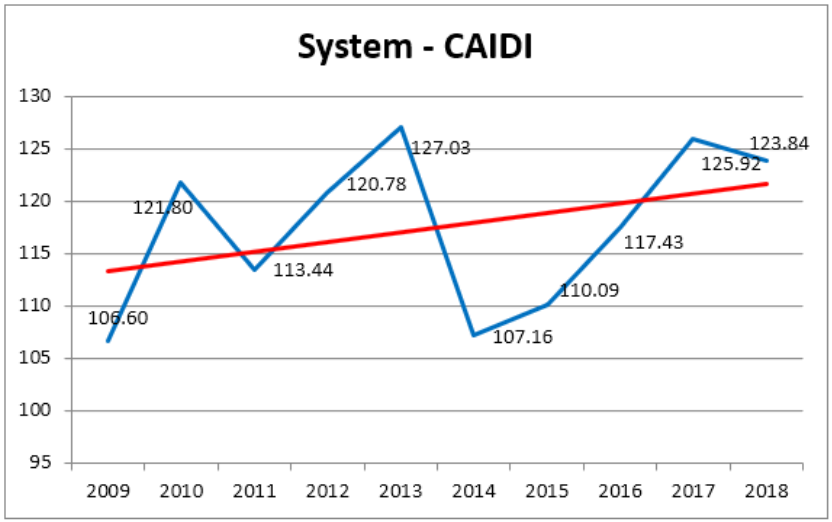
San Diego Gas & Electric **Transmission System Reliability Data 2009 - 2018**								
MED Included					MED Excluded			
Year	**SAIDI**	**SAIFI**	**CAIDI**	**MAIFI**	**SAIDI**	**SAIFI**	**CAIDI**	**MAIFI**
2009	5.22	0.028	185.99	0.030	0.73	0.012	60.18	0.030
2010	0.88	0.014	62.63	0.042	0.71	0.008	92.30	0.041
2011	514.72	1.037	496.29	0.022	1.32	0.038	34.26	0.022
2012	1.04	0.023	45.11	0.012	1.04	0.023	45.11	0.012
2013	20.28	0.109	186.51	0.005	5.43	0.022	250.61	0.005
2014	1.07	0.019	56.30	0.007	1.07	0.019	56.27	0.007
2015	0.21	0.005	44.08	0.024	0.21	0.005	44.08	0.024
2016	2.08	0.030	69.15	0.006	2.07	0.030	69.09	0.005
2017	1.87	0.009	217.47	0.007	1.86	0.009	216.07	0.007
2018	0.71	0.006	116.55	0.005	0.71	0.006	115.49	0.005

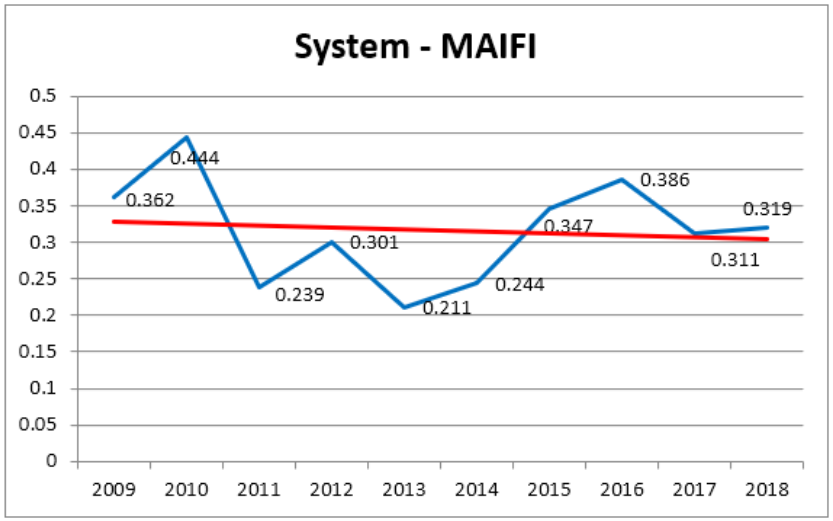
Note: Transmission System Indices includes substation transmission.

System Indices (Excludes Planned, ISO and MED)

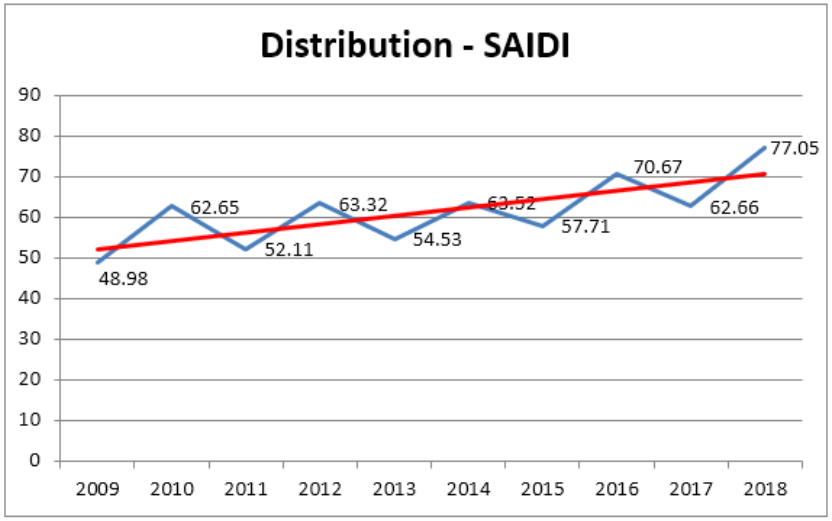


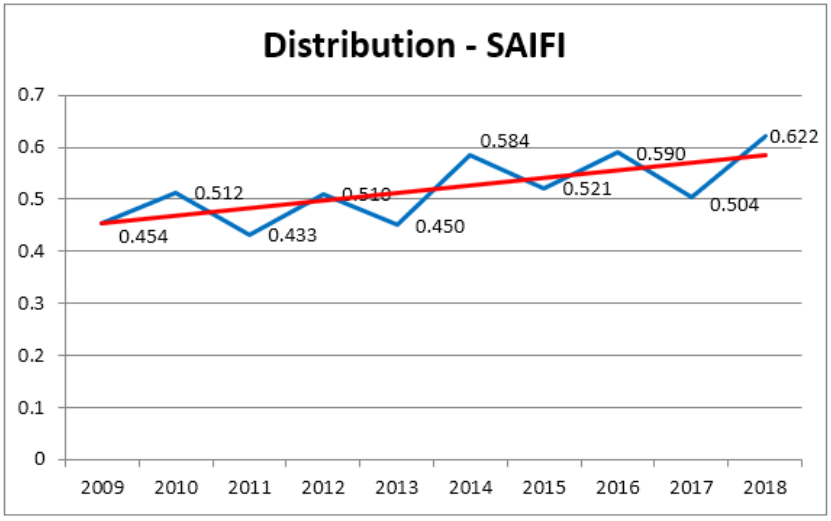


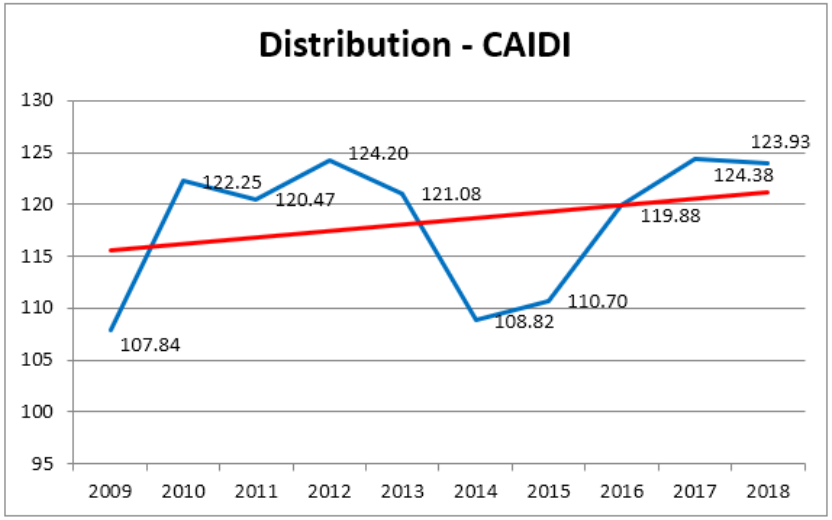


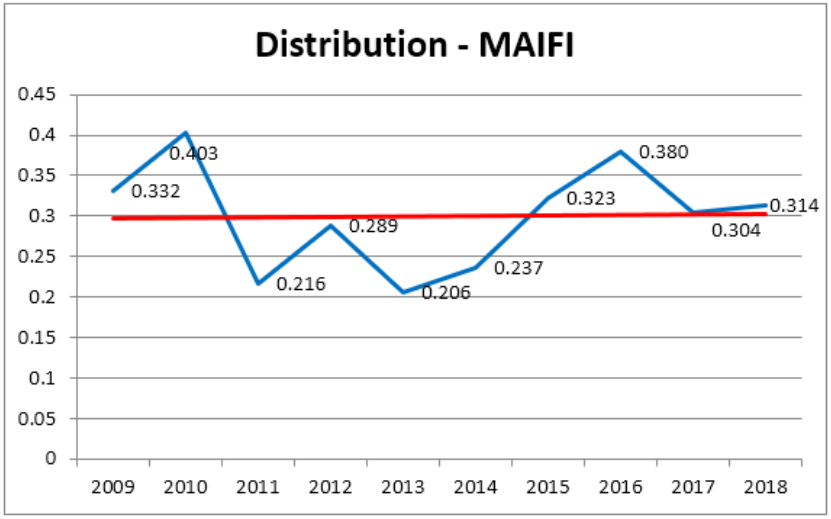


Distribution System Indices (Excludes Planned, ISO and MED)

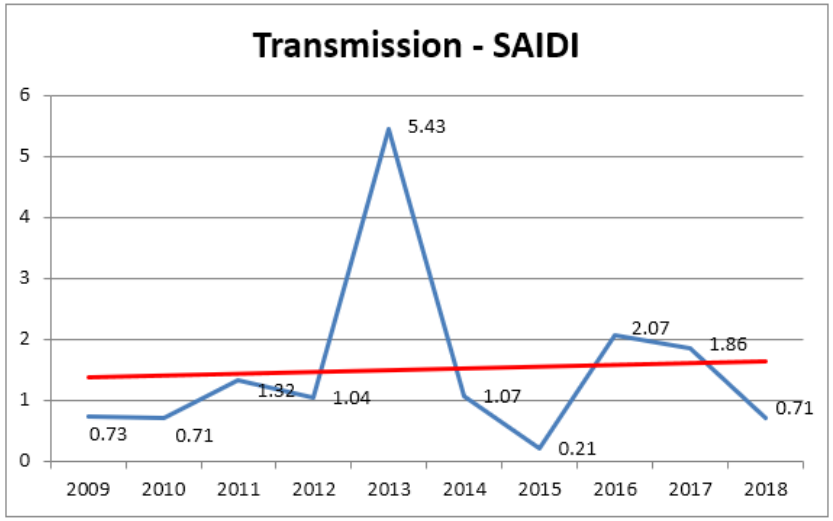


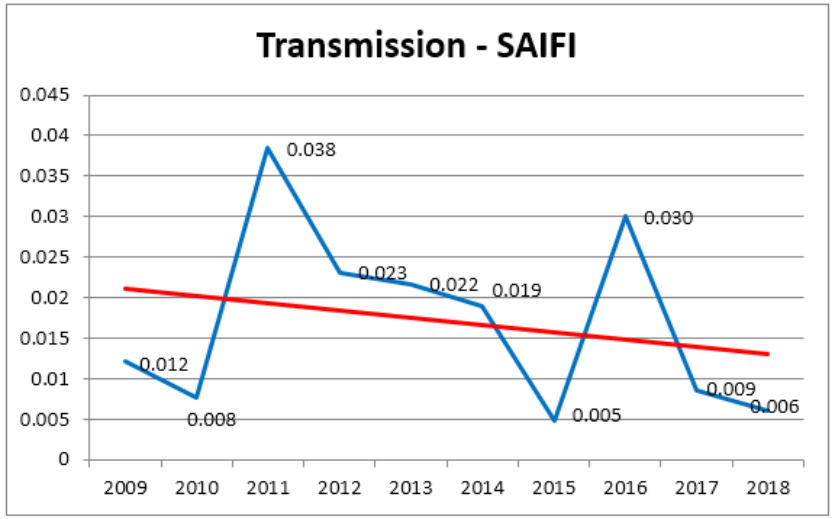


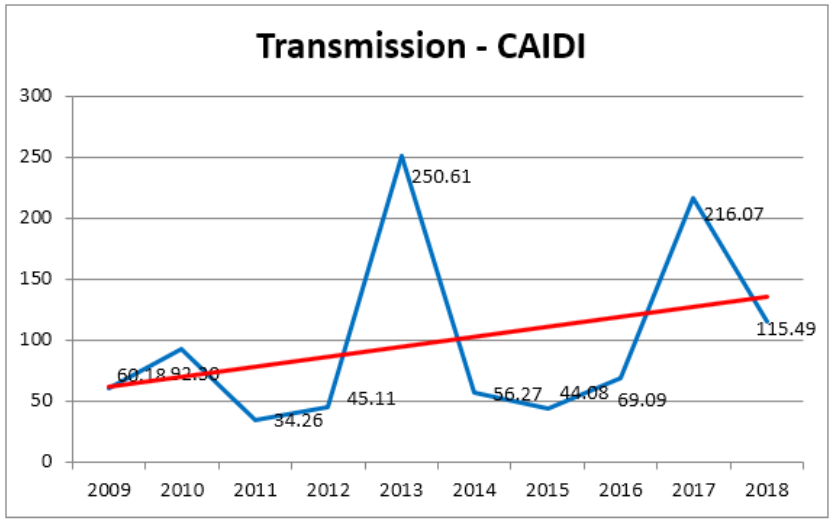


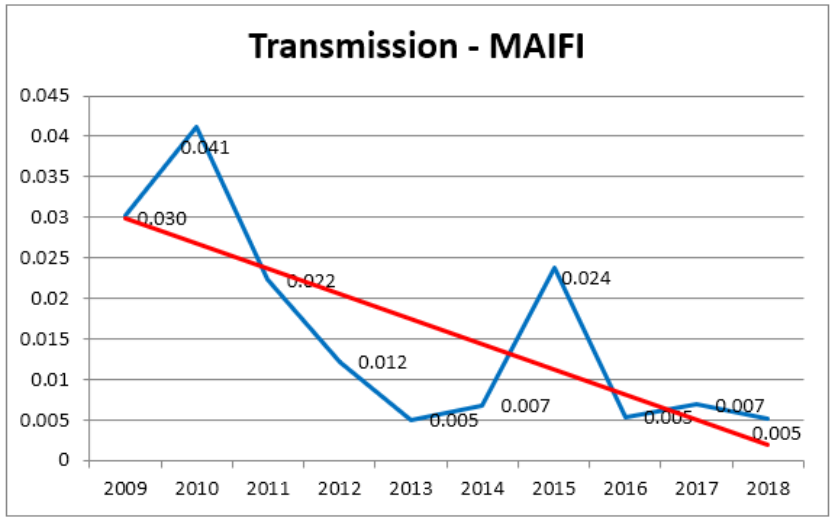


Transmission System Indices (Excludes Planned, ISO and MED)









SECTION 2 – DISTRICT RELIABILITY INDICES FOR THE PAST 10 YEARS INCLUDING AND EXCLUDING MED

A. SUMMARY OF ELECTRIC SYSTEM RELIABILITY FOR EACH OF SDG&E'S SIX DISTRICTS (EXCLUDES PLANNED AND CAISO OUTAGES)

- INDICES REPRESENT THE COMBINED TRANSMISSION, SUBSTATION AND DISTRIBUTION OUTAGE IMPACTS AT THE DISTRICT LEVEL

Table 2-1: Beach Cities – District Reliability Indices (2009 – 2018)

	MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI		SAIDI	SAIFI	CAIDI	MAIFI
2009	46.96	0.406	115.64	0.184		33.19	0.319	103.96	0.174
2010	59.00	0.392	150.53	0.233		48.34	0.354	136.56	0.182
2011	617.86	1.396	442.58	0.243		52.01	0.396	131.17	0.243
2012	39.54	0.338	116.80	0.401		39.54	0.338	116.80	0.401
2013	34.08	0.244	139.40	0.122		34.08	0.244	139.40	0.122
2014	41.37	0.366	113.09	0.136		38.78	0.357	108.66	0.113
2015	62.80	0.514	122.18	0.349		62.76	0.513	122.28	0.349
2016	90.55	0.699	129.48	0.385		77.04	0.651	118.31	0.385
2017	55.66	0.552	100.84	0.372		49.11	0.470	104.52	0.338
2018	74.63	0.634	117.74	0.293		74.17	0.626	118.49	0.293

Table 2-2: Eastern - District Reliability Indices (2009 – 2018)

MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI
2009	86.05	0.679	126.66	0.389	60.85	0.596	102.05	0.389
2010	90.81	0.629	144.41	0.562	54.24	0.443	122.41	0.400
2011	588.29	1.506	390.55	0.193	65.26	0.507	128.79	0.193
2012	87.40	0.688	127.07	0.339	87.40	0.688	127.07	0.339
2013	78.39	0.643	121.93	0.223	77.04	0.634	121.58	0.223
2014	91.73	0.574	159.75	0.243	77.80	0.528	147.39	0.238
2015	50.17	0.461	108.79	0.263	50.17	0.461	108.79	0.263
2016	108.24	0.820	132.06	0.326	84.93	0.705	120.41	0.292
2017	177.22	0.637	278.38	0.358	83.72	0.529	158.23	0.322
2018	203.88	0.688	296.39	0.362	108.94	0.654	166.62	0.362

Table 2-3: Metro - District Reliability Indices (2009 – 2018)

MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI
2009	51.07	0.419	121.80	0.254	38.18	0.357	107.03	0.211
2010	64.45	0.506	127.29	0.503	44.03	0.397	111.05	0.440
2011	519.36	1.320	393.52	0.244	36.63	0.314	116.69	0.244
2012	46.88	0.376	124.63	0.336	46.88	0.376	124.63	0.336
2013	44.75	0.401	111.46	0.294	44.75	0.401	111.46	0.294
2014	72.41	0.654	110.74	0.371	62.03	0.625	99.19	0.326
2015	68.48	0.546	125.41	0.489	68.26	0.538	126.83	0.489
2016	70.79	0.628	112.67	0.615	64.39	0.595	108.26	0.573
2017	96.54	0.524	184.28	0.474	57.48	0.443	129.65	0.414
2018	73.87	0.658	112.29	0.390	71.99	0.645	111.65	0.390

Table 2-4: North Coast - District Reliability Indices (2009 – 2018)

MED Included						MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI		SAIDI	SAIFI	CAIDI	MAIFI
2009	75.76	0.495	153.02	0.652		41.79	0.380	109.85	0.631
2010	117.12	0.771	151.87	0.789		93.47	0.656	142.51	0.738
2011	565.06	1.515	372.88	0.292		66.49	0.516	128.89	0.292
2012	75.68	0.602	125.67	0.215		75.68	0.602	125.67	0.215
2013	60.17	0.509	118.27	0.181		59.50	0.507	117.25	0.181
2014	76.33	0.606	125.92	0.294		59.96	0.590	101.59	0.282
2015	49.79	0.439	113.49	0.275		49.78	0.438	113.78	0.275
2016	78.82	0.501	157.21	0.558		61.31	0.411	149.09	0.412
2017	79.85	0.524	152.48	0.299		64.43	0.483	133.32	0.299
2018	80.59	0.571	141.25	0.399		61.47	0.540	113.75	0.399

Table 2-5: Northeast - District Reliability Indices (2009 – 2018)

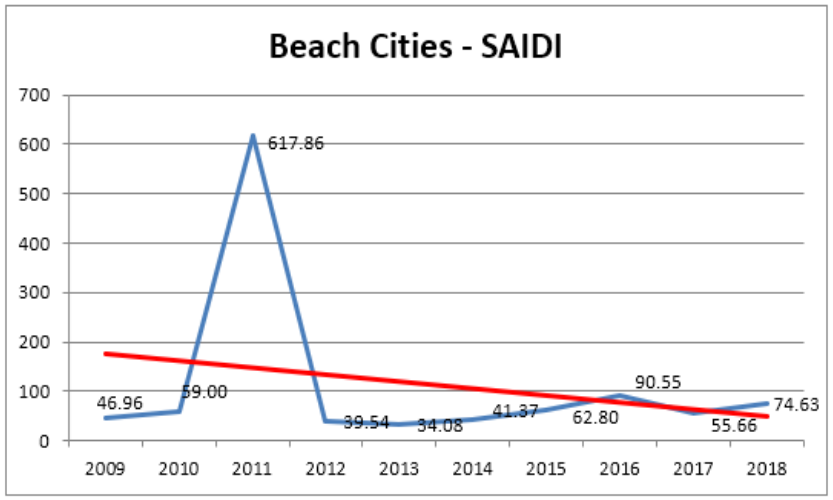
MED Included						MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI		SAIDI	SAIFI	CAIDI	MAIFI
2009	102.02	0.851	119.85	0.583		90.74	0.800	113.50	0.569
2010	101.96	0.948	107.55	0.544		77.47	0.707	109.64	0.497
2011	612.05	1.694	361.24	0.268		59.18	0.696	84.97	0.268
2012	78.46	0.626	125.32	0.272		78.46	0.626	125.32	0.272
2013	102.07	0.708	144.08	0.213		102.06	0.708	144.09	0.213
2014	95.74	0.899	106.48	0.174		75.92	0.832	91.22	0.173
2015	63.02	0.764	82.49	0.359		62.25	0.755	82.40	0.359
2016	93.94	0.815	115.27	0.323		82.15	0.779	105.39	0.270
2017	234.23	0.739	316.98	0.203		79.82	0.651	122.59	0.182
2018	244.84	0.788	310.65	0.200		90.33	0.694	130.20	0.200

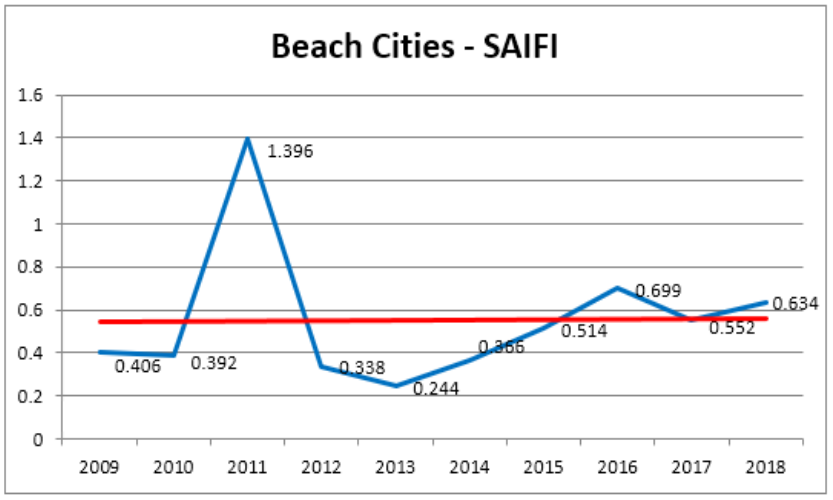
Table 2-6: Orange County - District Reliability Indices (2009 – 2018)

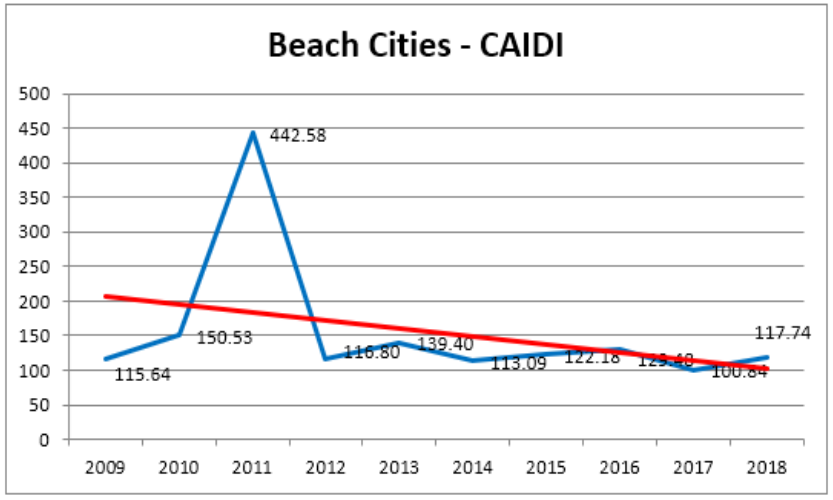
MED Included						MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI		SAIDI	SAIFI	CAIDI	MAIFI
2009	38.76	0.444	87.32	0.227		35.81	0.397	90.26	0.227
2010	97.15	0.852	114.00	0.395		81.24	0.738	110.05	0.395
2011	494.15	1.506	328.14	0.140		48.39	0.507	95.53	0.140
2012	75.86	0.794	95.52	0.156		75.86	0.794	95.52	0.156
2013	216.07	1.328	162.74	0.183		47.75	0.336	142.19	0.183
2014	87.79	0.752	116.68	0.334		87.74	0.752	116.63	0.334
2015	39.43	0.372	105.95	0.195		39.43	0.372	105.95	0.195
2016	80.99	0.608	133.21	0.277		71.29	0.579	123.13	0.179
2017	54.82	0.567	96.62	0.242		54.46	0.564	96.61	0.210
2018	56.02	0.585	95.80	0.168		56.02	0.585	95.80	0.168

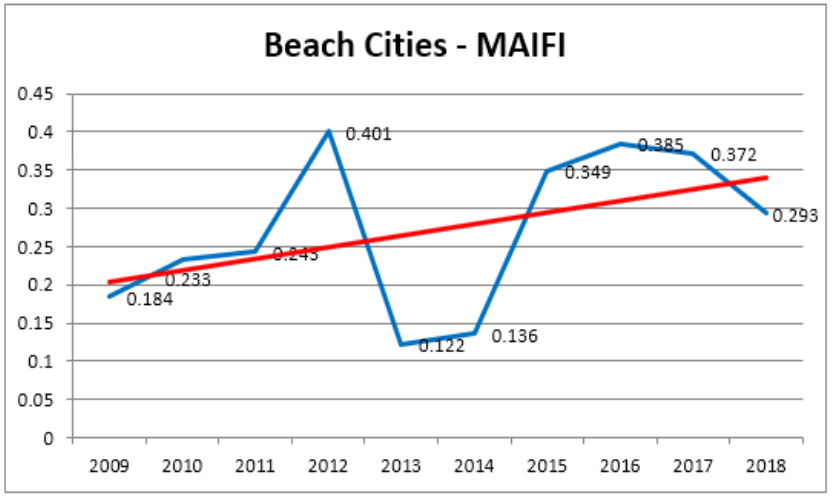
B. CHARTS FOR EACH OF SDG&E'S SIX DISTRICTS WITH LINEAR TREND LINE (EXCLUDES PLANNED AND CAISO OUTAGES; INCLUDES MED)

District Reliability Indices (Excludes Planned and ISO; Includes MED)



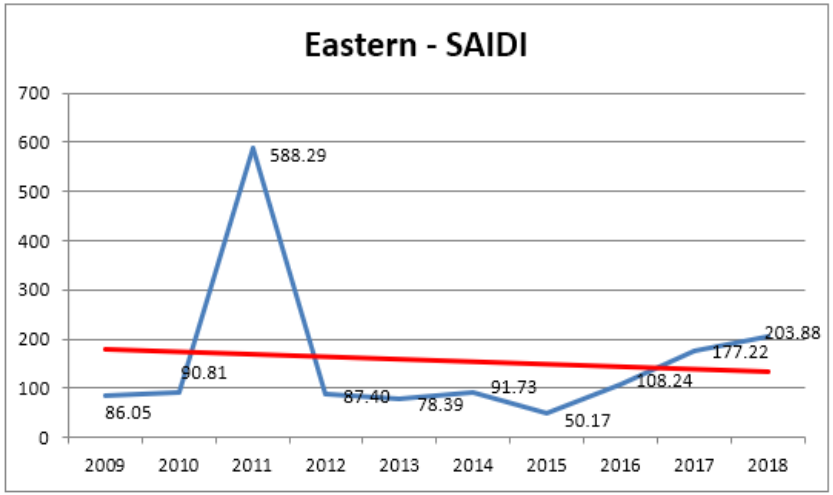


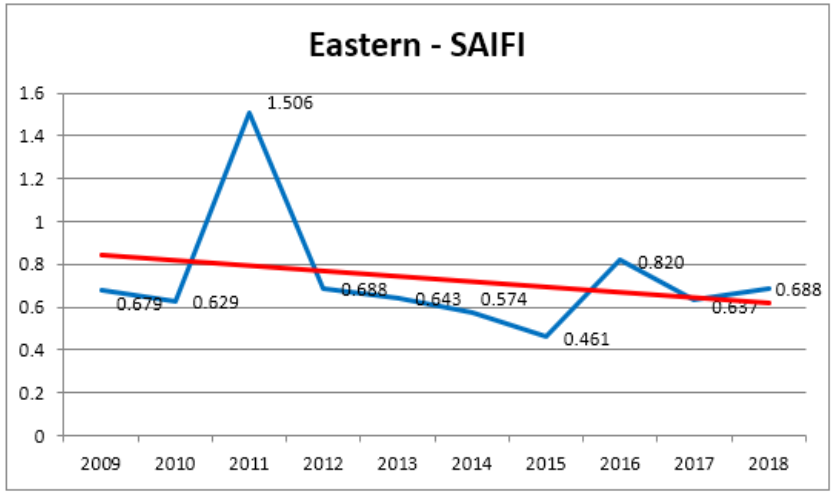


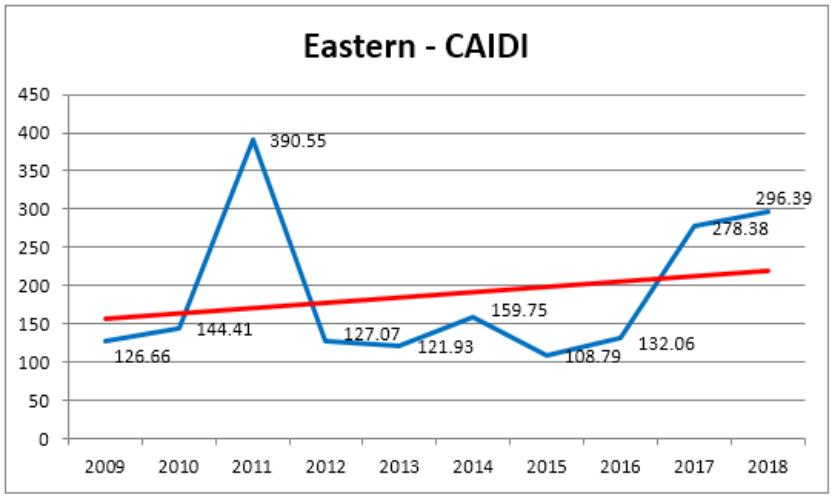


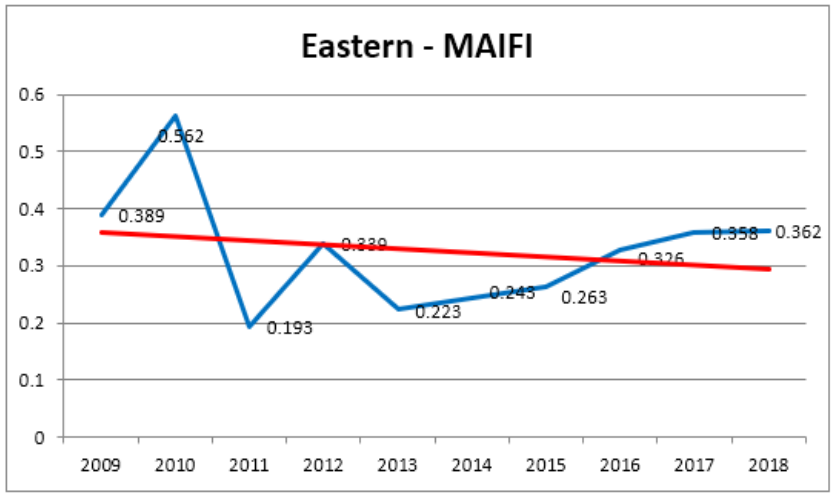
Note: The spike in 2011 is due to the Pacific Southwest Electric Outage (PSEO)

District Reliability Indices (Excludes Planned and ISO; Includes MED)



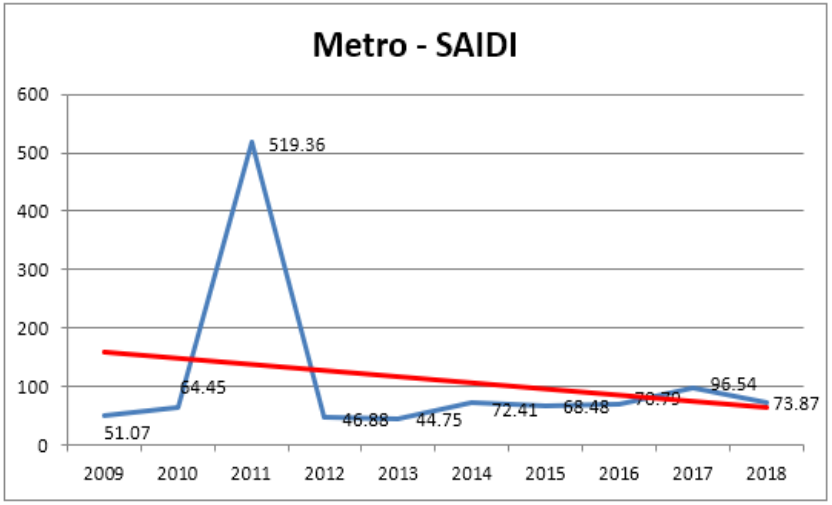


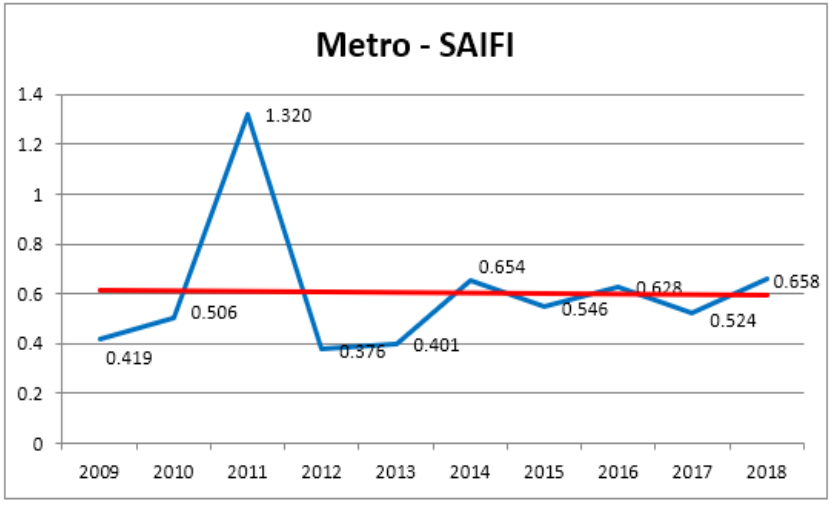


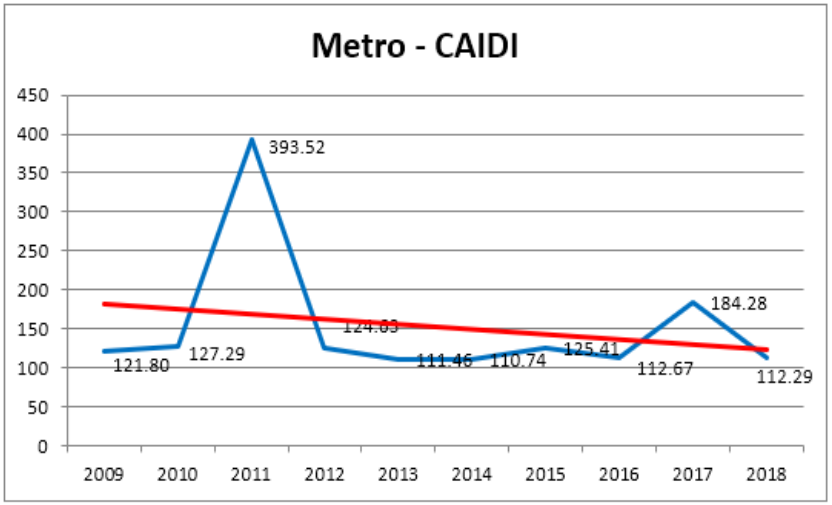


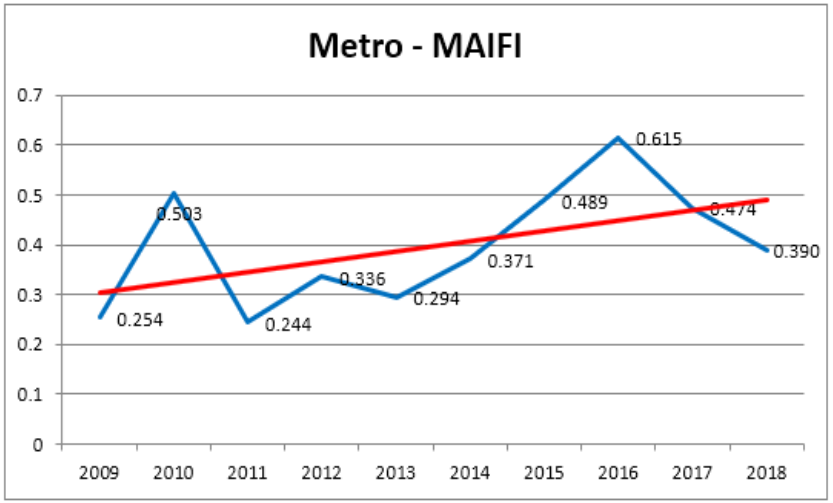
Note: The spike in 2011 is due to the Pacific Southwest Electric Outage (PSEO)

District Reliability Indices (Excludes Planned and ISO; Includes MED)



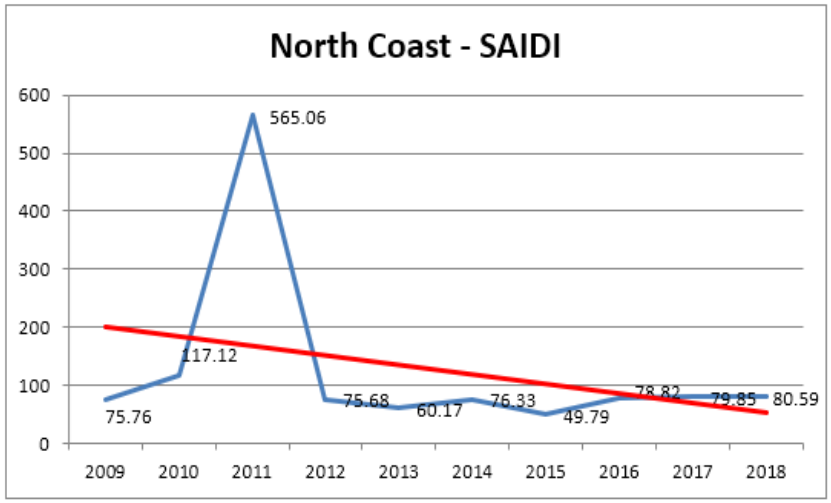


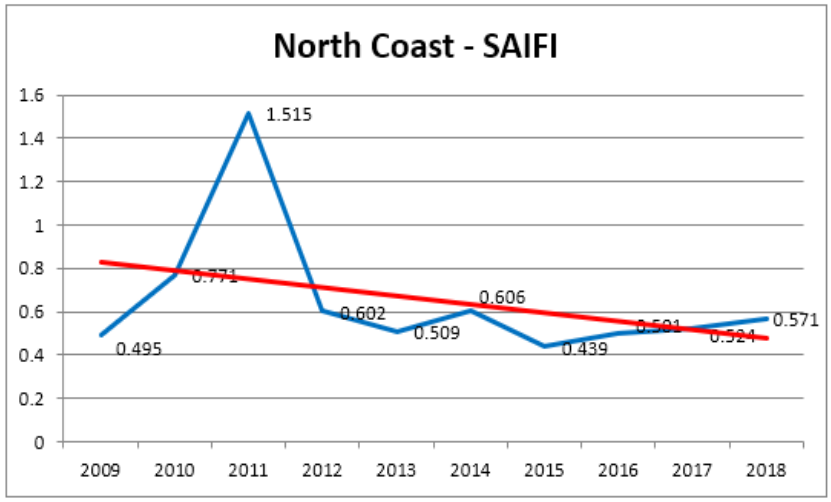


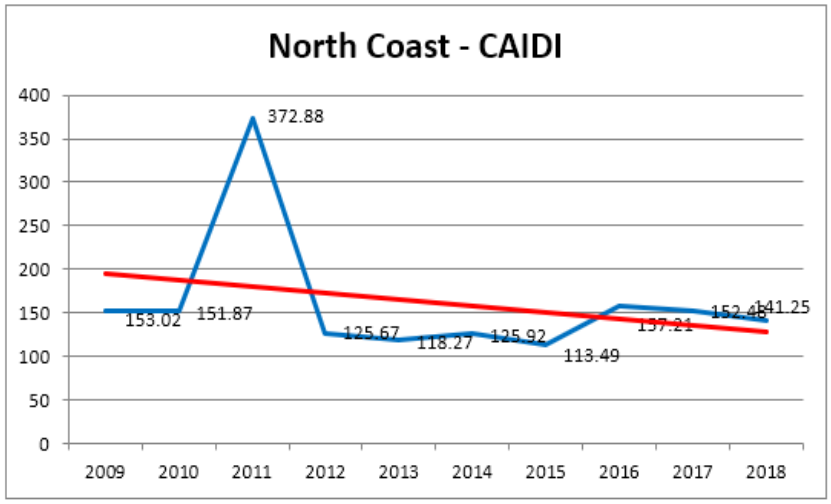


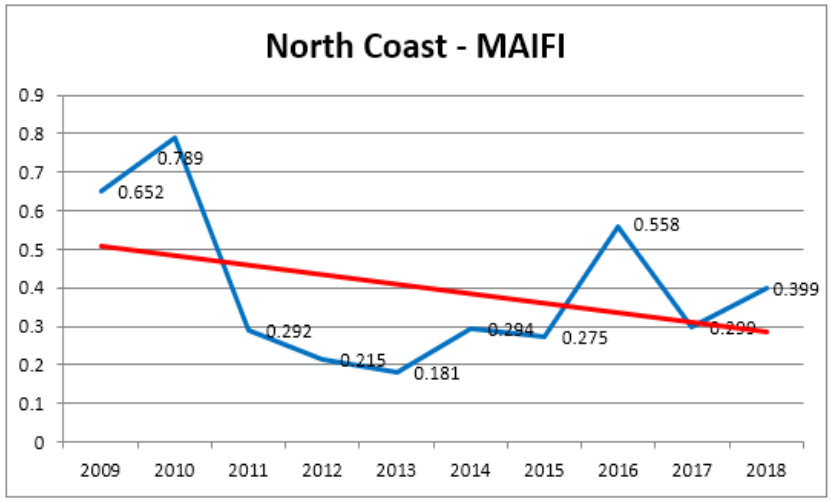
Note: The spike in 2011 is due to the Pacific Southwest Electric Outage (PSEO)

District Reliability Indices (Excludes Planned and ISO; Includes MED)



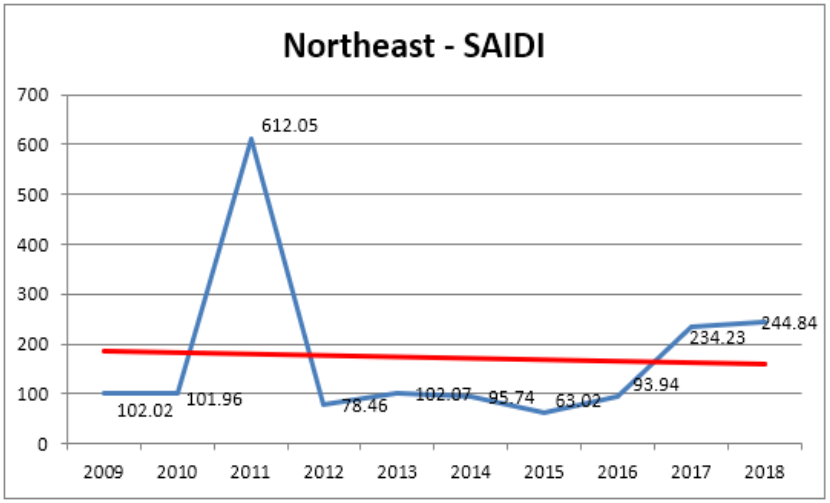


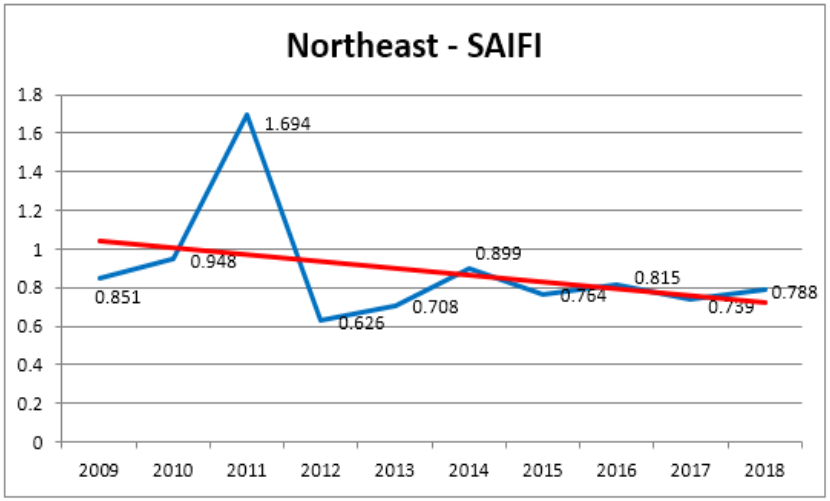


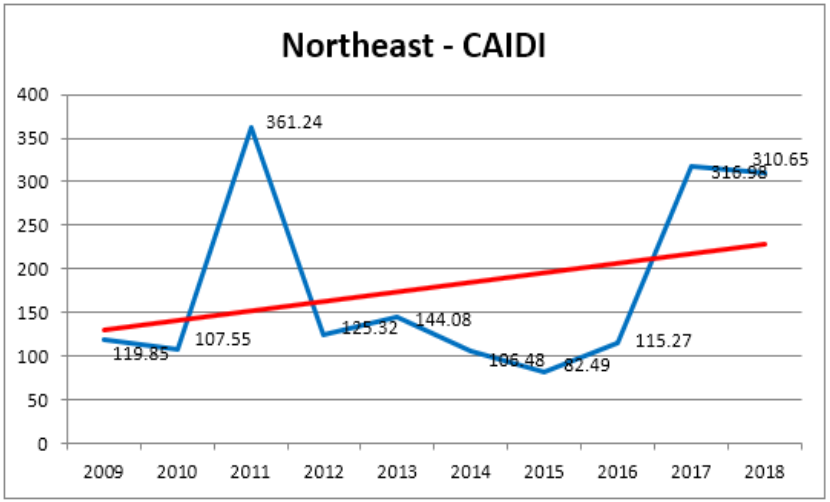


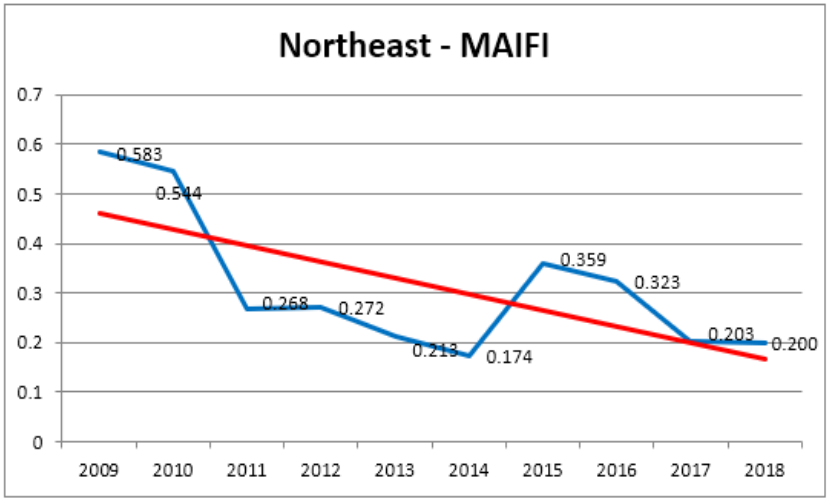
Note: The spike in 2011 is due to the Pacific Southwest Electric Outage (PSEO)

District Reliability Indices (Excludes Planned and ISO; Includes MED)



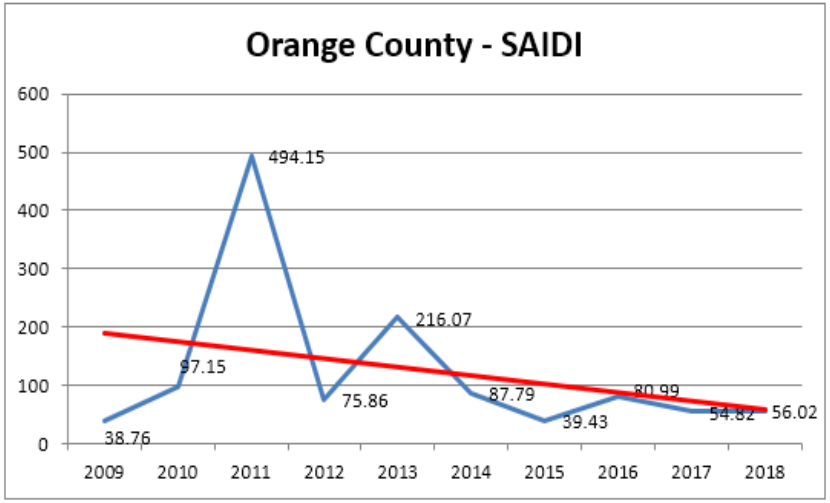


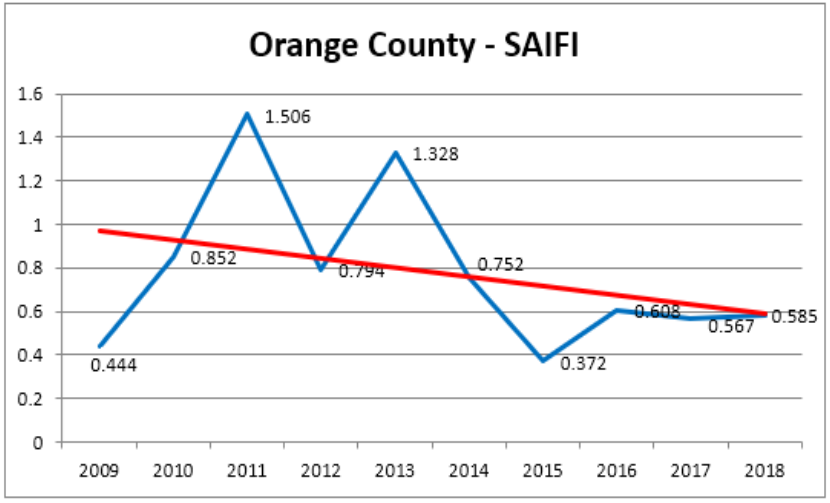


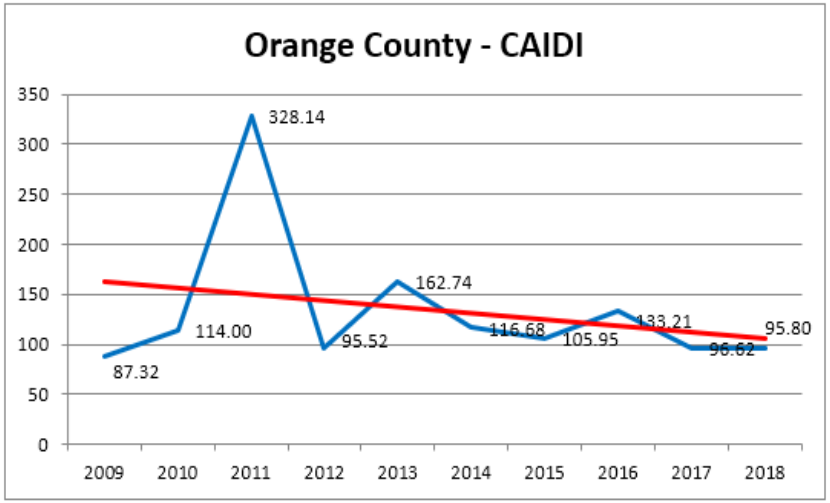


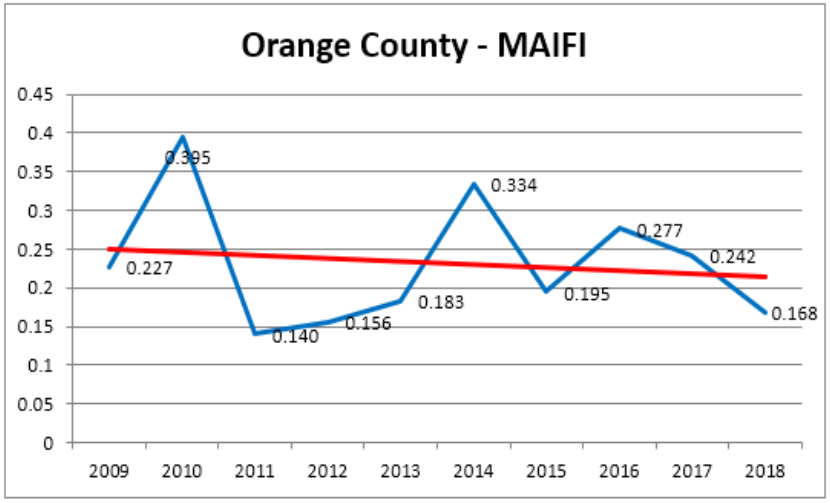
Note: The spike in 2011 is due to the Pacific Southwest Electric Outage (PSEO)

District Reliability Indices (Excludes Planned and ISO; Includes MED)





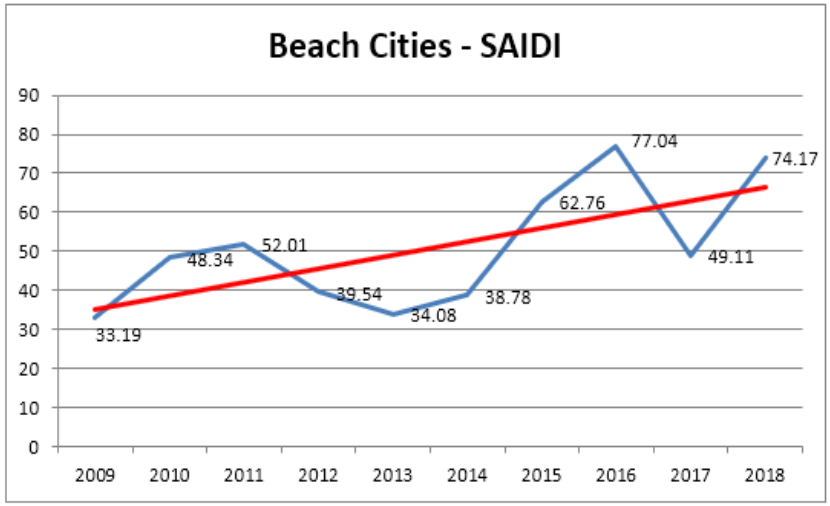


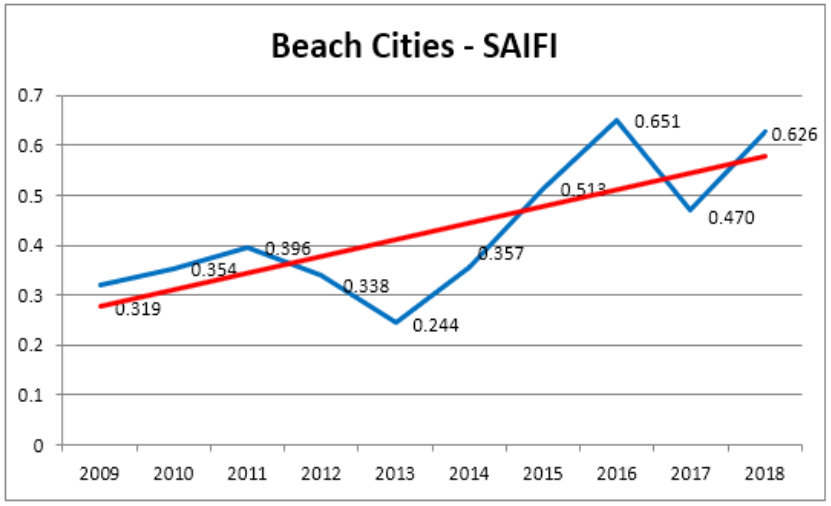


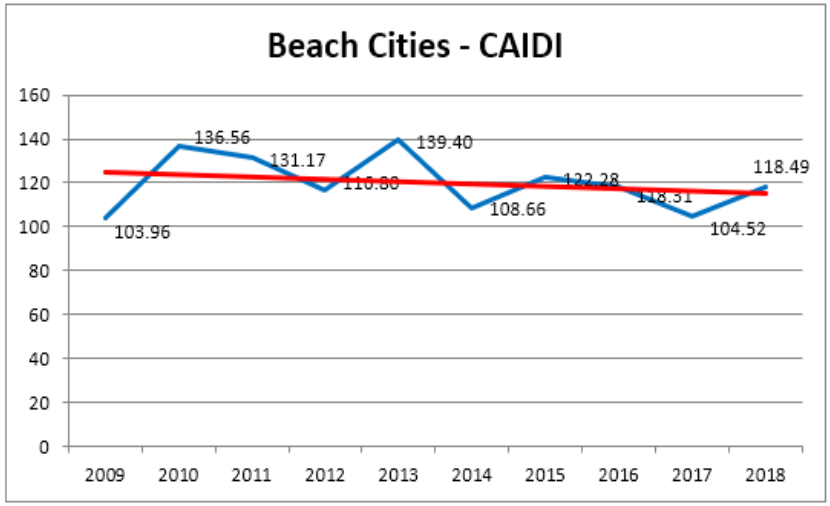
Note: The spike in 2011 is due to the Pacific Southwest Electric Outage (PSEO)

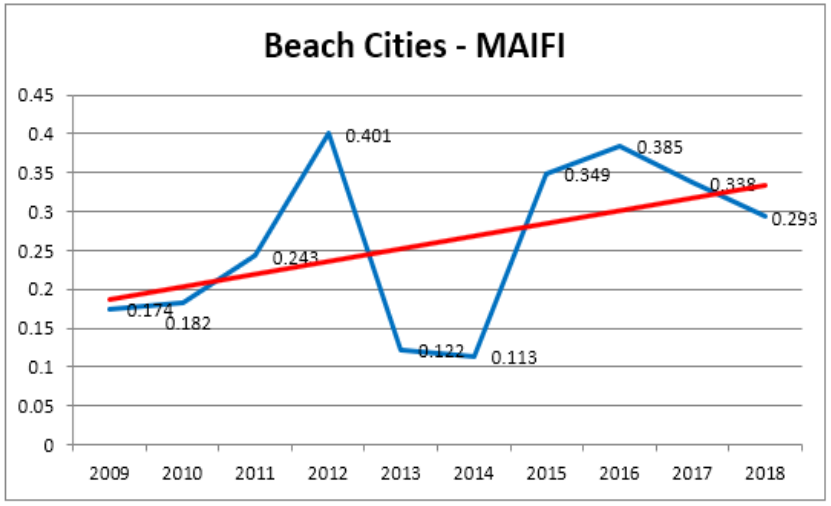
C. CHARTS FOR EACH OF SDG&E'S SIX DISTRICTS WITH LINEAR TREND LINE (EXCLUDES PLANNED, CAISO AND MED)

District Reliability Indices (Excludes Planned, ISO and MED)

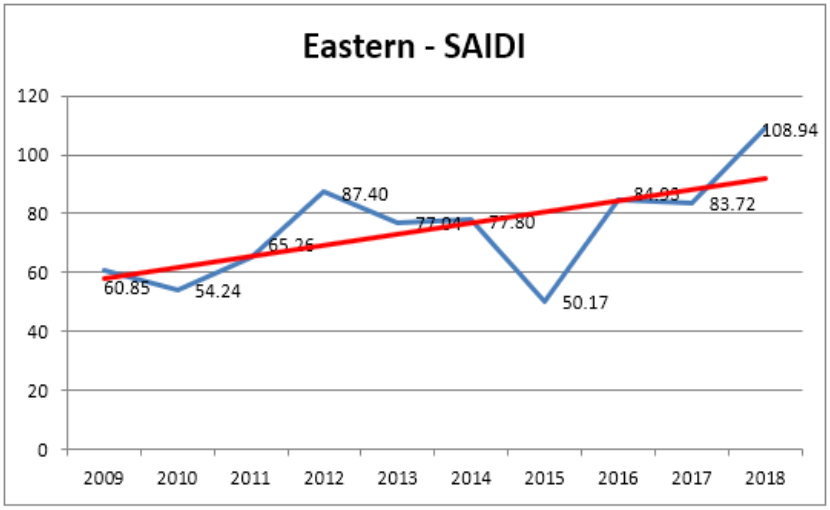


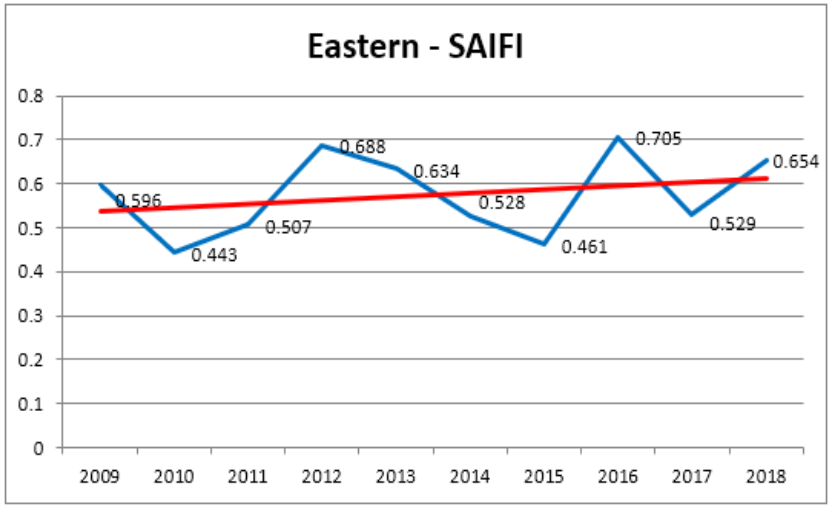


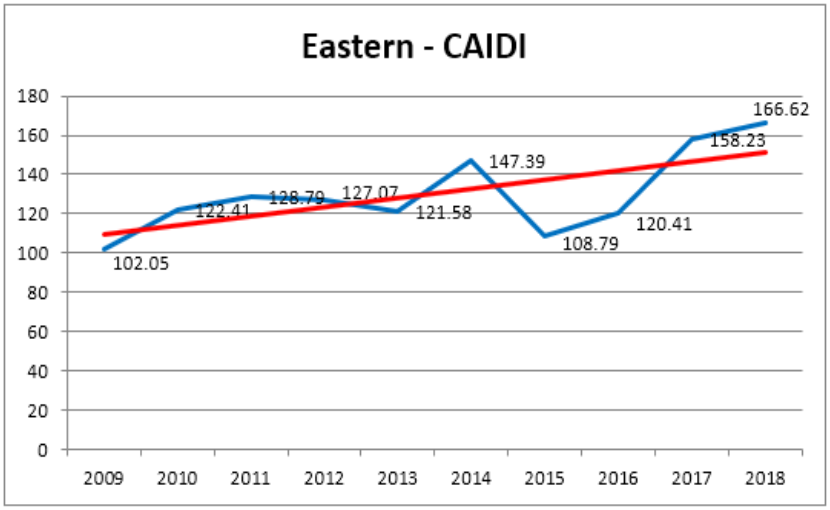


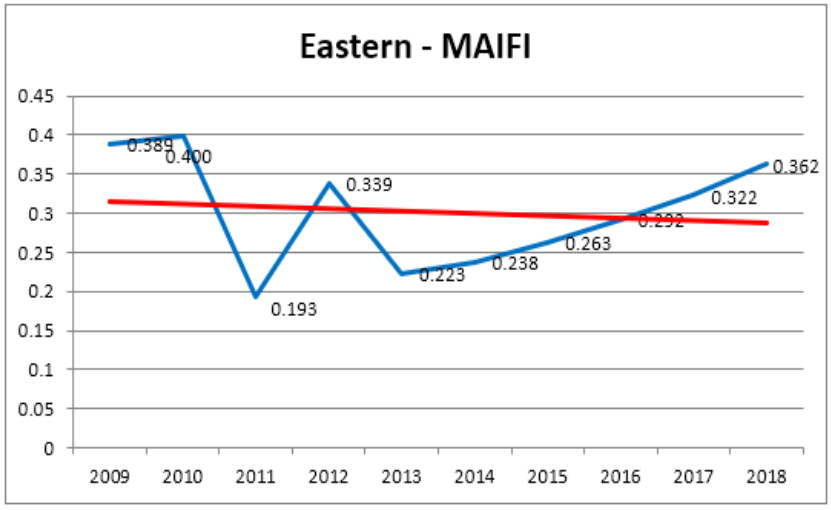


District Reliability Indices (Excludes Planned, ISO and MED)

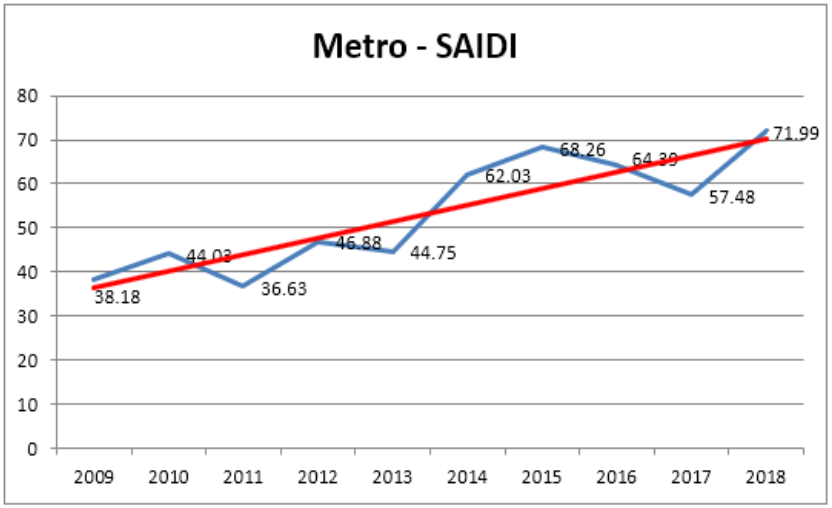


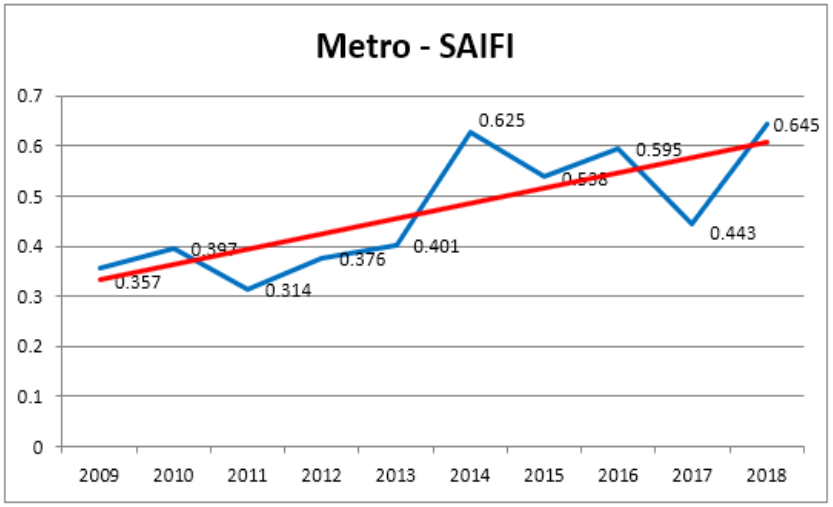


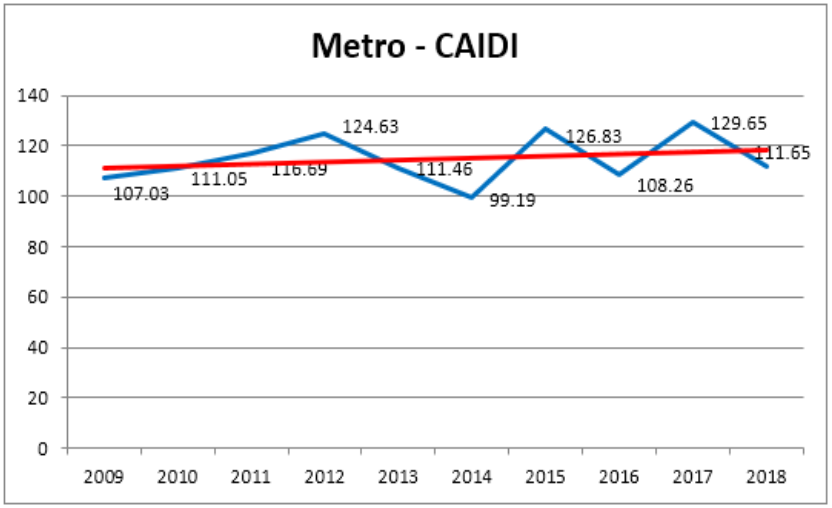


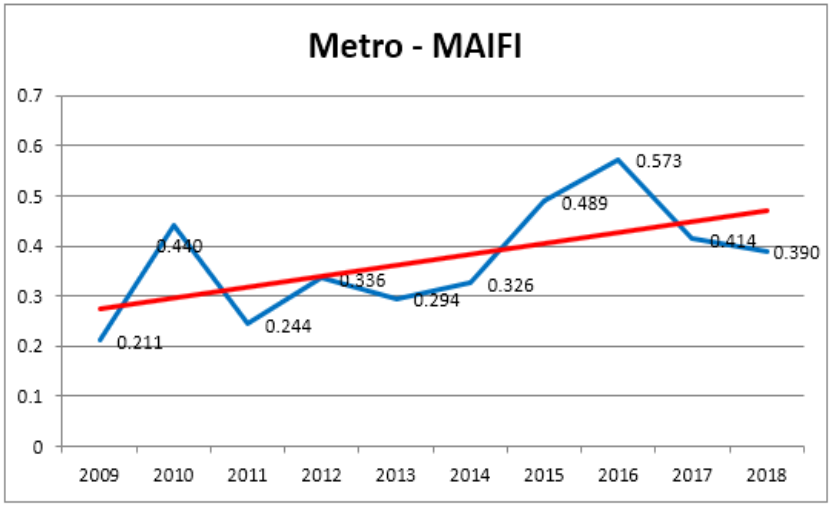


District Reliability Indices (Excludes Planned, ISO and MED)

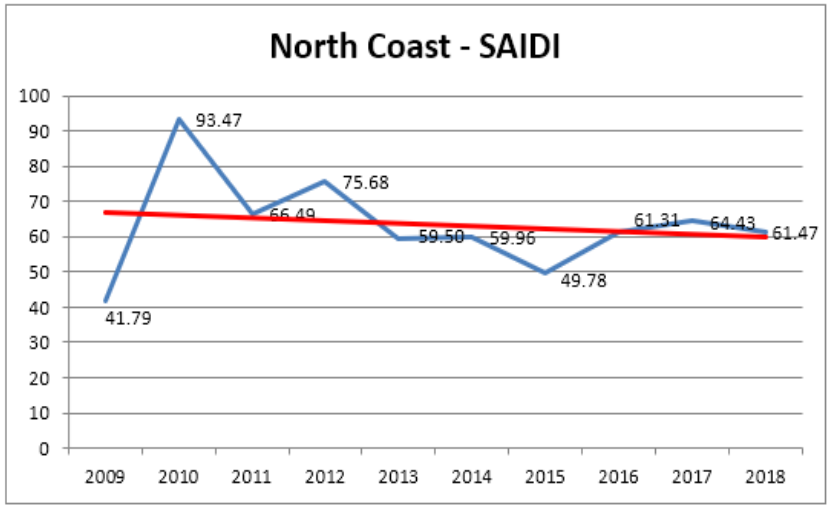


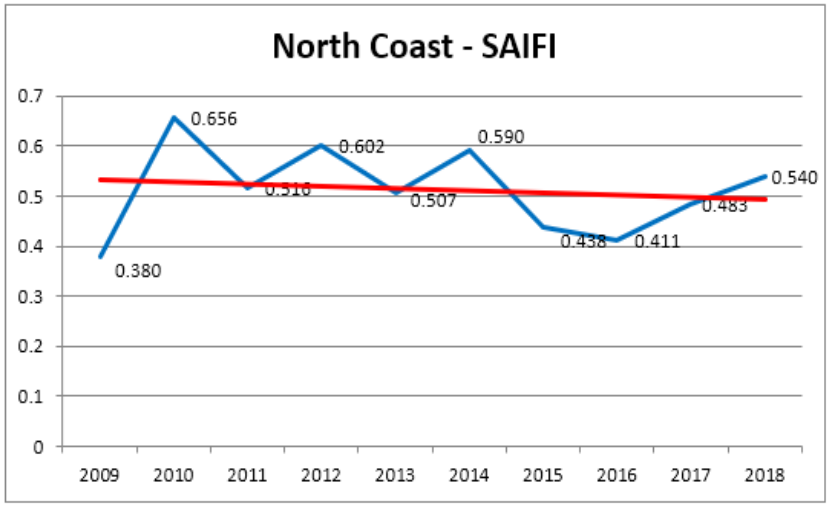


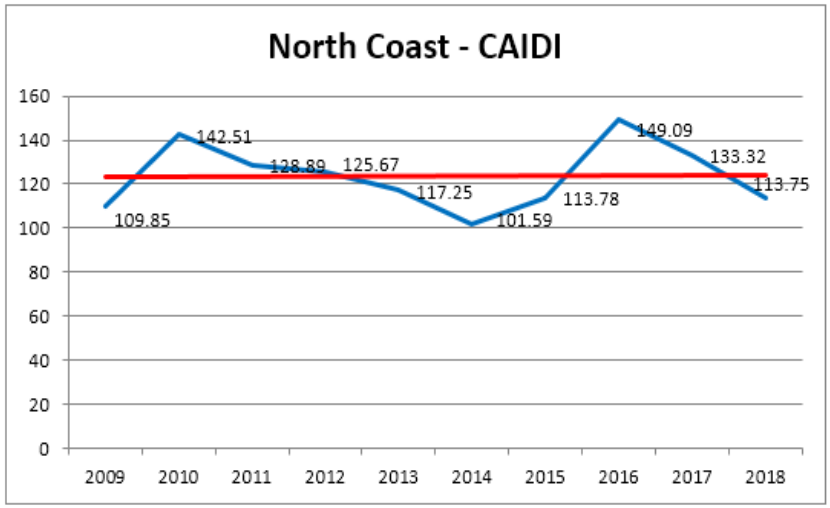


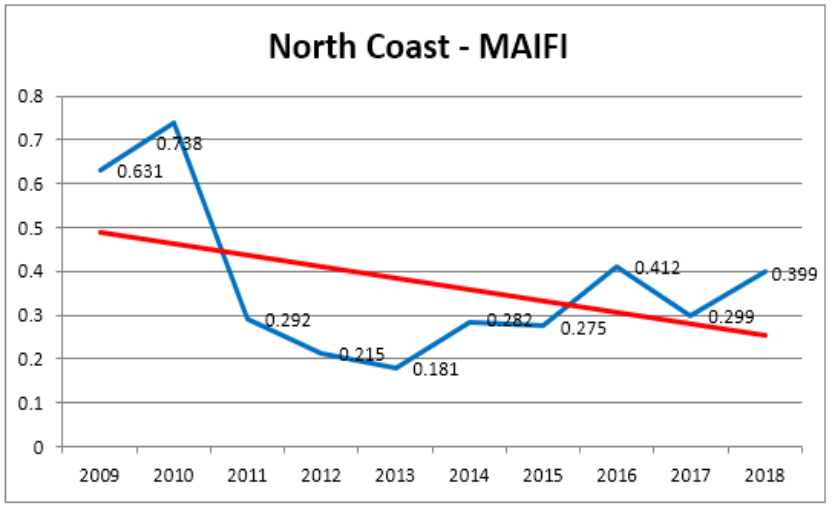


District Reliability Indices (Excludes Planned, ISO and MED)

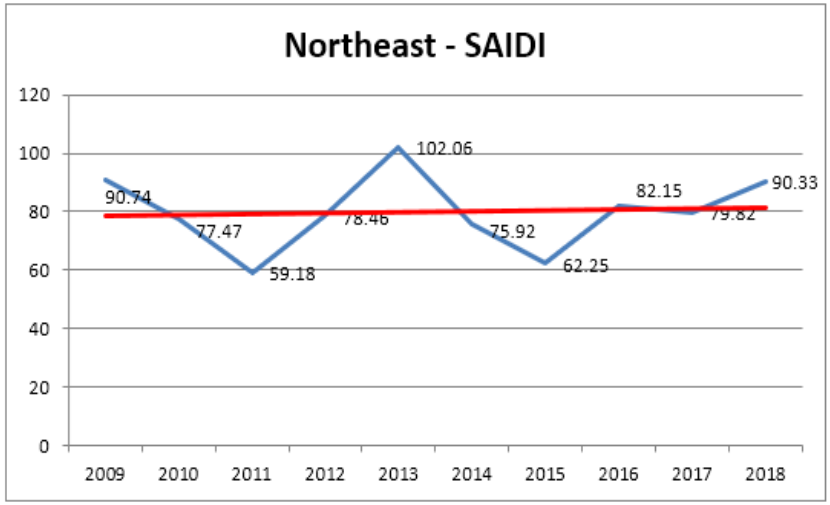


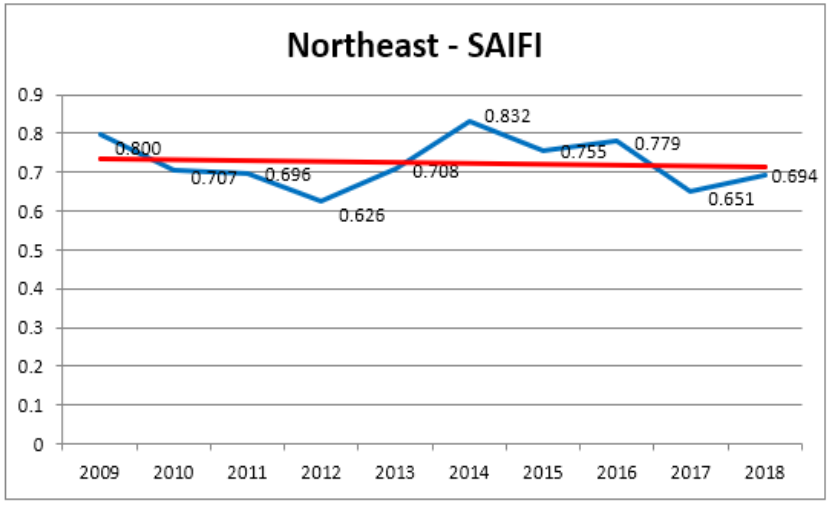


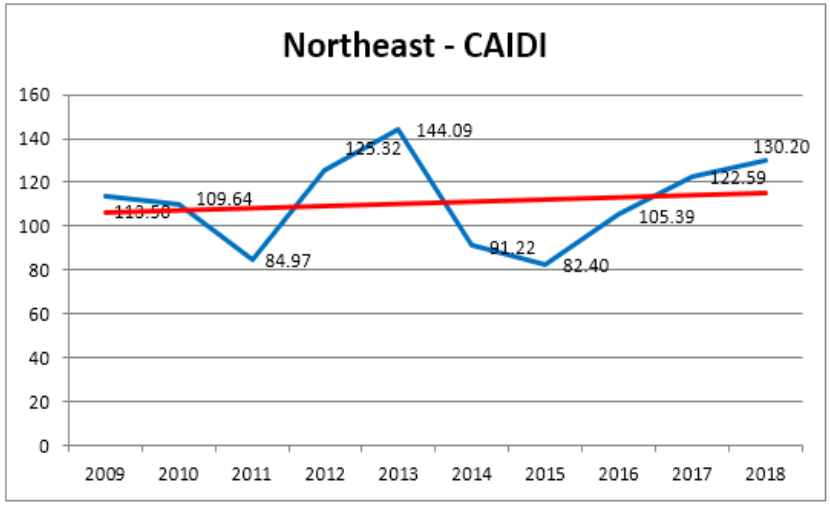


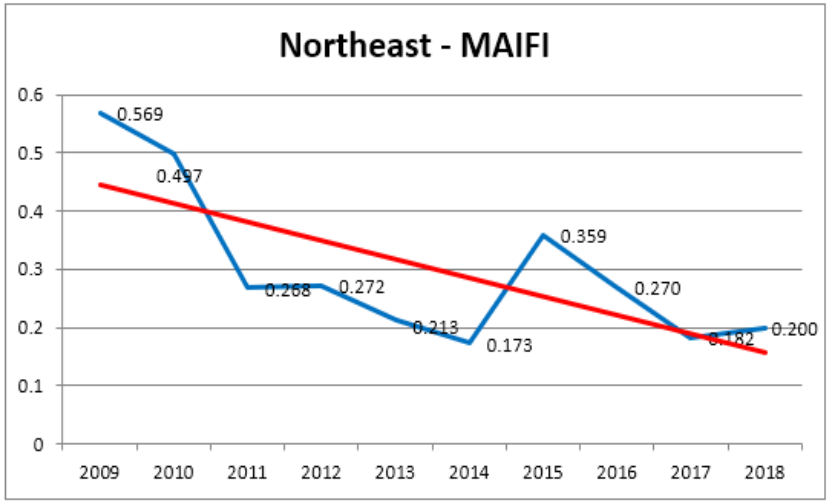


District Reliability Indices (Excludes Planned, ISO and MED)

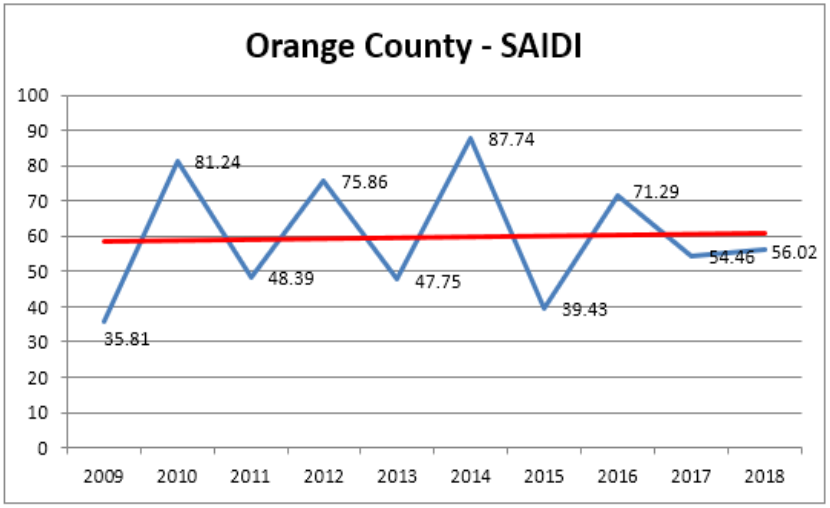


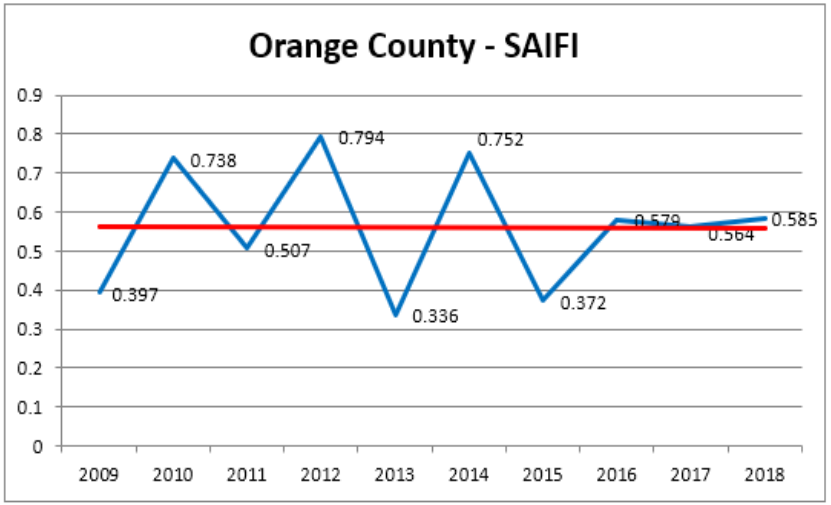


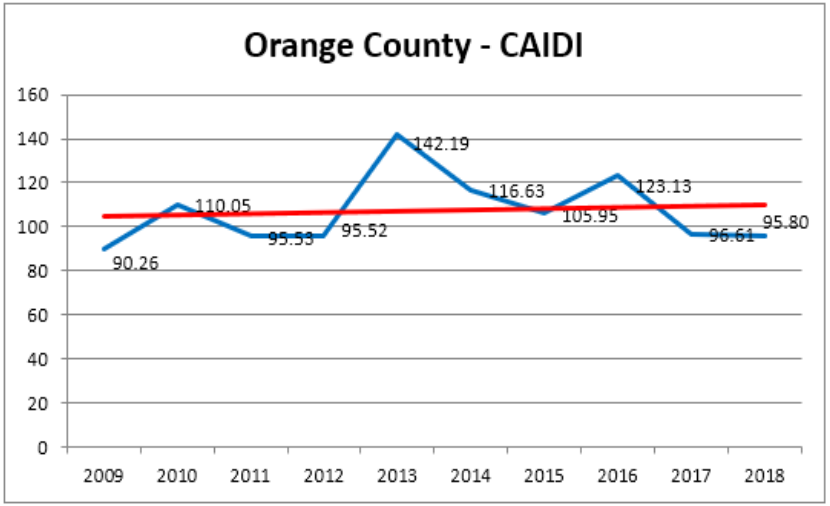


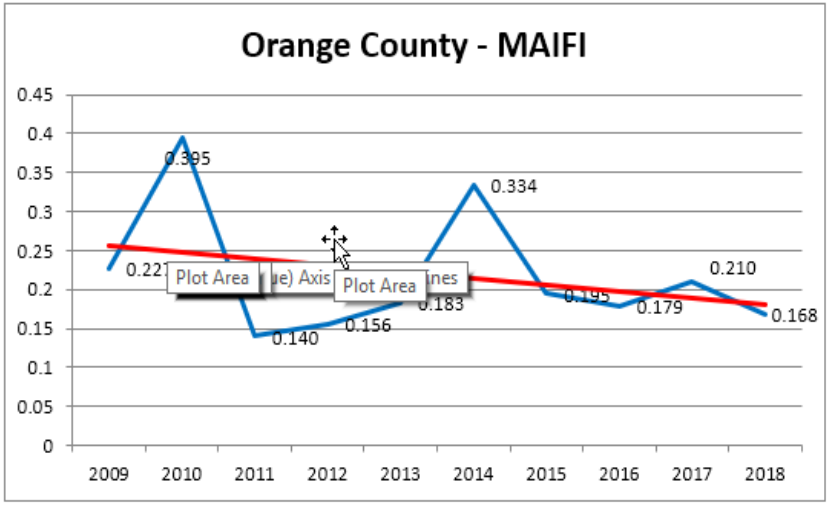


District Reliability Indices (Excludes Planned, ISO and MED)









SECTION 3 – SYSTEM AND DISTRICT INDICES BASED ON IEEE 1366 FOR THE PAST 10 YEARS INCLUDING PLANNED OUTAGES AND INCLUDING AND EXCLUDING MED

The Decision requires SDG&E to track and report planned outages on a historic running 10-year period. However, prior to the Decision, SDG&E kept and tracked planned outage data on a running three-year period, and because SDG&E started using a newly implemented outage management system in September, 2012, SDG&E has recorded planned outage data from only 2013 onward. Since the data for 2013-2015 was recorded for purposes other than as required per the Decision, the extracted data for those three years has not been reviewed and has not gone through a formal quality control process to assure accuracy of the indices in this Reliability Report.

The indices for years 2016 onward reflect an improved level of accuracy associated with using data that was recorded subject to a quality control program that was designed and implemented in 2016 to meet the Decision's reporting requirements. Moving forward, SDG&E will maintain 10 years' worth of planned outage data as directed per the Decision. Each year SDG&E will provide an additional years' worth of data and in 2022 will report a running 10 years' worth of planned outage data.

INDICES BELOW REPRESENT THE COMBINED TRANSMISSION, SUBSTATION AND DISTRIBUTION OUTAGE IMPACTS AT THE SYSTEM AND DISTRICT LEVELS.

System Indices (2013 – 2018) Planned and Unplanned								
MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI
2013	106.19	0.668	158.96	0.230	91.09	0.579	157.25	0.230
2014	106.48	0.746	142.65	0.277	95.26	0.717	132.88	0.259
2015	100.59	0.661	152.16	0.370	100.40	0.657	152.72	0.370
2016	122.06	0.802	152.18	0.467	108.78	0.744	146.21	0.409
2017	164.71	0.744	221.32	0.368	111.57	0.671	166.22	0.335
2018	167.13	0.827	202.15	0.344	123.87	0.796	155.52	0.344

Beach Cites - District Indices (2013 – 2018) Planned and Unplanned								
MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI
2013	80.72	0.376	214.82	0.126	80.70	0.376	214.89	0.126
2014	75.05	0.476	157.61	0.143	72.45	0.467	155.06	0.120
2015	85.76	0.592	144.92	0.357	85.73	0.591	145.04	0.357
2016	109.46	0.766	142.81	0.401	95.95	0.718	133.58	0.401
2017	100.41	0.694	144.63	0.388	93.85	0.612	153.32	0.353
2018	142.64	0.859	166.08	0.316	142.18	0.851	167.08	0.316

Eastern - District Indices (2013 – 2018) Planned and Unplanned								
MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI
2013	121.78	0.776	156.95	0.239	120.37	0.767	157.02	0.239
2014	121.34	0.670	181.05	0.245	107.36	0.623	172.21	0.240
2015	82.12	0.555	147.87	0.289	82.12	0.555	147.87	0.289
2016	136.40	0.911	149.76	0.332	113.09	0.797	141.97	0.298
2017	207.65	0.763	272.23	0.386	113.74	0.654	173.89	0.351
2018	241.61	0.830	291.11	0.394	146.67	0.796	184.28	0.394

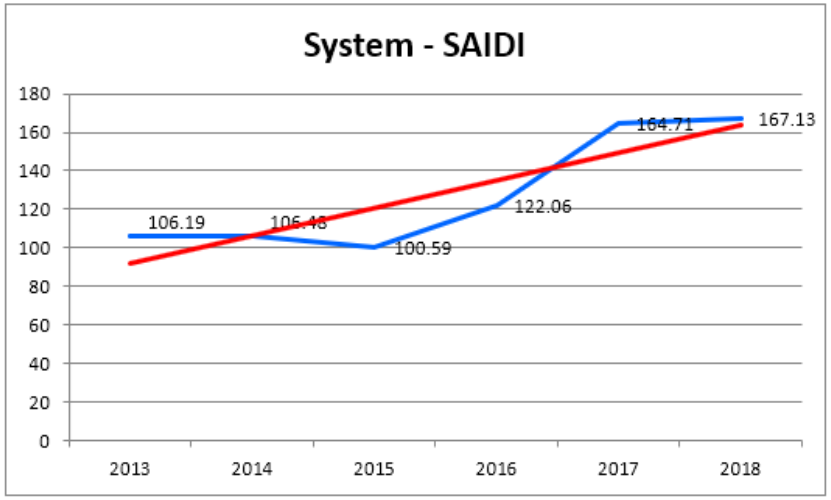
Metro - District Indices (2013 – 2018) Planned and Unplanned								
MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI
2013	65.17	0.472	137.98	0.295	65.11	0.472	138.00	0.295
2014	105.54	0.752	140.25	0.374	95.16	0.724	131.43	0.328
2015	141.46	0.721	196.31	0.492	141.25	0.713	198.16	0.492
2016	114.66	0.759	150.99	0.617	108.20	0.725	149.25	0.575
2017	151.01	0.683	221.25	0.478	111.61	0.601	185.64	0.417
2018	104.76	0.777	134.89	0.408	102.88	0.764	134.74	0.408

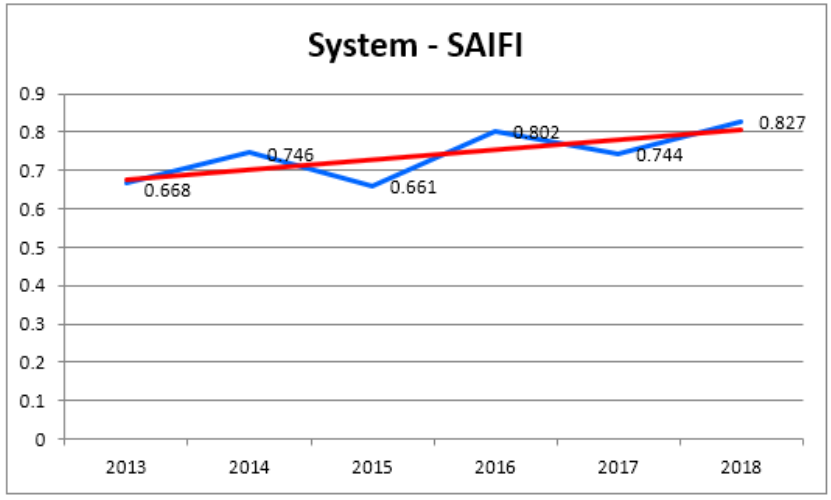
North Coast - District Indices (2013 – 2018) Planned and Unplanned								
MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI
2013	90.52	0.625	144.79	0.191	89.84	0.624	144.02	0.191
2014	104.10	0.741	140.56	0.322	87.72	0.725	121.06	0.310
2015	87.90	0.580	151.58	0.299	87.89	0.579	151.88	0.299
2016	114.65	0.664	172.72	0.584	97.14	0.574	169.34	0.438
2017	108.76	0.665	163.62	0.329	93.34	0.624	149.51	0.329
2018	118.73	0.712	166.71	0.419	99.62	0.682	146.05	0.419

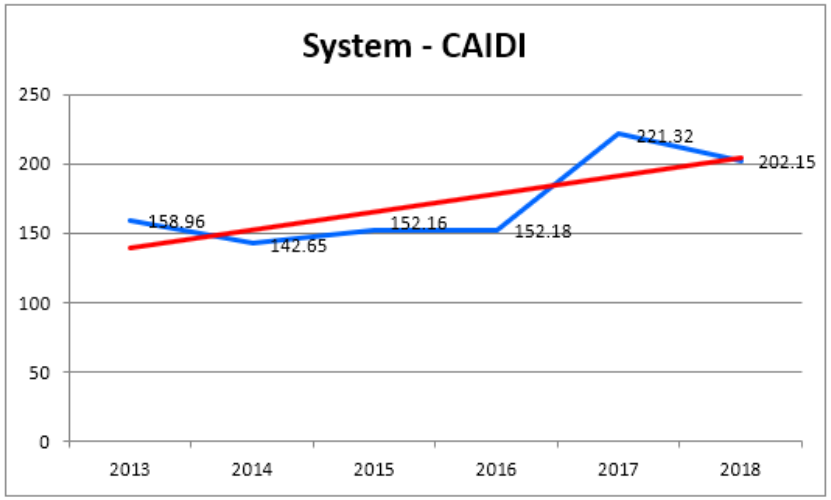
Northeast - District Indices (2013 – 2018) Planned and Unplanned								
MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI
2013	130.01	0.817	159.11	0.264	129.99	0.817	159.12	0.264
2014	121.17	1.016	119.20	0.217	101.35	0.950	106.72	0.215
2015	95.03	0.911	104.37	0.431	94.26	0.902	104.50	0.431
2016	154.02	1.010	152.56	0.410	142.23	0.974	146.02	0.357
2017	315.41	0.986	319.80	0.261	161.00	0.898	179.20	0.240
2018	312.52	1.043	299.76	0.234	158.01	0.948	166.64	0.234

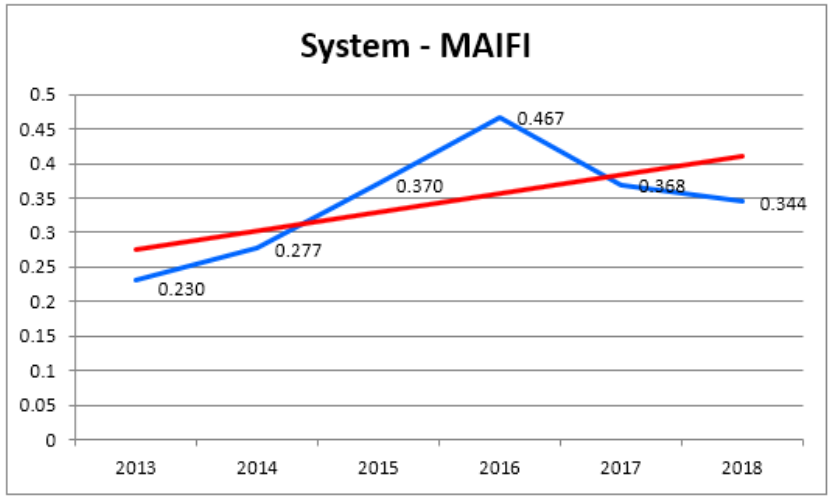
Orange County - District Indices (2013 – 2018) Planned and Unplanned								
MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI
2013	233.85	1.430	163.49	0.245	65.52	0.438	149.54	0.245
2014	122.61	0.906	135.36	0.348	122.56	0.906	135.33	0.348
2015	80.31	0.505	158.94	0.211	80.31	0.505	158.94	0.211
2016	98.96	0.688	143.86	0.288	89.26	0.659	135.47	0.190
2017	87.10	0.692	125.90	0.260	86.58	0.688	125.91	0.229
2018	89.71	0.716	125.27	0.198	89.71	0.716	125.27	0.198

System Indices - Planned and Unplanned (Excludes ISO; Includes MED)

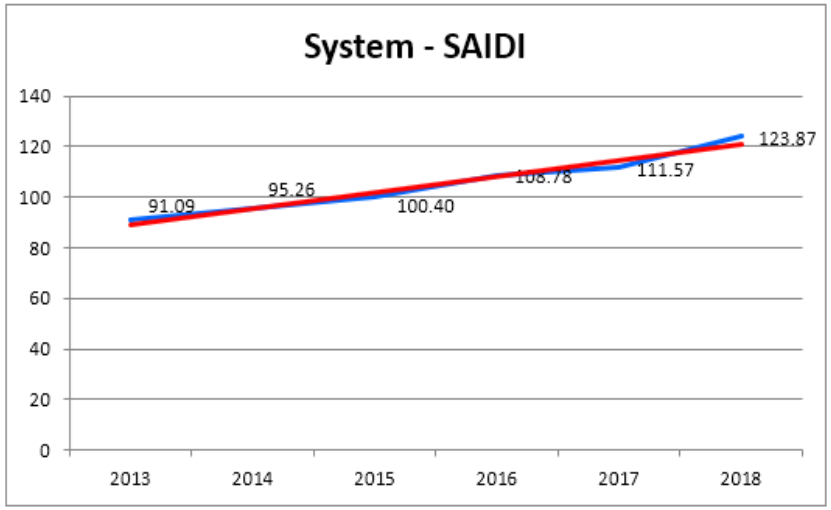


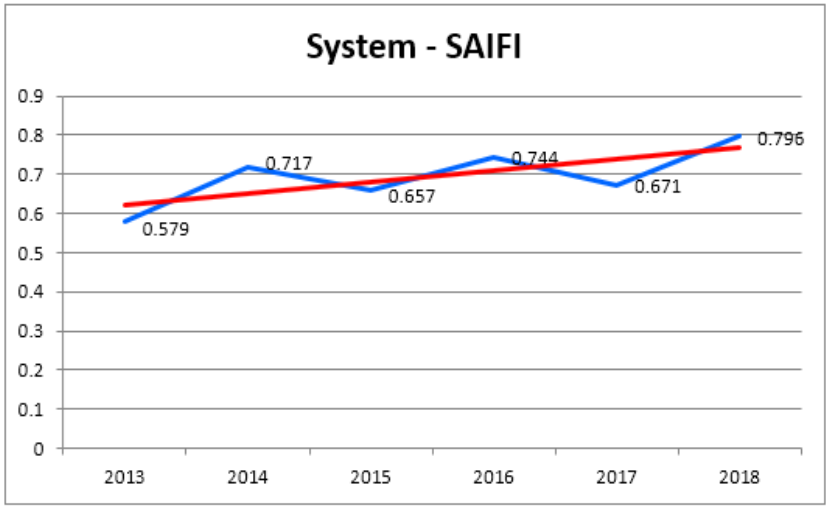


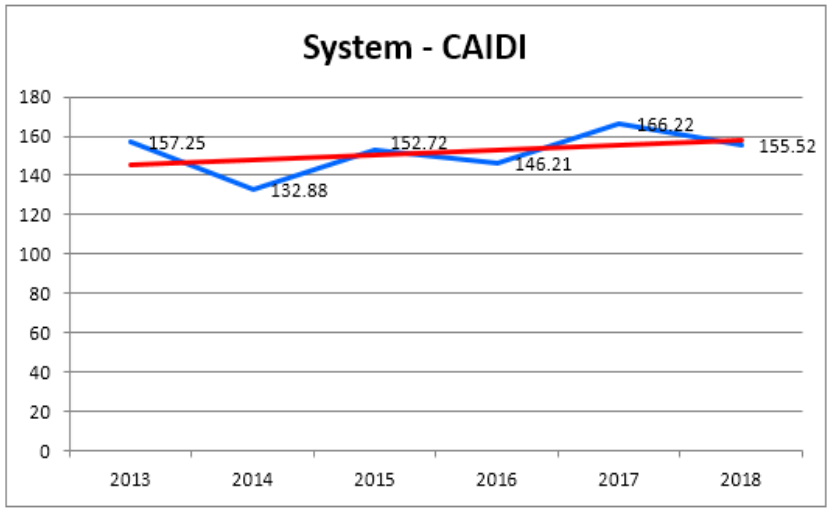


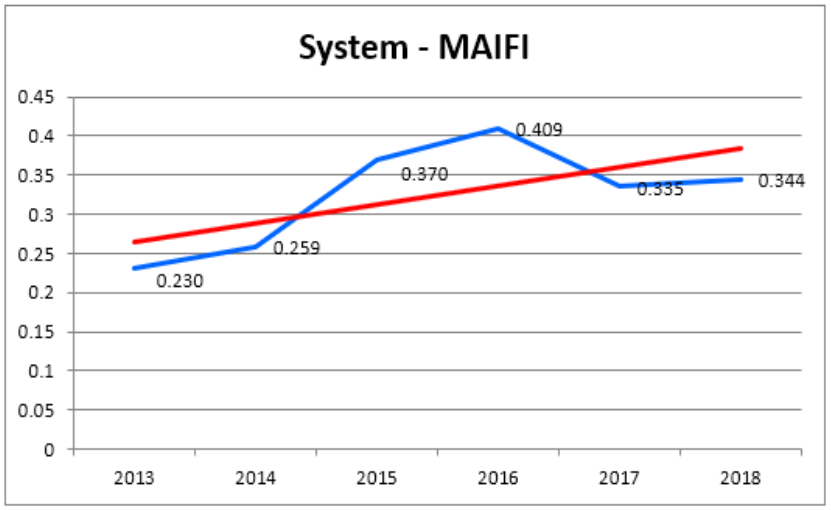


System Indices - Planned and Unplanned (Excludes ISO and MED)

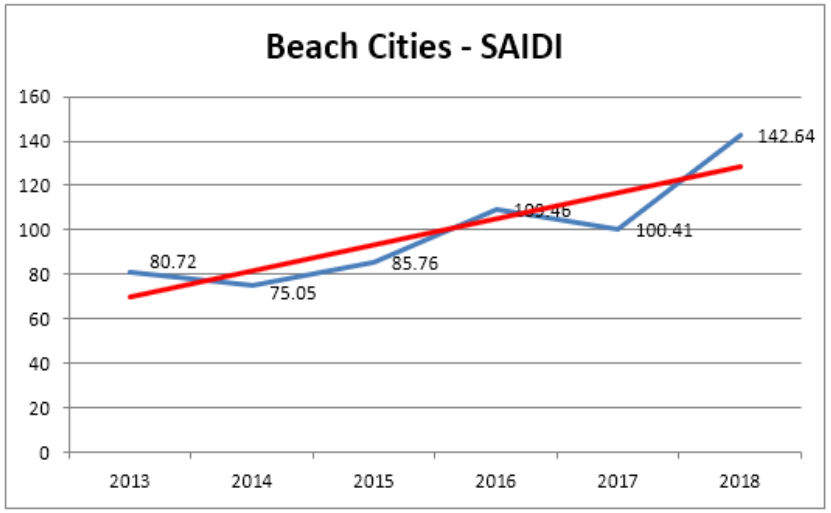


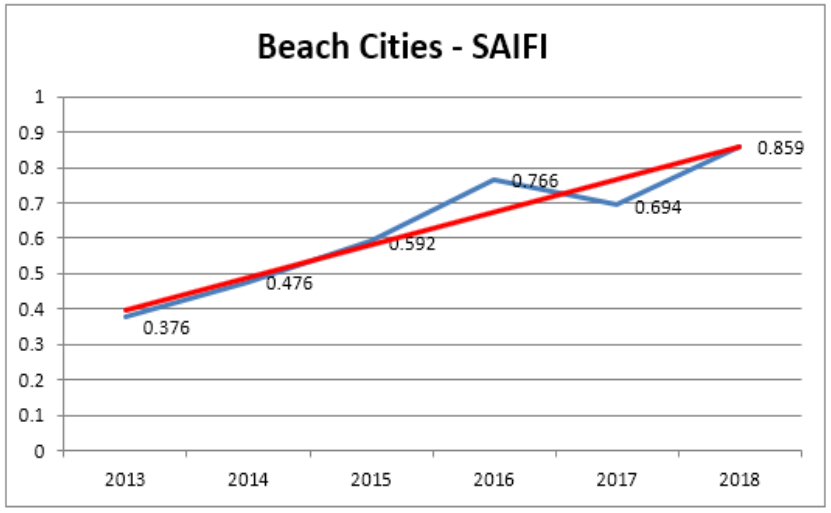


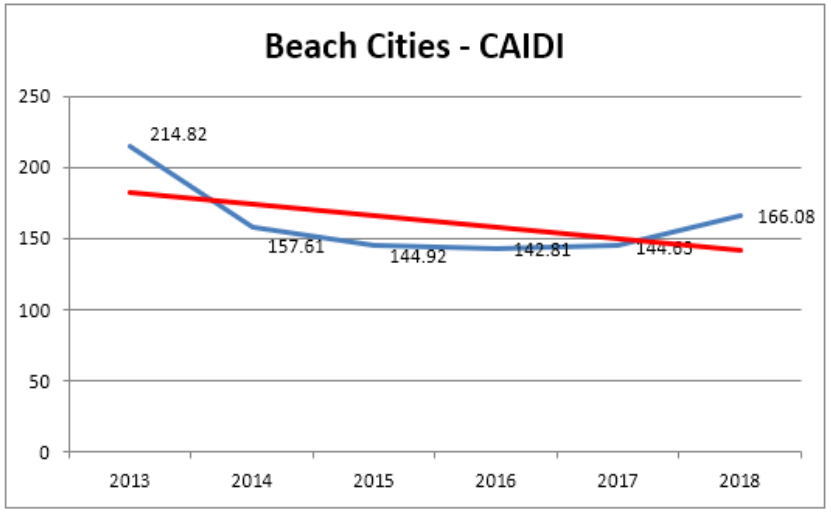


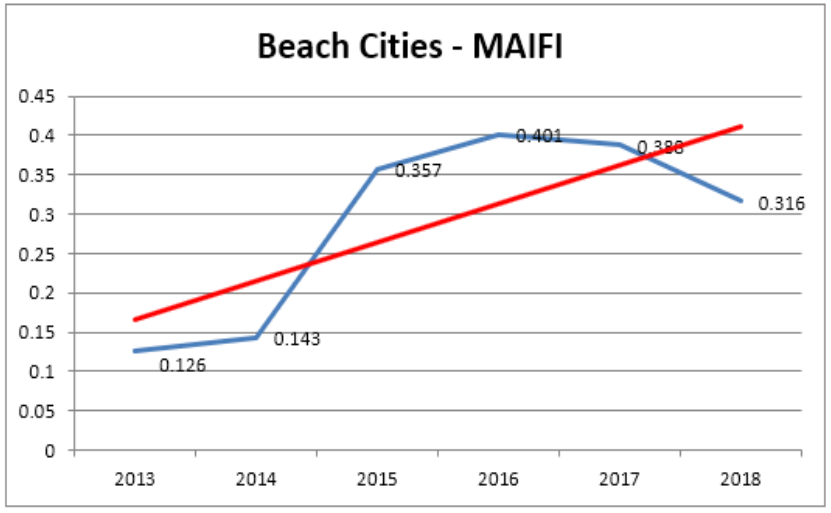


District Indices - Planned and Unplanned (Excludes ISO; Includes MED)

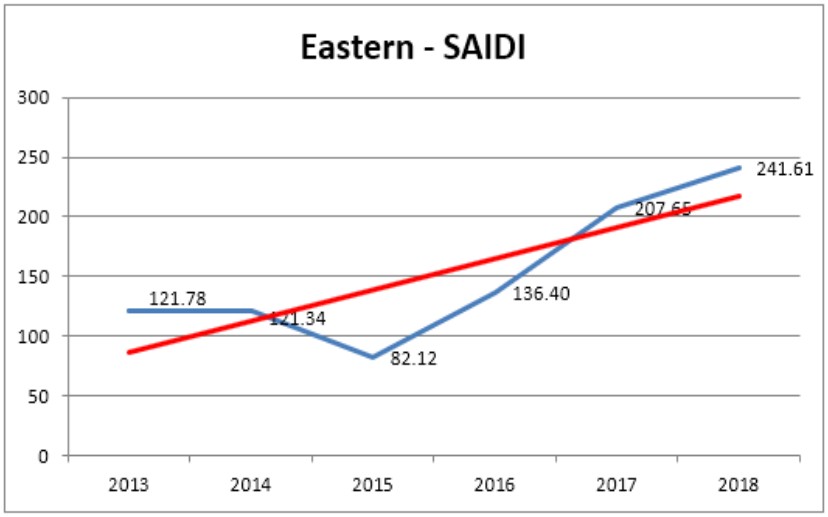


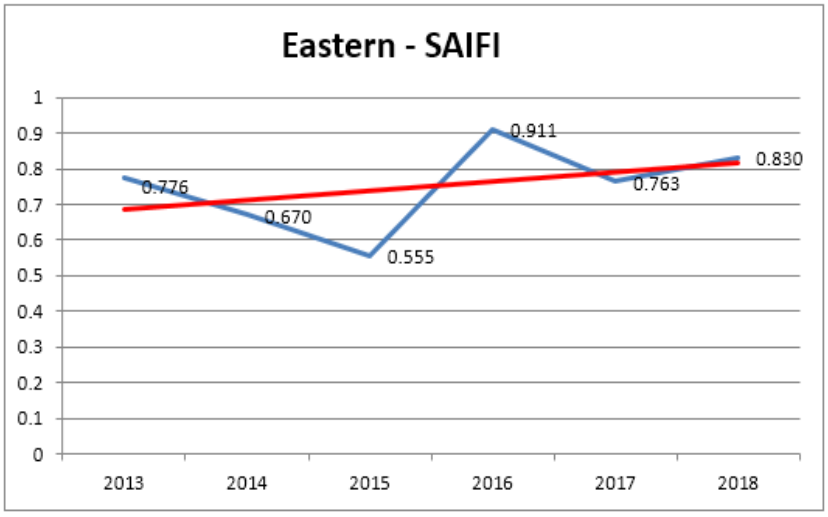


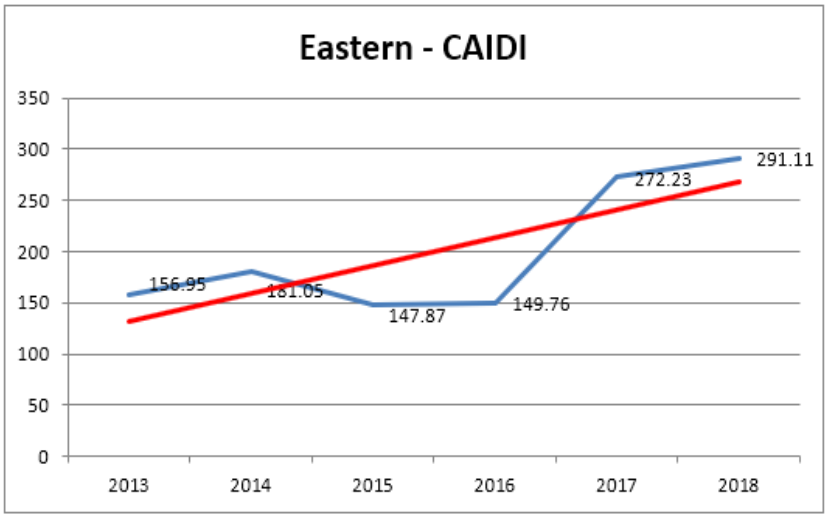


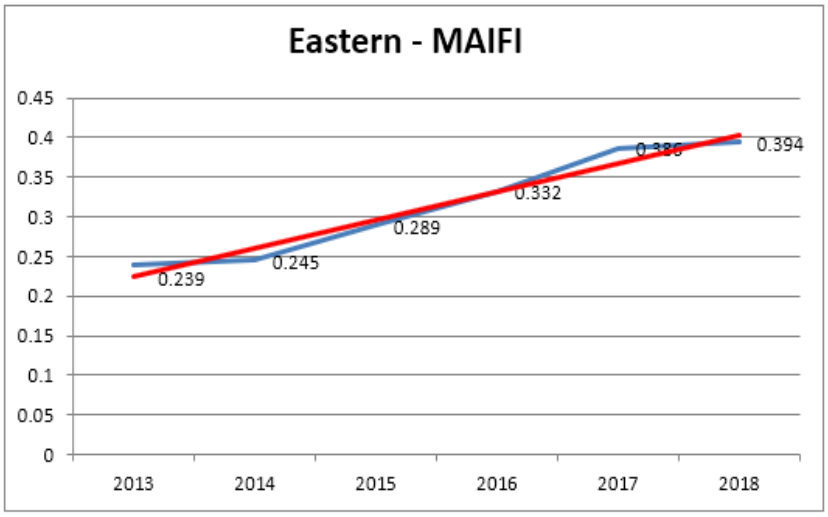


District Indices - Planned and Unplanned (Excludes ISO; Includes MED)

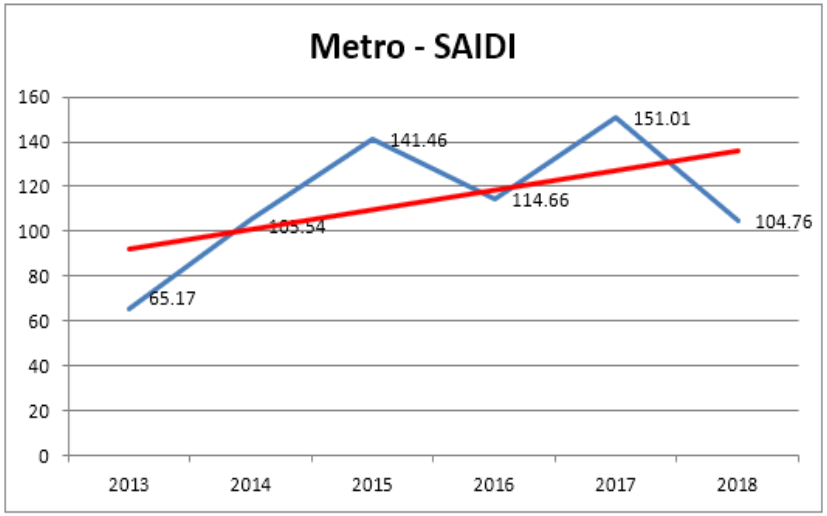


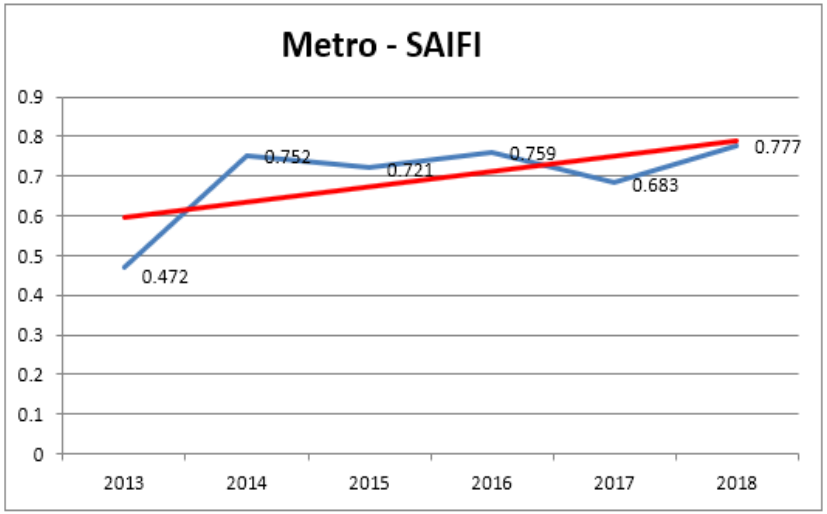


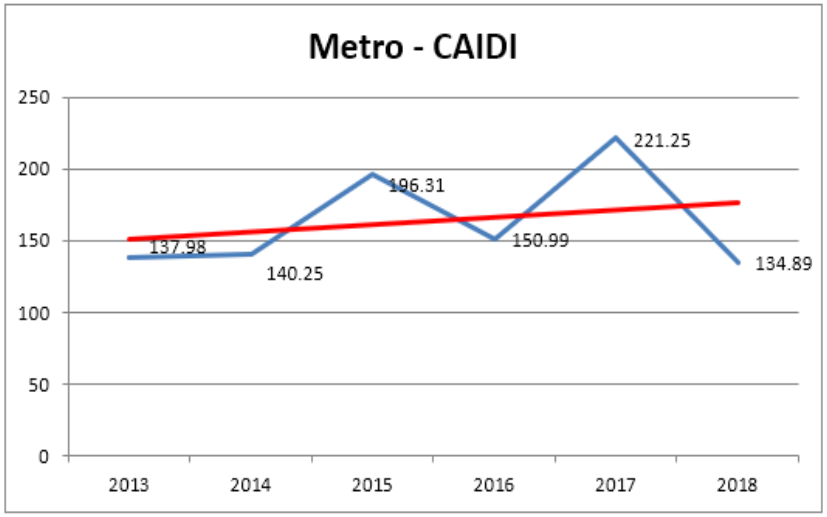


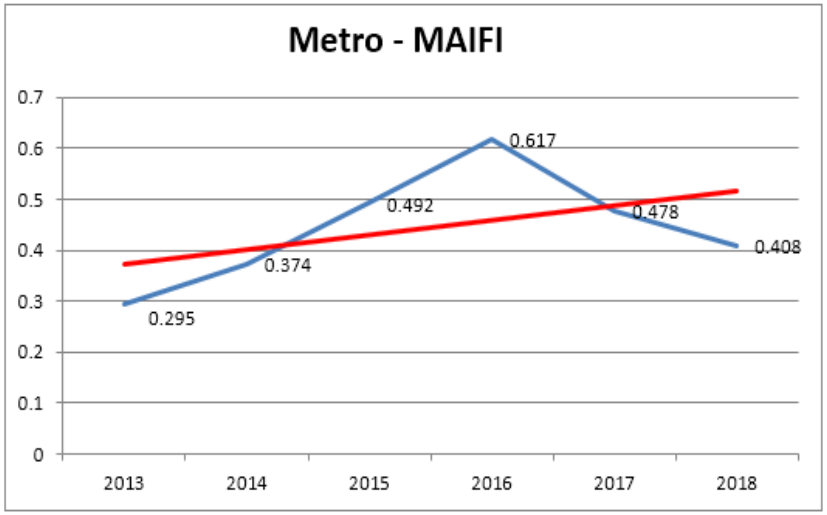


District Indices - Planned and Unplanned (Excludes ISO; Includes MED)

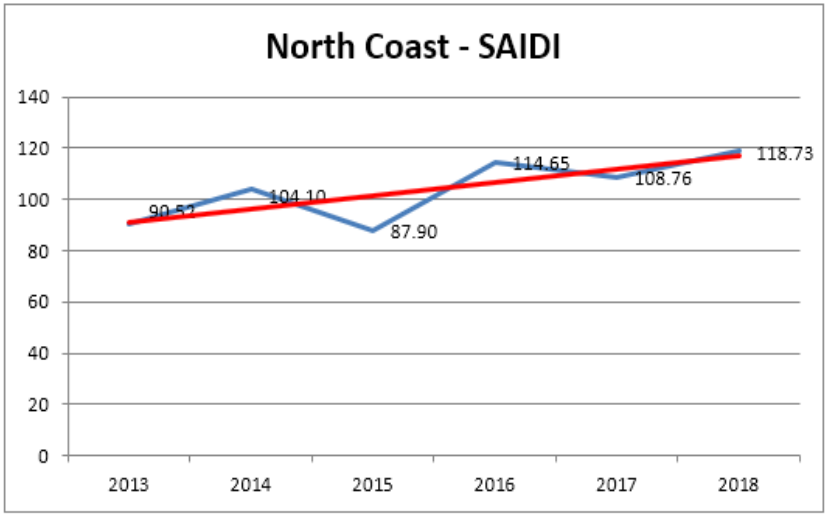


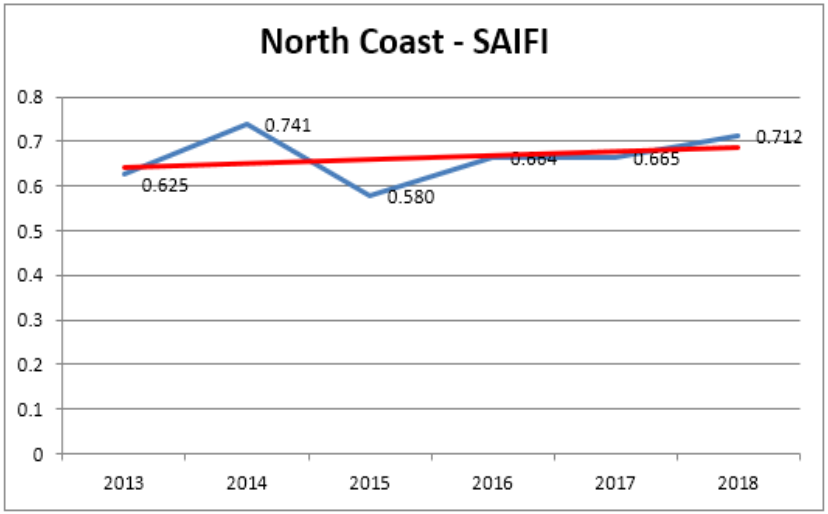


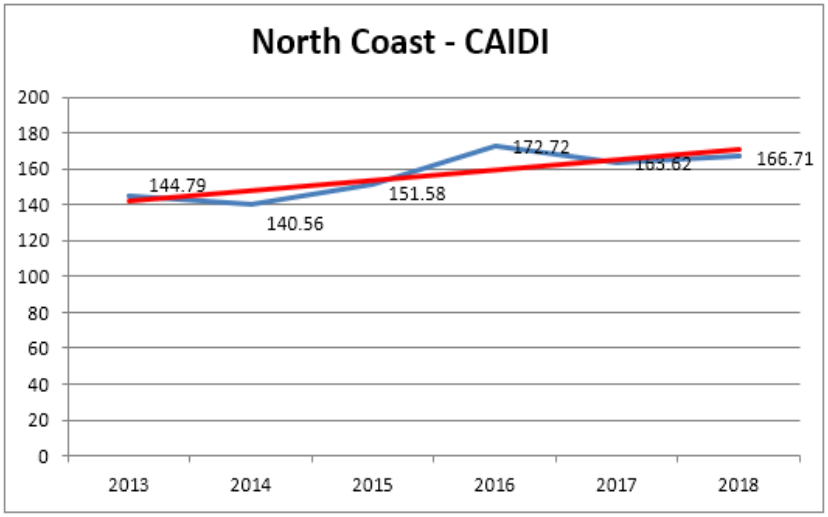


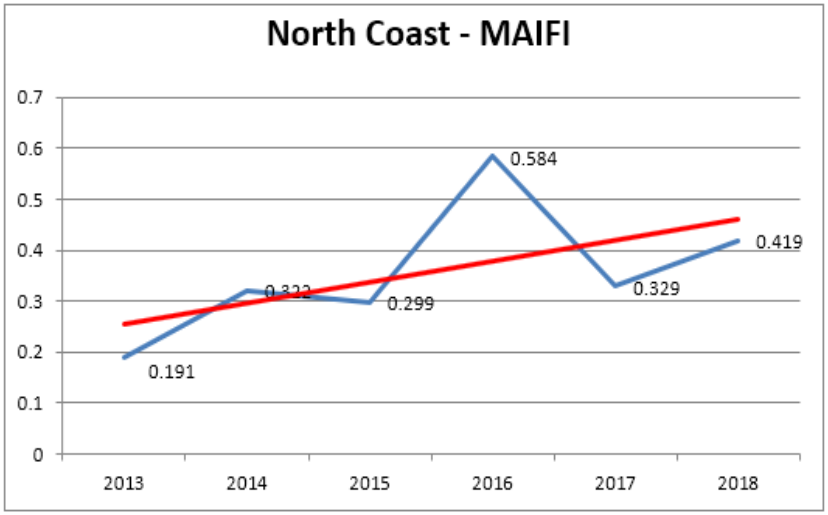


District Indices - Planned and Unplanned (Excludes ISO; Includes MED)

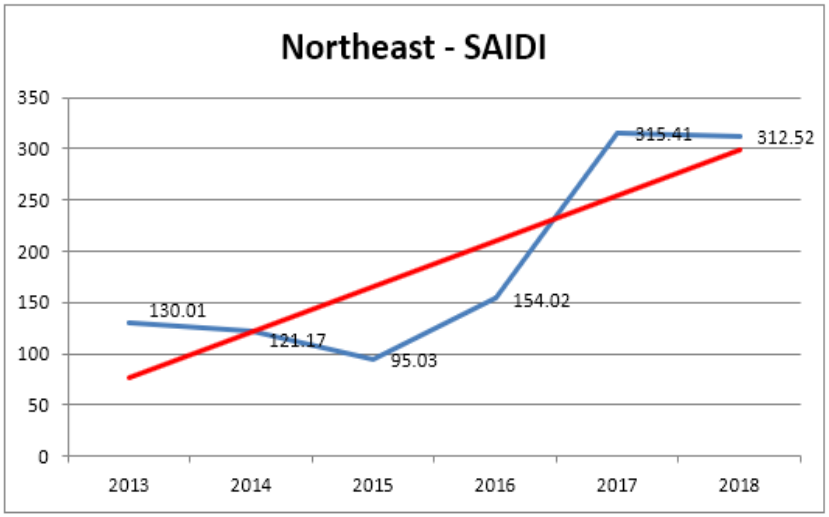


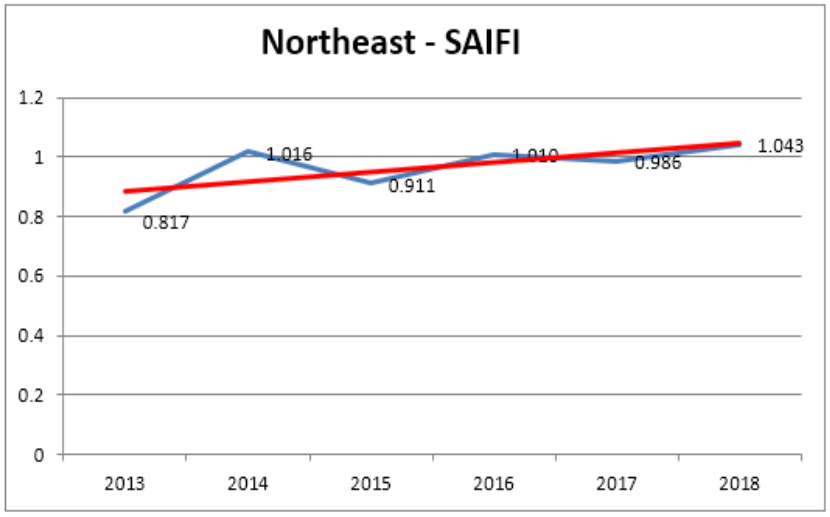


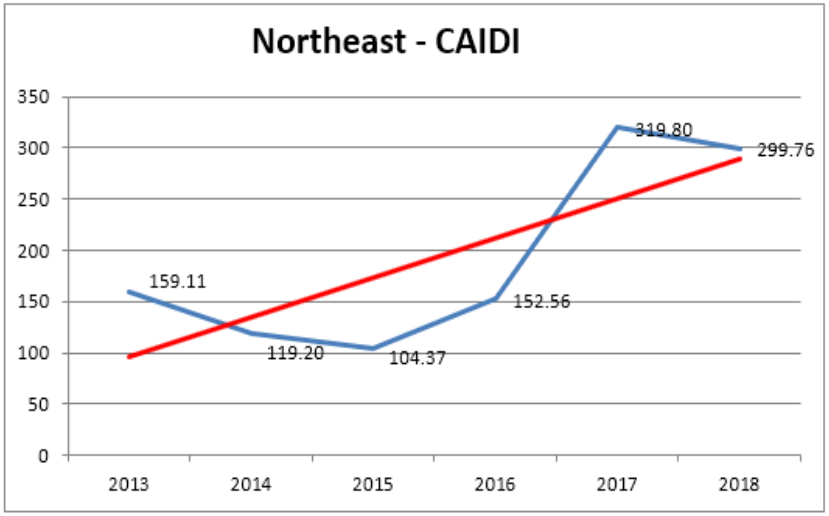


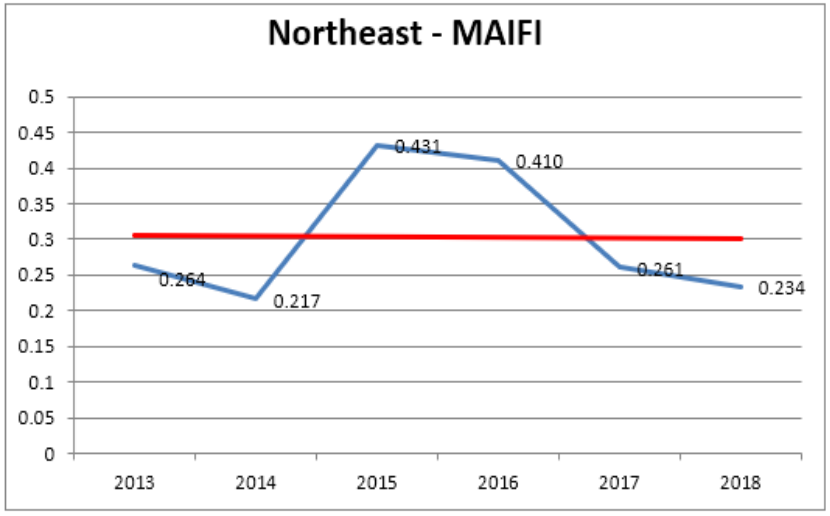


District Indices - Planned and Unplanned (Excludes ISO; Includes MED)

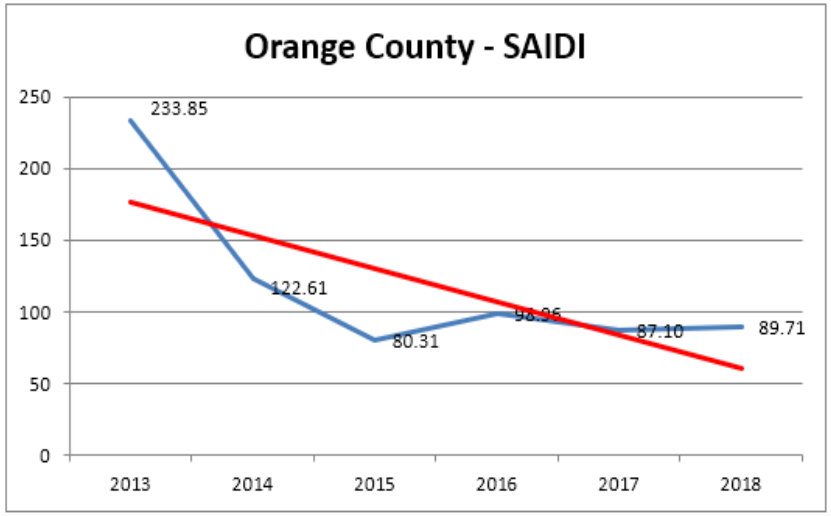


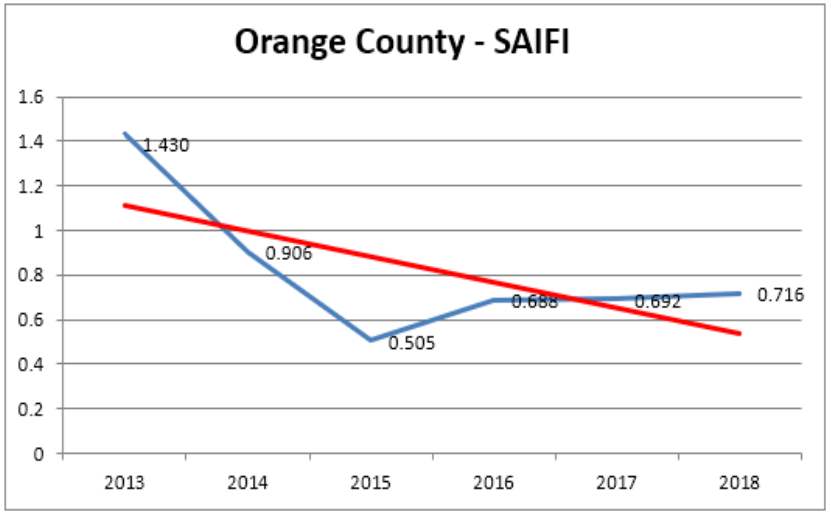


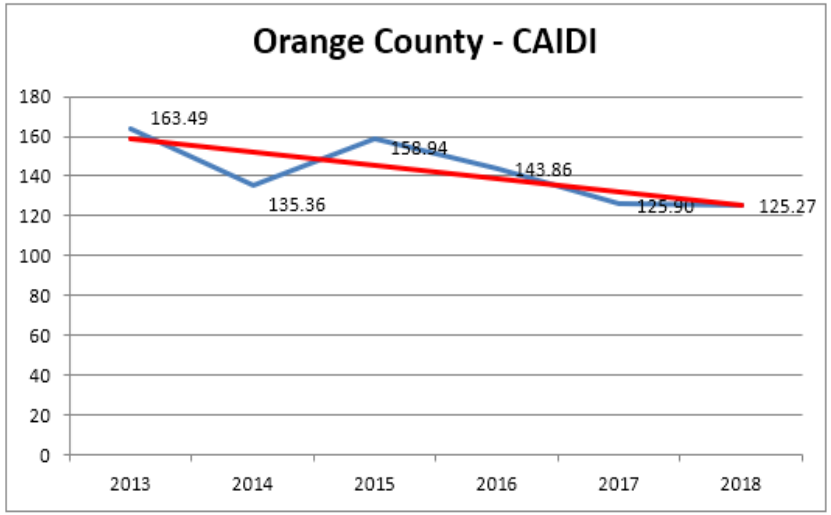


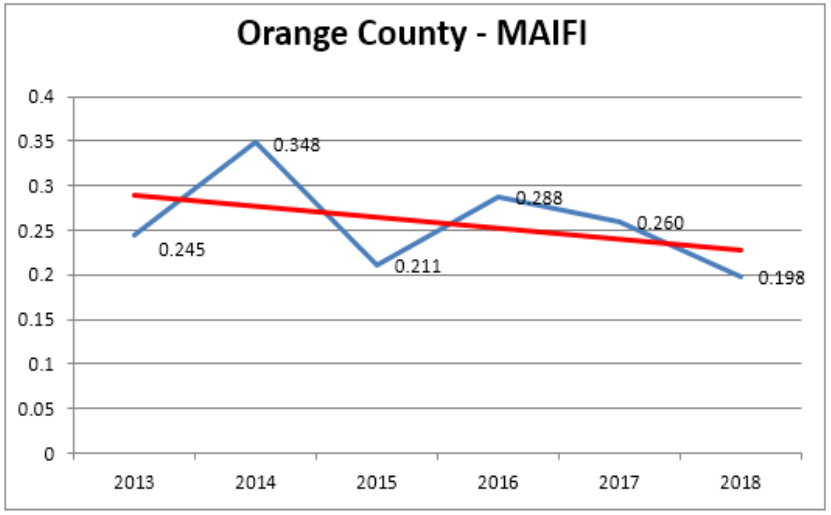


District Indices - Planned and Unplanned (Excludes ISO; Includes MED)

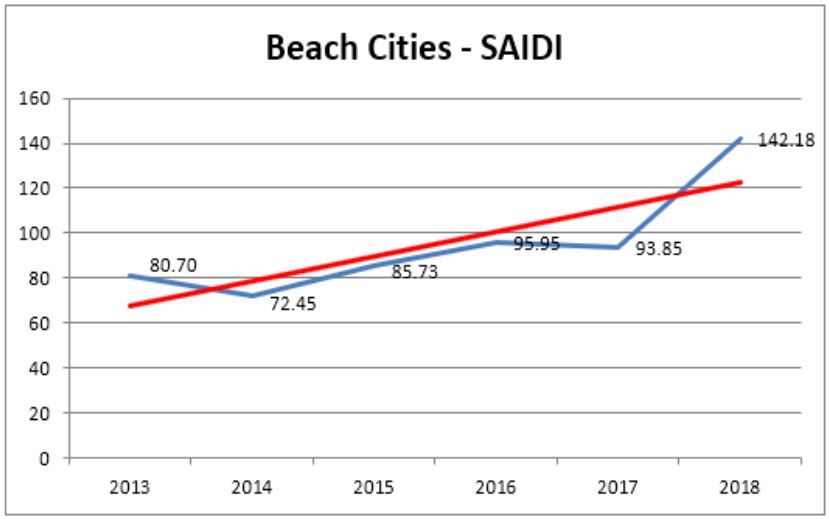


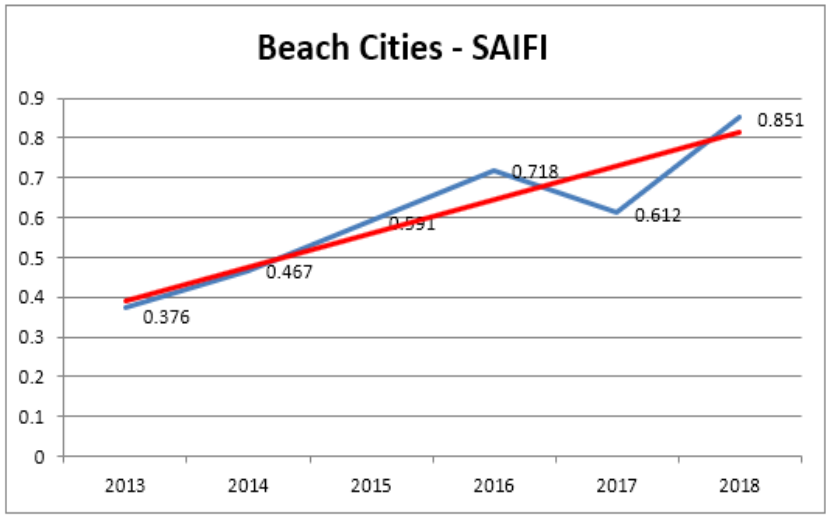


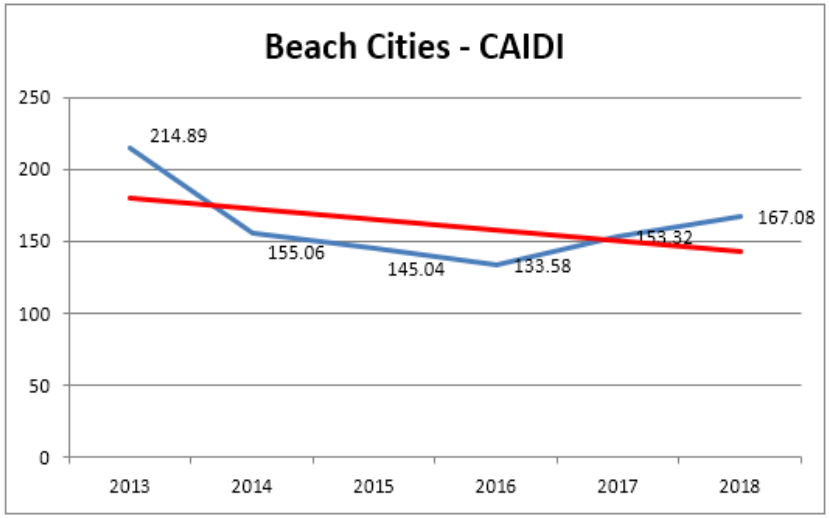


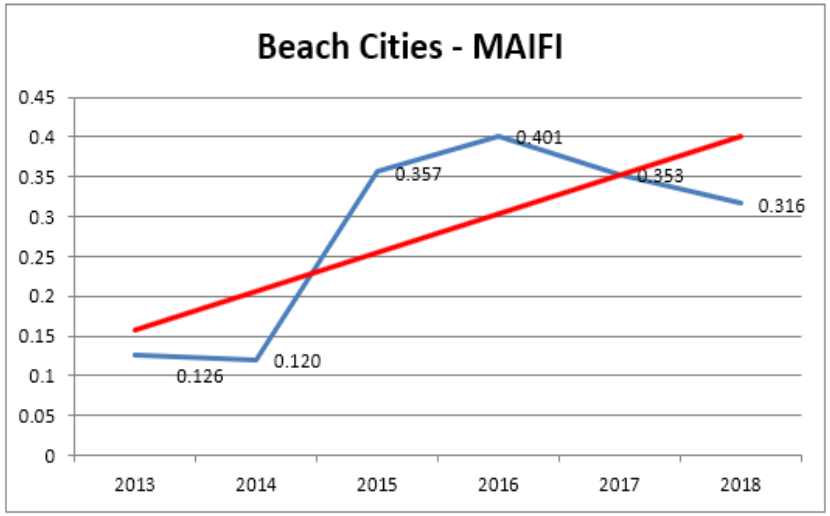


District Indices - Planned and Unplanned (Excludes ISO and MED)

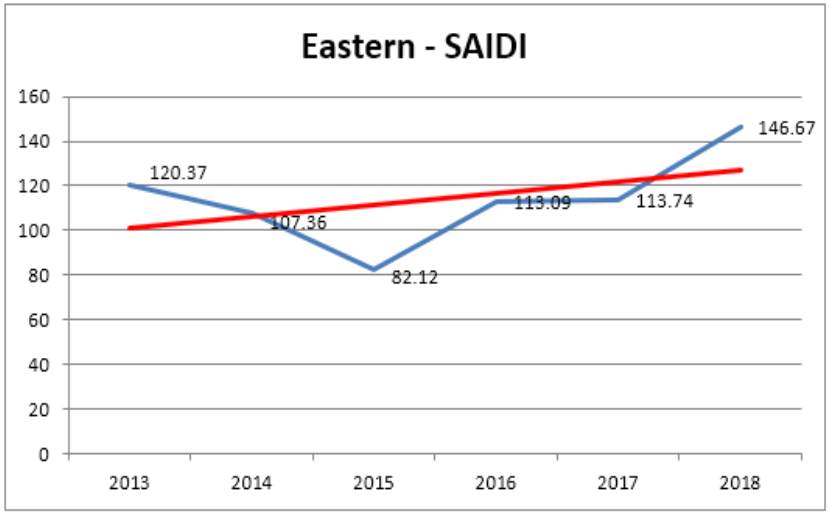


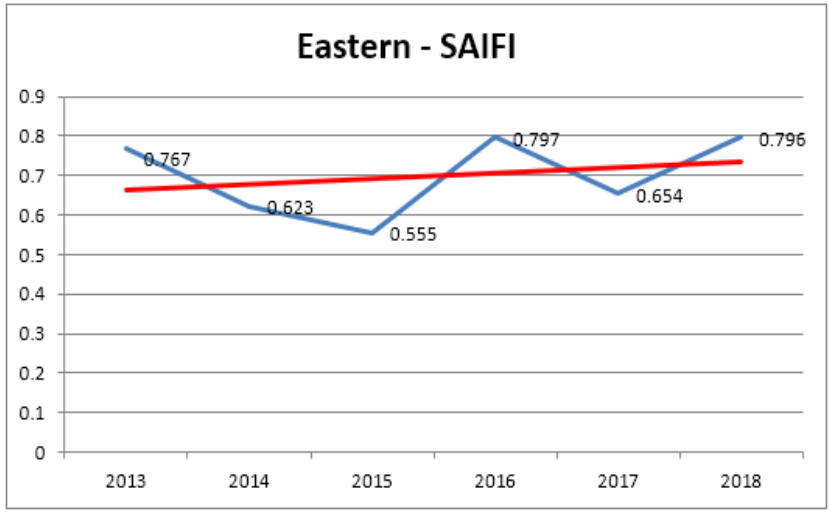


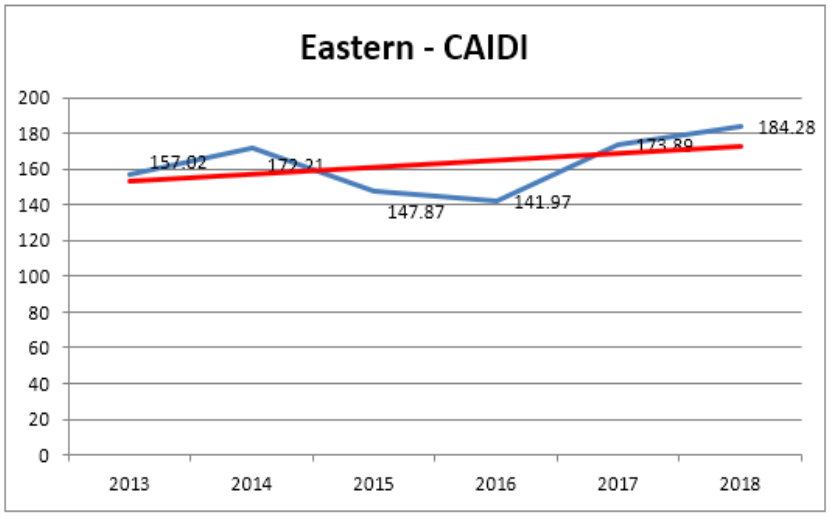


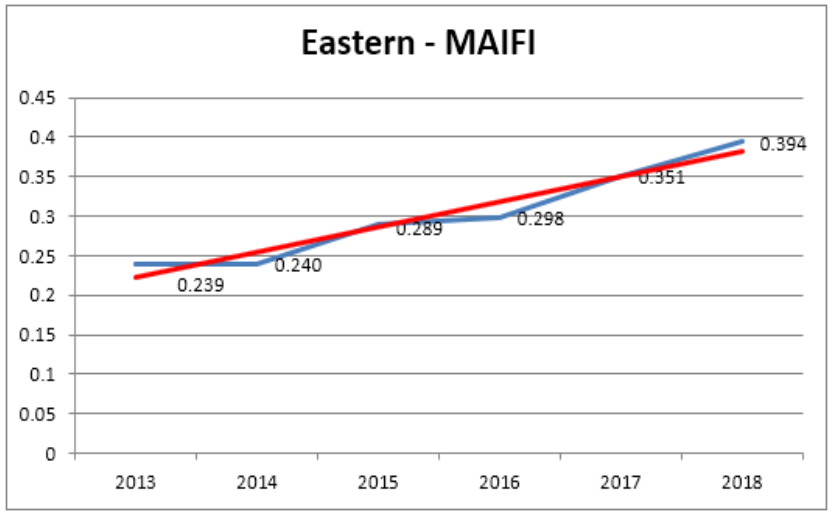


District Indices - Planned and Unplanned (Excludes ISO and MED)

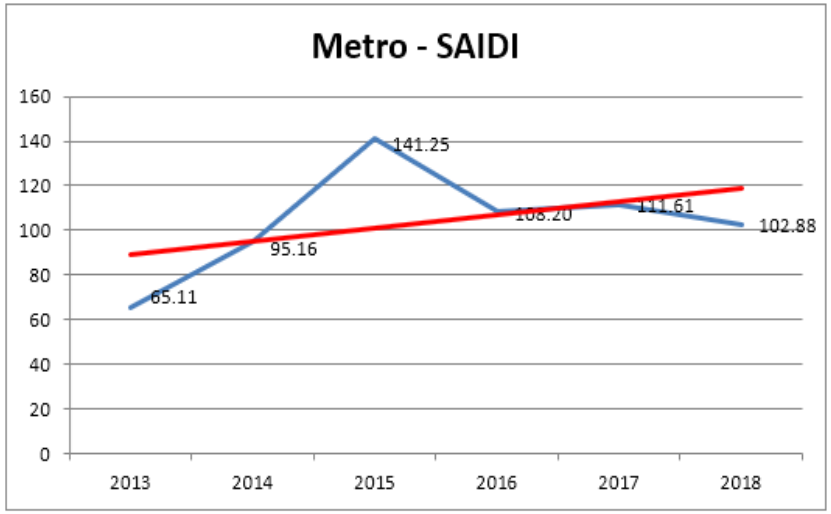


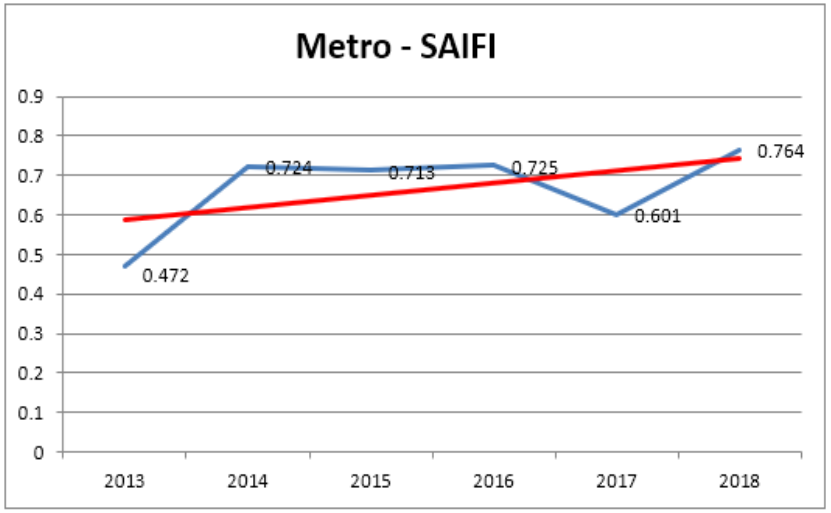


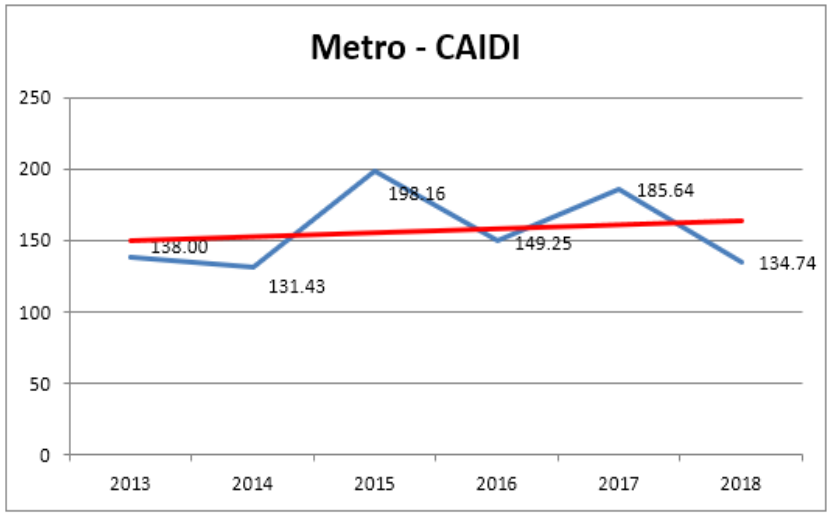


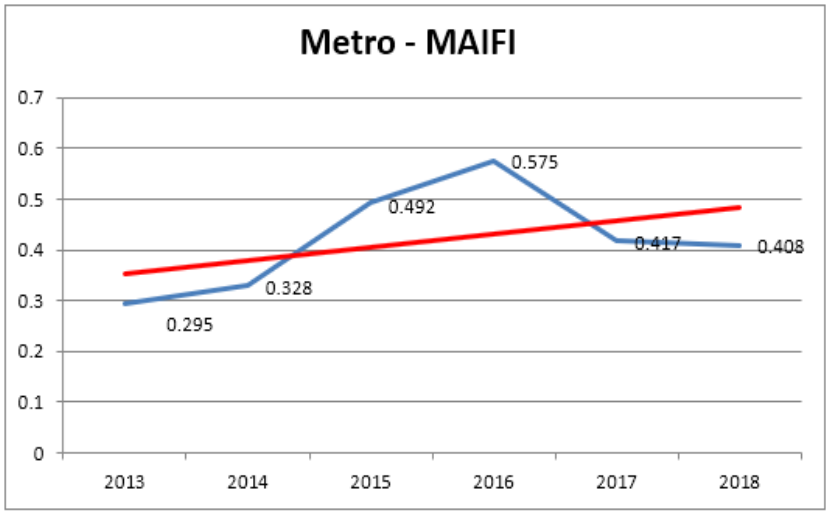


District Indices - Planned and Unplanned (Excludes ISO and MED)

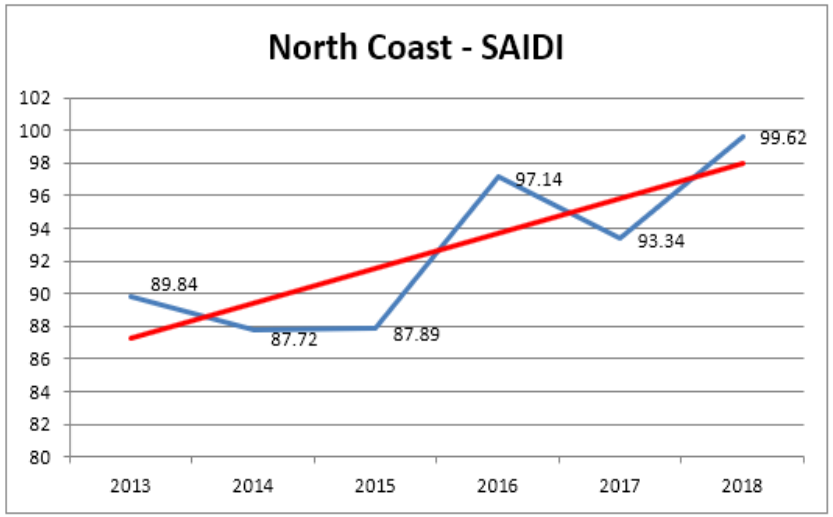


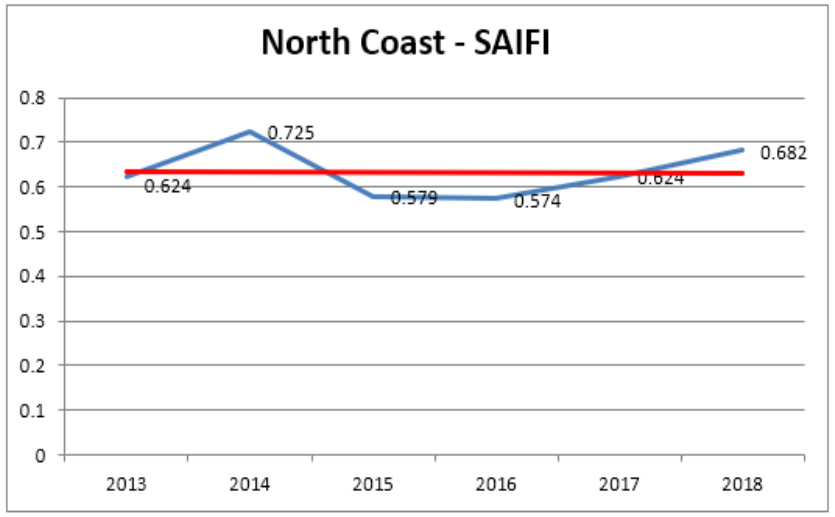


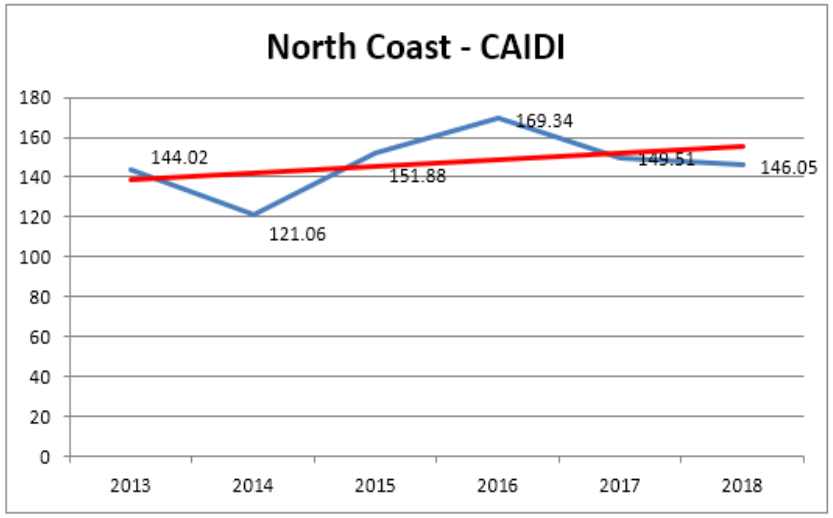


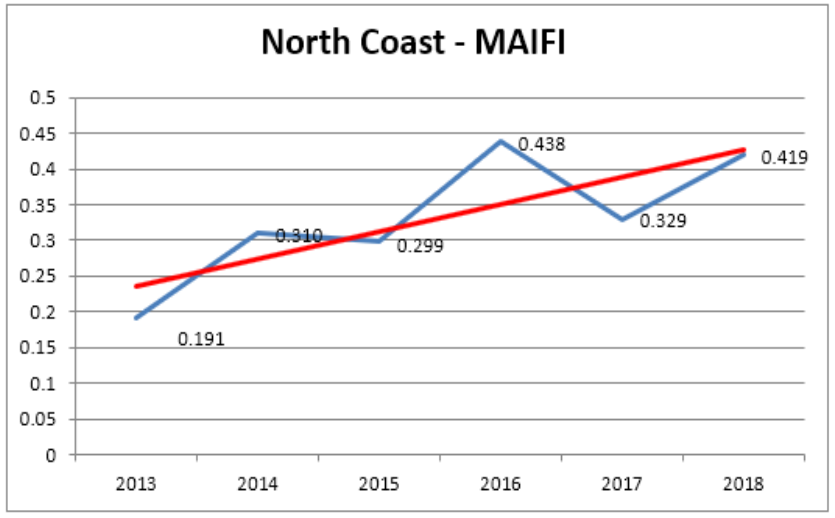


District Indices - Planned and Unplanned (Excludes ISO and MED)

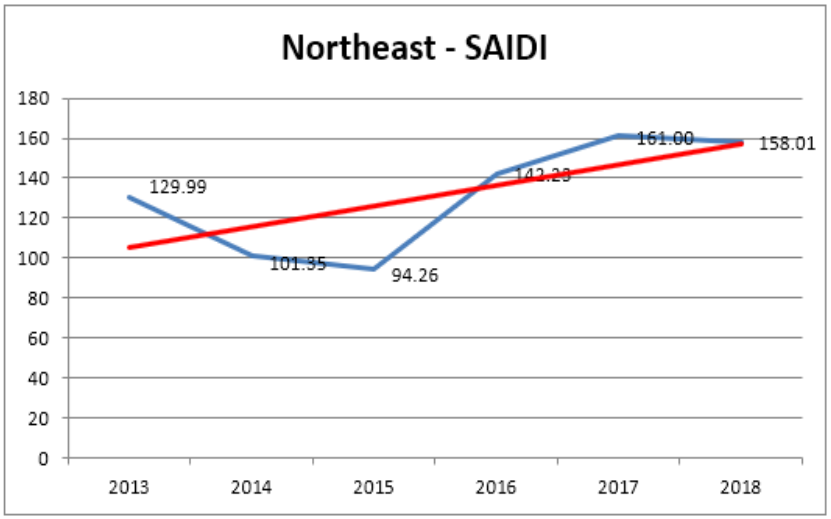


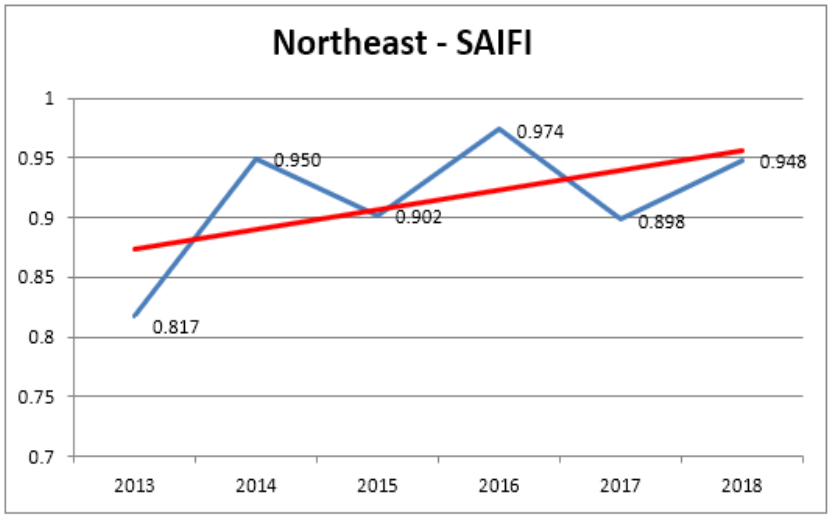


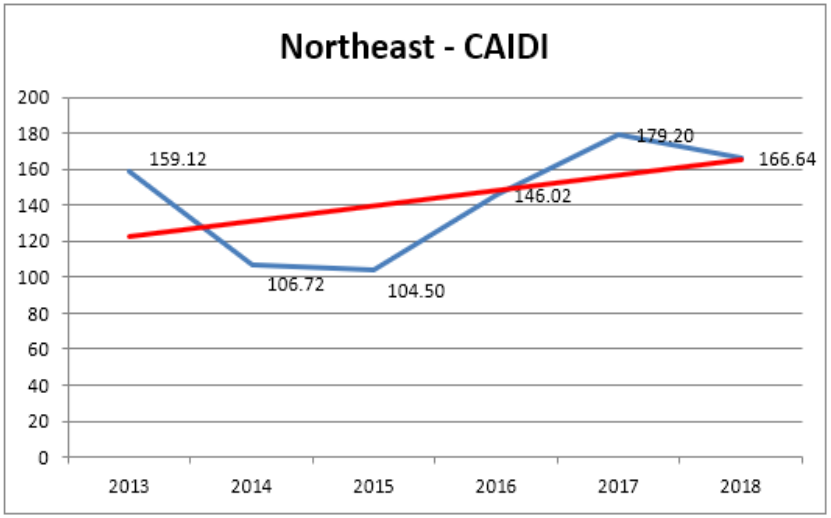


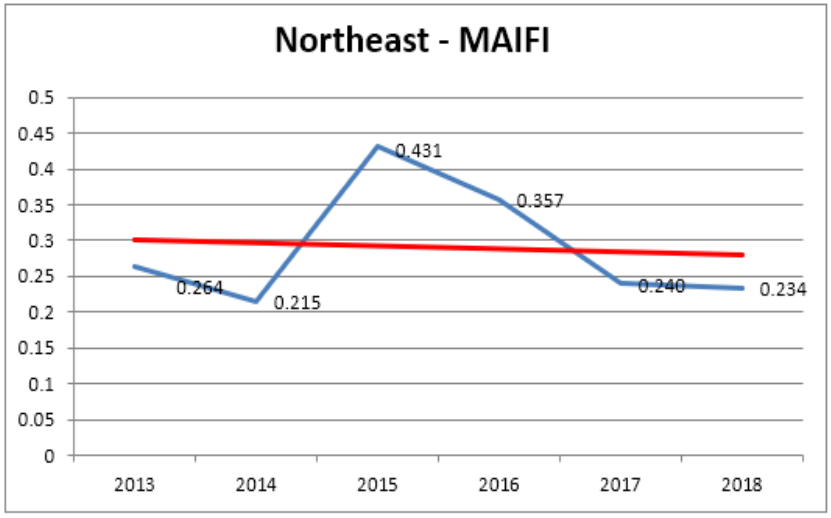


District Indices - Planned and Unplanned (Excludes ISO and MED)

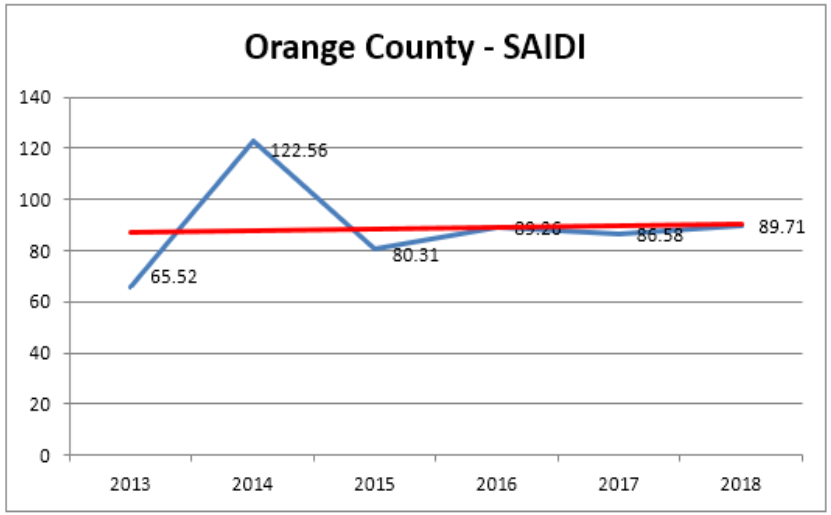


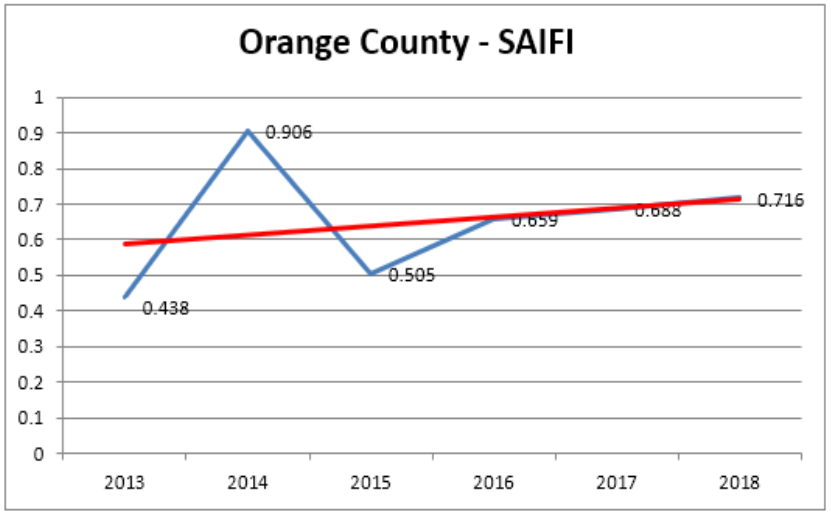


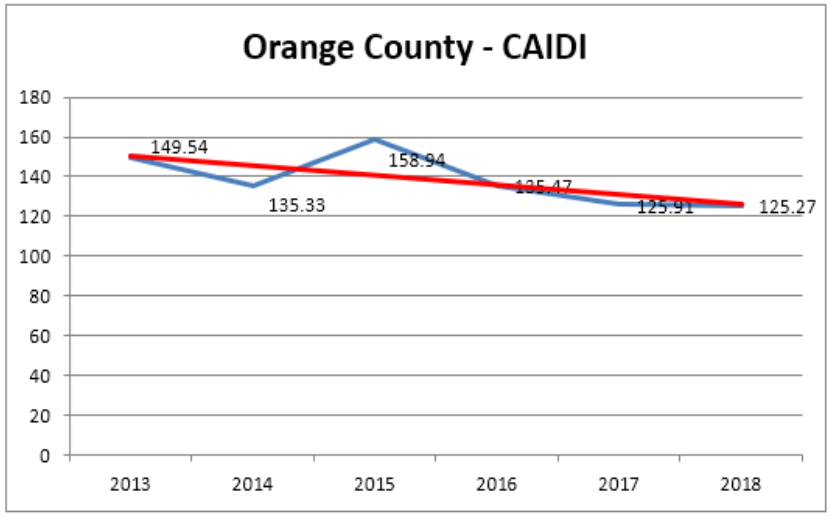


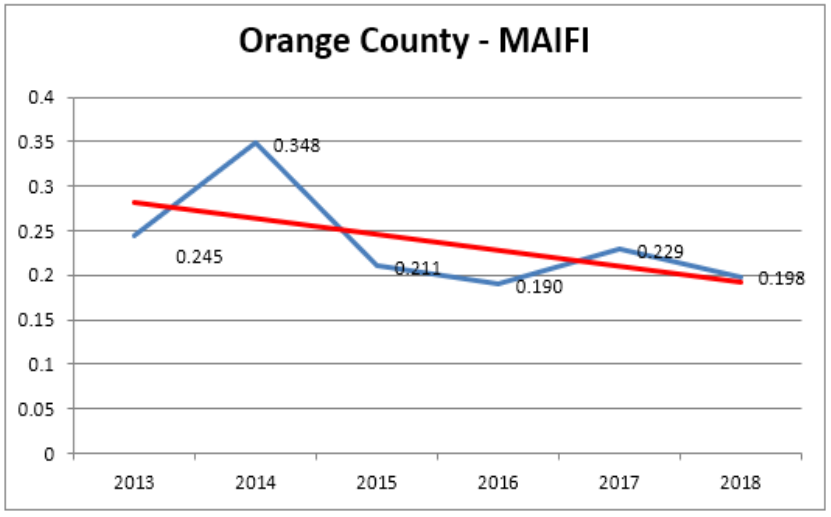


District Indices - Planned and Unplanned (Excludes ISO and MED)









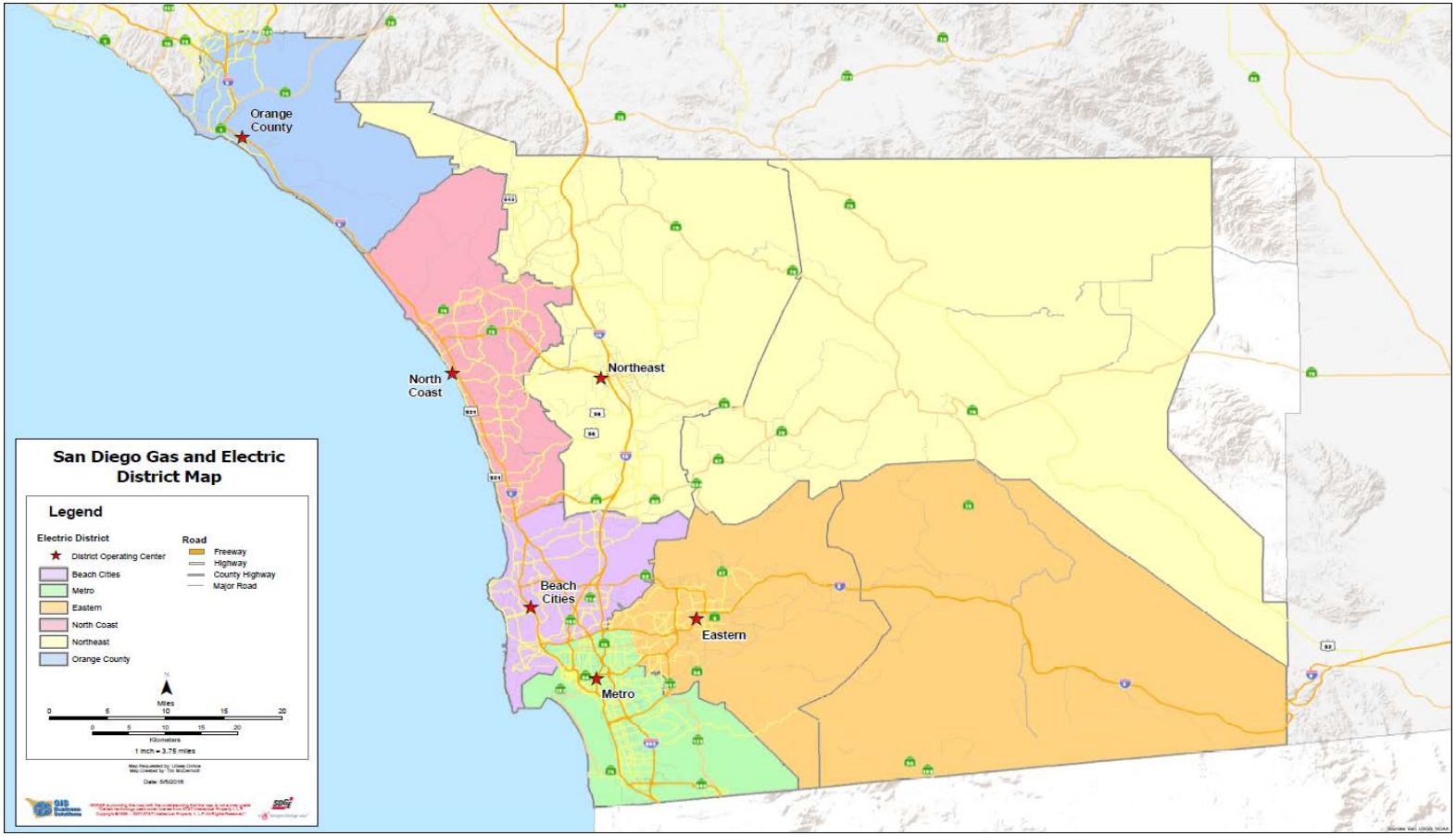
NUMBER, DATE AND LOCATION OF PLANNED OUTAGES IN EACH DISTRICT (2018)

Planned Outages – 2018						
Month	**Beach Cities**	**Eastern**	**Metro**	**North Coast**	**Northeast**	**Orange County**
January	26	52	37	27	94	31
February	30	46	32	35	92	24
March	42	48	45	43	134	26
April	26	38	33	35	130	26
May	37	37	27	44	95	25
June	28	27	37	38	107	25
July	16	22	19	29	94	12
August	22	22	27	63	118	27
September	21	50	29	23	91	25
October	35	55	33	31	59	11
November	34	47	17	19	40	7
December	13	49	18	16	56	3
Totals	**330**	**493**	**354**	**403**	**1110**	**242**

In 2018 there were 2932 primary planned outages

SECTION 4 – SERVICE TERRITORY MAP INCLUDING DIVISIONS OF DISTRICTS

MAP OF SERVICE TERRITORY WITH DIVISIONS OF DISTRICTS



SDG&E is providing this map with the understanding that the map is not survey grade.
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SECTION 5 – TOP 1% OF WORST PERFORMING CIRCUITS (WPC) EXCLUDING MED

TOP 1% OF WORST PERFORMING CIRCUITS (2017-2018)

a. Per the Decision, each utility shall include the following information in its annual report for each WPC: 1) Circuit Name; 2) District/Division; 3) Customer Count; 4) Substation name; 5) Circuit-miles; 6) Percentage underground, or "% UG"; 7) Percentage overhead or "% OH"; 8) Number of mainline/feeder/backbone outages resulting in the operation of either a circuit breaker ("CB") or automatic re-closer ("AR"); and, 9) its preferred reliability metric.

As required per the Decision, SDG&E is providing a table of WPCs based on the Circuit SAIDI indices (Table 5.1) and based upon the Circuit SAIFI indices (Table 5.2). Each of these indices is based on a two-year historical period[1].

Preferred Metric is Circuit SAIDI

[1] As stated in Section 3.2 of D.16-01-008, each utility shall use two or three years of data, at its discretion, to flag a grouping of worst performing circuits.

Table 5.1:
2018 Worst SAIDI Circuits List based upon 2017-2018 data (Excludes Planned and MED)

Circuit	District	Circuit Customers	Substation Name	Circuit Miles	% OH	% UG	Annualized Feeder Outage Count	Annualized Total Circuit SAIDI **
*1215	Eastern	154	CRESTWOOD	23.8	97%	3%	8	3863
*440	Eastern	266	GLENCLIFF	23.2	86%	14%	6	3824
*441	Eastern	106	GLENCLIFF	27.8	90%	10%	4	3550
445	Eastern	961	BOULEVARD	108.2	95%	5%	6	1411
CE1	Metro	141	CENTRAL	1.4	0%	100%	3	1215
*212	Northeast	662	WARNERS	118.4	96%	4%	5	1166
*78	Eastern	269	DESCANSO	14.9	85%	15%	3	1099
*220	Northeast	339	SANTA YSABEL	55.1	95%	5%	2	1033
*448	Eastern	999	CAMERON	87.4	94%	6%	4	1011
79	Eastern	879	DESCANSO	76.7	93%	7%	9	968

* Circuit appeared on the previous worst performance list

** Circuit SAIDI represents the 2-year average (2017-2018) of all outages: Mainline, Feeder, Backbone, and Branch

Preferred Metric is Circuit SAIDI. Based upon 2 Years data annualized.

Table 5.2:
2018 Worst SAIFI Circuits List based upon 2017-2018 data (Excludes Planned and MED)

Circuit	District	Circuit Customers	Substation Name	Circuit Miles	% OH	% UG	Annualized Feeder Outage Count	Annualized Total Circuit SAIFI **
*1215	Eastern	154	CRESTWOOD	23.8	97%	3%	8	6.1
*973	Northeast	1,352	CREELMAN	53.1	44%	56%	6	5.1
*440	Eastern	266	GLENCLIFF	23.2	86%	14%	6	4.5
*SL1	Northeast	227	SALTON	5.0	98%	2%	5	4.5
310	Orange County	4,706	LAGUNA NIGUEL	33.1	22%	78%	4	4.3
*221	Northeast	1,123	SANTA YSABEL	93.4	94%	6%	5	3.8
441	Eastern	106	GLENCLIFF	27.8	90%	10%	4	3.7
*OK1	Northeast	255	OAKS 1	12.5	99%	1%	4	3.4
442	Eastern	861	GLENCLIFF	33.1	86%	14%	5	3.2
73	Eastern	764	DESCANSO	57.5	93%	7%	4	3.0

* Circuit appeared on the previous worst performance list

** Circuit SAIFI represents the 2-year average (2017-2018) of all outages: Mainline, Feeder, Backbone, and Branch

Preferred Metric is Circuit SAIDI. Based upon 2 Years data annualized.

b. Any circuit appearing on this list of “deficient” WPC circuits that also appeared on the previous year's list would be marked by an asterisk. For each asterisked circuit, each utility shall provide the following information:

Circuit 1215

i. An explanation of why it was ranked as a "deficient" circuit, i.e., the value of the metric used to indicate its performance;

C1215 was listed as a worst circuit due to circuit SAIDI and SAIFI performance.

ii. A historical record of the metric:

C1215: 2 Year Circuit SAIDI and SAIFI Data

Cir	Metric	2017	2018
1215	Circuit SAIDI	1669	6057
1215	Circuit SAIFI	6.4	5.9

Note: See methodology in section 5c

iii. An explanation of why it was on the deficiency list again;

C1215 was on the worst circuit SAIDI list largely due to the effects of Public Safety Power Shutoff (PSPS), which contributed to 75% of the circuit SAIDI over the last 2-years. The circuit is also on the worst circuit SAIFI list. The largest cause of SAIFI impact is utility caused wildfire mitigation including PSPS events and relaying designed to isolate system issues faster before they can lead to fire ignition. These mitigation measures account for approximately 42% of the 2-year SAIFI impact. The remaining 58% of SAIFI impacts can be attributed to electric equipment failures, animal contacts with overhead power lines, and wind/lightning events.

iv. An explanation of what is being done to improve the circuit's future performance and the anticipated timeline for completing those activities (or an explanation why remediation is not being planned); and

Over the next 2 years, SDG&E’s Fire Risk Mitigation project (FiRM) seeks to replace small conductor infrastructure on this circuit. The work will increase spacing to reduce the chance of incidental foreign object contact with the energized lines and also reduce the instances of downed wires due to infrastructure failure.

v. A quantitative description of the utility's expectation for that circuit's future performance.

Fire hardening efforts will renew infrastructure and reduce the likelihood of wire down caused outages, leading to improved circuit performance. Since wire down events are still relatively rare, reliability modeling and quantitative reliability analysis provides marginal benefits for this failure mode. Replacement of aging infrastructure will reduce the instances of equipment caused failures, but these benefits were not quantified as the projects were predicated on public health and safety improvements.

Circuit 440

i. An explanation of why it was ranked as a "deficient" circuit, i.e., the value of the metric used to indicate its performance;

C440 was listed as a worst circuit due to circuit SAIDI and SAIFI performance.

ii. A historical record of the metric:

C440: 2 Year Circuit SAIDI and SAIFI Data

Cir	Metric	2017	2018
440	Circuit SAIDI	814	6835
440	Circuit SAIFI	3.8	5.2

Note: See methodology in section 5c

iii. **An explanation of why it was on the deficiency list again**;

C440 was on the worst circuit SAIDI list, largely due to the effects of Public Safety Power Shutoff (PSPS), which contributed to 72% of the circuit SAIDI over the last 2-years. The circuit is also on the worst circuit SAIFI list. External forces such as lightning and animal contacts with overhead power lines account for 43% of the circuit SAIDI impacts, 32% are caused by equipment failure, and 26% are due to wildfire mitigation measures including PSPS events and relaying designed to isolate system issues faster before they can lead to fire ignition.

iv. An explanation of what is being done to improve the circuit's future performance and the anticipated timeline for completing those activities (or an explanation why remediation is not being planned); and

The Cleveland National Forest project (CNF) project will rebuild most of C440 with fire hardened structures and a large section will be undergrounded. The project is ongoing through 2020.

v. A quantitative description of the utility's expectation for that circuit's future performance.

Fire hardening efforts will renew infrastructure and reduce the likelihood of wire down caused outages, leading to improved circuit performance. Since wire down events are still relatively rare, reliability modeling and quantitative reliability analysis provides marginal benefits for this failure mode. Replacement of aging infrastructure will reduce the instances of equipment caused failures, but these benefits were not quantified as the projects were predicated on public health and safety improvements. Additionally, undergrounding of overhead power lines will eliminate instances of storm and animal contact driven outages in the portions of the circuit planned for undergrounding.

Circuit 441

i. An explanation of why it was ranked as a "deficient" circuit, i.e., the value of the metric used to indicate its performance;

C441 was listed as a worst circuit due to circuit SAIDI performance.

ii. A historical record of the metric:

C441: 2 Year Circuit SAIDI Data

Cir	Metric	2017	2018
441	Circuit SAIDI	2101	5000

Note: See methodology in section 5c

iii. An explanation of why it was on the deficiency list again;

C441 was on the worst circuit SAIDI list largely due to the effects of Public Safety Power Shutoff (PSPS), which contributed to 92% of the circuit SAIDI over the last 2-years.

iv. An explanation of what is being done to improve the circuit's future performance and the anticipated timeline for completing those activities (or an explanation why remediation is not being planned); and

Over the next 2 years, SDG&E's Fire Risk Mitigation project (FiRM) seeks to replace small conductor infrastructure on this circuit. The work will increase spacing to reduce the chance of incidental foreign object contact with the energized lines and also reduce the instances of downed wires due to infrastructure failure.

v. A quantitative description of the utility's expectation for that circuit's future performance.

Fire hardening efforts will not prevent the effects of operational mitigation necessary to prevent wildfire ignitions and therefore the circuit SAIDI is expected to continue to follow past performance.

Circuit 212

i. An explanation of why it was ranked as a "deficient" circuit, i.e., the value of the metric used to indicate its performance;

C448 was listed as a worst circuit due to circuit SAIDI performance.

ii. A historical record of the metric:

C212: 2 Year Circuit SAIDI Data

Cir	Metric	2017	2018
212	Circuit SAIDI	2303	28

Note: See methodology in section 5c

iii. An explanation of why it was on the deficiency list again;

C212 was on the worst circuit SAIDI list largely due to the effects of Public Safety Power Shutoff (PSPS), which contributed to 83% of the circuit SAIDI over the last 2-years.

iv. An explanation of what is being done to improve the circuit's future performance and the anticipated timeline for completing those activities (or an explanation why remediation is not being planned); and

Over the next 2 years, SDG&E's Fire Risk Mitigation project (FiRM) seeks to replace small conductor infrastructure on this circuit. The work will increase spacing to reduce the chance of incidental foreign object contact with the energized lines and also reduce the instances of downed wires due to infrastructure failure.

v. A quantitative description of the utility's expectation for that circuit's future performance.

Fire hardening efforts will not prevent the effects of operational mitigation necessary to prevent wildfire ignitions and therefore the circuit SAIDI is expected to continue to follow past performance.

Circuit 78

i. An explanation of why it was ranked as a "deficient" circuit, i.e., the value of the metric used to indicate its performance;

C78 was listed as a worst circuit due to circuit SAIDI performance.

ii. A historical record of the metric:

C78: 2 Year Circuit SAIDI Data

Cir	Metric	2017	2018
78	Circuit SAIDI	1717	482

Note: See methodology in section 5c

iii. An explanation of why it was on the deficiency list again;

C78 was on the worst circuit SAIDI list largely due to the effects of Public Safety Power Shutoff (PSPS), which contributed to 64% of the circuit SAIDI over the last 2-years. Approximately 27% of the 2-year circuit SAIDI was also caused by a combination of animal contacts with overhead power lines and storms.

iv. An explanation of what is being done to improve the circuit's future performance and the anticipated timeline for completing those activities (or an explanation why remediation is not being planned); and

SDG&E has already invested in replacing small wire on this circuit, which also increased spacing to reduce the chance of incidental foreign object contact with the energized lines and also reduce the instances of wire downs. No further work is planned at this time.

v. A quantitative description of the utility's expectation for that circuit's future performance.

Fire hardening efforts will not prevent the effects of operational mitigation necessary to prevent wildfire ignitions and therefore the circuit SAIDI is expected to continue to follow past performance.

Circuit 220

i. An explanation of why it was ranked as a "deficient" circuit, i.e., the value of the metric used to indicate its performance;

C220 was listed as a worst circuit due to circuit SAIDI and SAIFI performance.

ii. A historical record of the metric:

C220: 2 Year Circuit SAIDI and SAIFI Data

Cir	Metric	2017	2018
220	Circuit SAIDI	1600	466

Note: See methodology in section 5c

iii. An explanation of why it was on the deficiency list again;

C220 was on the worst circuit SAIDI list largely due to the effects of Public Safety Power Shutoff (PSPS) and other electric infrastructure fire prevention measures, such as requiring daytime visual patrols prior to re-energizing lines. These measures contributed to 93% of the circuit SAIDI over the last 2-years.

iv. An explanation of what is being done to improve the circuit's future performance and the anticipated timeline for completing those activities (or an explanation why remediation is not being planned); and

Over the next 2 years, SDG&E's Fire Risk Mitigation project (FiRM) seeks to replace small conductor infrastructure on this circuit. The work will increase spacing to reduce the chance of incidental foreign object contact with the energized lines and also reduce the instances of downed wires due to infrastructure failure.

v. A quantitative description of the utility's expectation for that circuit's future performance.

Fire hardening efforts will not prevent the effects of operational mitigation necessary to prevent wildfire ignitions and therefore the circuit SAIDI is expected to continue to follow past performance.

Circuit 448

i. An explanation of why it was ranked as a "deficient" circuit, i.e., the value of the metric used to indicate its performance;

C448 was listed as a worst circuit due to circuit SAIDI performance.

ii. A historical record of the metric:

C448: 2 Year Circuit SAIDI Data

Cir	Metric	2017	2018
448	Circuit SAIDI	1635	386

Note: See methodology in section 5c

iii. An explanation of why it was on the deficiency list again;

C448 was on the worst circuit SAIDI list largely due to the effects of Public Safety Power Shutoff (PSPS), which contributed to 74% of the circuit SAIDI over the last 2-years.

iv. An explanation of what is being done to improve the circuit's future performance and the anticipated timeline for completing those activities (or an explanation why remediation is not being planned); and

Minimal work is planned for C448 in replacing small conductor on this circuit. The work will increase spacing to reduce the chance of incidental foreign object contact with the energized lines and also reduce the instances of downed wire due to infrastructure failure.

v. A quantitative description of the utility's expectation for that circuit's future performance.

Fire hardening efforts will not prevent the effects of operational mitigation necessary to prevent wildfire ignitions and therefore the circuit SAIDI is expected to continue to follow past performance.

Circuit 973

i. An explanation of why it was ranked as a "deficient" circuit, i.e., the value of the metric used to indicate its performance;

C973 was listed as a worst circuit due to circuit SAIFI performance.

ii. A historical record of the metric:

C973: 2 Year Circuit SAIFI Data

Cir	Metric	2017	2018
973	Circuit SAIFI	7.9	2.2

Note: See methodology in section 5c

iii. An explanation of why it was on the deficiency list again;

Circuit 973 is on the worst circuit SAIFI list. The largest cause of SAIFI impact is utility caused wildfire mitigation including PSPS events and relaying designed to isolate system issues faster before they can lead to fire ignition. These mitigation measures account for approximately 58% of the 2-year SAIFI impact. 41% of SAIFI impacts can be attributed to electric equipment failures.

iv. An explanation of what is being done to improve the circuit's future performance and the anticipated timeline for completing those activities (or an explanation why remediation is not being planned); and

No mitigation is planned at this time, but future replacement of small conductor is being considered.

v. A quantitative description of the utility's expectation for that circuit's future performance.

The circuit will continue to perform consistent with past performance.

Circuits 221 / OK1 / SL1

i. An explanation of why it was ranked as a "deficient" circuit, i.e., the value of the metric used to indicate its performance;

C221 was listed as a worst circuit due to circuit SAIFI performance. OK1 and SL1 are 4kV circuits fed from circuit 221, and all impacts on these circuits listed are directly caused by loss of power on the C221 feed. For this reason, these circuits are being treated as a part of C221 for this analysis.

ii. A historical record of the metric:

2 Year Circuit SAIFI Data

CIR	Metric	2017	2018
221	Circuit SAIFI	5.1	2.5
OK1	Circuit SAIFI	4.9	1.8
SL1	Circuit SAIFI	5.0	4.0

Note: See methodology in section 5c

iii. An explanation of why it was on the deficiency list again;

Circuit 221 is on the worst circuit SAIFI list. The largest cause of SAIFI impact is equipment failure on the electric system, which accounts for approximately 55% of the SAIFI impact. Storms, foreign object contacts, and animal contacts with overhead power lines contribute to approximately 30% of SAIFI. Wildfire mitigation including PSPS events and relaying designed to isolate system issues faster before they can lead to fire ignition account for a 14% SAIFI impact.

iv. An explanation of what is being done to improve the circuit's future performance and the anticipated timeline for completing those activities (or an explanation why remediation is not being planned); and

SDG&E has completed fire hardening of the circuit by replacing small wire on C221. This includes replacement of roughly one-third of the wire spans and poles on the circuit with new structures. Additionally, SDG&E cutover a small portion of the 4kV on circuit MAN1 to 12kV and cutover the rest of the MAN1 circuit to OK1, eliminating the circuit altogether.

v. A quantitative description of the utility's expectation for that circuit's future performance.

Circuit 221 saw a 37% reduction in SAIDI impact between 2017 and 2018. Fire Hardening efforts were completed during this timeframe and future expected SAIFI performance can be expected to track to the 2018 year-end results.

c. Language to explain how the IOUs' include a cost effectiveness review as part of their respective internal review processes for circuit remediation projects.

i. Definitions of terms, acronyms, limitations, and assumptions;

Definitions:

RAT - Reliability Assessment Team

WPC- Worst Performing Circuits

Assumptions

Our analysis excludes planned outages, MED outages, and circuits with less than 100 customers for WPC calculation.

ii. A clear explanation of the utility's process to determine the worst performing circuits:

Methodology used in the Annual Reliability Report

The Worst Performing Circuits identified in this Report are determined by first calculating the SAIDI for each circuit based upon the previous two years of unplanned outage data, ranking those circuits highest to lowest based upon the SAIDI value, and then selecting the 1% of the circuits with the highest SAIDI value. Planned and MED events are excluded, and circuits with less than 100 customers are also excluded. SDG&E had 1045 circuits in 2018, so this report reflects the ten WPCs.

iii. A clear explanation of the utility's process to determine cost-effective remediation projects. This shall include why the utility may decide to implement a project to address one worst performing circuit issue while deciding to not implement a project to address a different worst performing circuit.

SDG&E established an internal Reliability Assessment Team (RAT) in 1997 with the charge to identify ways to improve the service reliability of our distribution system. This team is comprised of technical leaders from Distribution Operations, Engineering Standards, Regional Operations, System Protection, and Distribution Asset Management. The Reliability Assessment Team meets regularly to evaluate and authorize reliability improvement projects for areas with low circuit reliability and where customer satisfaction issues arise. The team provides strategy and guidance for continuous improvements to system reliability, integrated planning support, and budget management.

District engineers present proposals for reliability improvement projects along with a circuit analysis, cost-benefit analysis, and details on customer impact. SDG&E has implemented a practice to identify projects to be reviewed and approved by an engineering committee, and then prioritized based on the largest benefit to cost ratio to ensure the projects that create the largest proportional system benefit are realized first.

In 2018, the Reliability Assessment Team approved a number of circuit improvement projects in addition to monitoring budgets, reviewing new equipment and assisting various work groups with operational issues. Ongoing RAT initiatives include:

- Reduction in the number of customers between sectionalizing devices
- SCADA automation expansion initiatives for 12 kV circuits
- Utilization of Branch Cable Replacement Analysis Model and Circuit Reliability Analysis Model

The Reliability Assessment Team continues to coordinate activities with various stakeholders in order to optimize capital investment risk reduction activities.

SECTION 6 – TOP 10 MAJOR UNPLANNED POWER OUTAGE EVENTS WITHIN A REPORTING YEAR

TOP 10 MAJOR UNPLANNED OUTAGE EVENTS (2018)

The table below captures the top 10 major unplanned outage events for 2018 including the cause and the location of the outage.

Top 10 Major Unplanned Power Outage Events						
Rank	**Outage Date**	**Cause**	**Location**	**Customer Impact**	**SAIDI**	**SAIFI**
1	11/11/2018	High Winds / RFW spanning multiple days	CM, EA, NC, NE	35481	43.98	0.024
2	1/31/2018	Substation - Bushings	CM, EA	29338	2.55	0.020
3	10/12/2018	Lightning Storm	BC, EA, NC, NE	20002	1.23	0.014
4	4/20/2018	Substation - Animal Contact	BC	15554	0.75	0.011
5	5/26/2018	Substation - Jumper	CM	12601	0.72	0.009
6	12/6/2018	Faulted Recloser	CM, EA, NE, OC	12070	1.27	0.008
7	1/25/2018	Substation - Animal Contact	NC	11683	0.48	0.008
8	11/30/2018	Substation - Equipment	CM	8506	0.53	0.006
9	11/7/2018	Gas hazard - Circuits de-energized for safety	NC	6992	0.40	0.005
10	1/9/2018	Rain Storm	All Districts	6286	0.64	0.004

Based upon customer impact

SECTION 7 – SUMMARY LIST OF MED PER IEEE 1366

2018 SUMMARY LIST OF MED (2018)

The tables below summarize the two MED events occurring in 2018. The information includes the number of customers without services at periodic intervals, the cause and the location of the Major Event.

Table 7-1 2018 Summary List of 11/12/18 MED

Date of Outage	Description of Outage	Location	Number of Customers Out of Service	Customers Interrupted - Hours Into the Event Day *								
				0	2	4	6	8	10	12	14	16
November 12	Winds / RFW	BC, CM EA, NC, NE	23,883	0	0	2	1813	7179	10950	15210	18443	11788
				Customers Interrupted - Hours Into the Event Day (continued)								
				18	20	22	24	26	28	30	32	34
				10887	9890	11940	11940	11746	11746	11746	11746	11746
				Customers Interrupted - Hours Into the Event Day (continued)								
				36	38	40	42	44	46	48	50	52
				11212	11212	10942	9529	9121	9121	9121	9121	9121
				Customers Interrupted - Hours Into the Event Day (continued)								
				54	56	58	60	62	64	66	68	70
				9121	9121	9121	9121	8577	6462	4886	4569	3957
				Customers Interrupted - Hours Into the Event Day (continued)								
				72	74	76	78	80	82	84	86	88
				3319	3319	3319	3319	3319	3273	2855	1705	1404
				Customers Interrupted - Hours Into the Event Day (continued)								
				90	92	94	96	98	100			
				712	3	3	3	3	0			

Customers reflected in the time increments include all customers experiencing sustained outages at that point in time. The event day begins at midnight.

Table 7-2 2018 Summary List of 11/13/18 MED

Date of Outage	Description of Outage	Location	Number of Customers Out of Service	Customers Interrupted - Hours Into the Event Day *								
				0	1	2	3	4	5	6	7	8
November 13	Winds / RFW	CM, EA, NC, NE	20,370	0	0	0	0	32	2039	6788	9867	14609
				Customers Interrupted - Hours Into the Event Day (continued)								
				9	10	11	12	13	14	15	16	17
				17828	18748	18840	18840	16807	17124	16732	16283	13919
				Customers Interrupted - Hours Into the Event Day (continued)								
				18	19	20	21	22	23	24	25	26
				12644	9939	8031	7876	7886	7871	6493	6493	6493
				Customers Interrupted - Hours Into the Event Day (continued)								
				27	28	29	30	31	32	33	34	35
				6492	6492	6492	6492	6492	6492	6492	6432	6420
				Customers Interrupted - Hours Into the Event Day (continued)								
				36	37	38	39	40	41	42	43	44
				5570	5295	3279	2378	1782	921	800	800	786
				Customers Interrupted - Hours Into the Event Day (continued)								
				45	46	47	48	49	50	51	52	53
				786	786	786	786	786	786	786	786	786
				Customers Interrupted - Hours Into the Event Day (continued)								
				54	55	56	57	58	59	60	61	62
				786	786	786	786	636	636	636	629	497
				Customers Interrupted - Hours Into the Event Day (continued)								
				63								
				0								

Customers reflected in the time increments include all customers experiencing sustained outages at that point in time. The event day begins at midnight.

SECTION 8 – HISTORICAL 10 LARGEST UNPLANNED OUTAGES EVENTS FOR THE PAST 10 YEARS

HISTORICAL LARGEST UNPLANNED OUTAGE EVENTS (2009-2018)

The tables below capture the ten largest unplanned outage events for each of the years from 2018 – 2009 based on SAIDI values

2018

Historical 10 Largest Unplanned Outage Events				
Rank	**Date**	**SAIDI**	**SAIFI**	**Description**
1	11/11/2018	43.98	0.024	High Winds / RFW spanning multiple days
2	1/28/2018	3.87	0.003	High Wind Event
3	1/31/2018	2.55	0.020	Substation - Bushings
4	7/6/2018	1.66	0.002	Brush Fire
5	11/12/2018	1.37	0.001	Substation - Undetermined Cause
6	12/6/2018	1.27	0.008	Faulted Recloser
7	10/12/2018	1.23	0.014	Lightning Storm
8	7/7/2018	1.12	0.003	Vehicle Contact
9	2/25/2018	1.06	0.004	Tee Failure
10	9/13/2018	0.96	0.004	Switch Failure

2017

Historical 10 Largest Unplanned Outage Events				
Rank	**Date**	**SAIDI**	**SAIFI**	**Description**
1	12/7/2017	18.32	0.023	High Wind Event
2	1/20/2017	11.48	0.030	Rain Storm Event
3	12/7/2017	9.65	0.003	Lilac FIRE
4	12/9/2017	6.82	0.004	High Wind Event
5	12/6/2017	4.86	0.002	High Wind Event
6	12/5/2017	4.77	0.010	High Wind Event (over multiple days)
7	7/25/2017	1.93	0.031	STATION F outage - squirrel
8	2/27/2017	1.12	0.003	Rain Storm Event
9	1/20/2017	1.07	0.001	C941 - Deenergized for safety/transformer
10	2/17/2017	1.07	0.009	Rain Storm Event

2016

Historical 10 Largest Unplanned Outage Events				
Rank	**Date**	**SAIDI**	**SAIFI**	**Description**
1	1/31/2016	13.35	0.061	1/31-2/1 El Niño Storm
2	7/21/2016	1.15	0.012	Station F – Mylar Balloon on Circuit 366
3	1/31/2016	0.99	0.003	Circuit 486 – Tree in primary
4	8/9/2016	0.93	0.002	Genesee Sub – Circuits 268 & 65
5	7/26/2016	0.88	0.002	Circuit 582 – Wire Down, faulted cable, blown switch
6	6/19/2016	0.87	0.001	Border Fire – Circuits 448 & 157
7	8/23/2016	0.84	0.003	Transmission Lines 6926 & 681 – car contact
8	11/12/2016	0.83	0.001	Circuit 198 – Pendleton Aircraft Contact
9	1/5/2016	0.80	0.011	El Niño Storm – 1/5-1/7
10	6/26/2016	0.77	0.001	Circuit RD@ - Vehicle contact w/ Trayer switch

2015

Historical 10 Largest Unplanned Outage Events				
Rank	**Date**	**SAIDI**	**SAIFI**	**Description**
1	9/20/2015	5.15	0.089	9/20 Load Curtailment
2	7/18/2015	2.26	0.016	July 18-20 Rain Storm
3	11/25/2015	1.75	0.010	Transmission Lines 641 & 642 - Montgomery Sub Outage
4	7/3/2015	1.00	0.006	Circuits 366 & BRM1 Outage
5	8/13/2015	0.67	0.001	Circuit 438 - Faulted Tee
6	4/18/2015	0.64	0.002	Circuit 821 - Tee Failure
7	9/15/2015	0.60	0.006	Circuits 1049 & 167 - Car contact w/ fuse cab
8	9/12/2015	0.59	0.003	Circuit 255 - Wire Down
9	9/9/2015	0.49	0.004	Circuit 287 - Blowing tees
10	5/12/2015	0.47	0.003	Circuit 952 - Vehicle Contact

2014

Historical 10 Largest Unplanned Outage Events				
Rank	**Date**	**SAIDI**	**SAIFI**	**Description**
1	5/13/2014	9.73	0.036	May 13 through May 18 Wind and Fire Storm
2	9/14/2014	5.30	0.018	September 14 through September 17 Heat/Rain Storm
3	4/29/2014	3.59	0.014	April 29 through May 1 Wind Storm
4	11/15/2014	2.16	0.033	Station F Substation Outage - Bank 30, 31 & 32
5	2/28/2014	1.23	0.008	February 28, 2014 Rain Storm
6	5/31/2014	0.95	0.004	Circuits 792 & 795 Exceeding 500,000 Customer Minutes
7	6/15/2014	0.90	0.004	Circuits 545 and BP1 Exceeding 500,000 Customer Minutes
8	3/9/2014	0.80	0.004	Circuit 460 Exceeding 500,000 Customer Minutes
9	11/22/2014	0.68	0.003	Circuits 362 - Cable Failure
10	1/12/2014	0.66	0.003	Circuit 163 - Exceeding 500,000 Customer Minutes

2013

Historical 10 Largest Unplanned Outage Events				
Rank	**Date**	**SAIDI**	**SAIFI**	**Description**
1	7/18/2013	14.85	0.087	Orange County Transmission Outage
2	9/3/2013	3.26	0.018	Heat and Rain Storm - Sept 3 through Sept 8
3	4/8/2013	1.76	0.002	Transmission Line 687 - De-energized for safety, poles down
4	12/26/2013	1.11	0.006	Circuits 1435, 363, & GH2 - Contractor Error/Label Error
5	6/4/2013	0.78	0.002	Transmission Line 687 Borrego Substation Outage
6	12/3/2013	0.69	0.003	Circuit 166 - Exceeding 500,000 Customer Minutes
7	11/7/2013	0.60	0.005	Circuits 209 & 205 - Exceeding 500,000 Customer Minutes
8	1/7/2013	0.57	0.001	Circuits 368 & 431 - Exceeding 500,000 Customer Minutes
9	1/10/2013	0.56	0.003	Circuits 792 & SE4- Exceeding 500,000 Customer Minutes
10	3/12/2013	0.51	0.001	Circuits 715 & 706 - Damaged Tee's and Low Gas

2012

Historical 10 Largest Unplanned Outage Events				
Rank	**Date**	**SAIDI**	**SAIFI**	**Description**
1	9/9/2012	1.64	0.019	September 9th - Storm
2	6/23/2012	1.48	0.003	Circuits 166 & 397 Exceeding 500,000 Customer Minutes
3	7/12/2012	1.45	0.014	Circuit 329 - San Mateo Substation Outage
4	5/28/2012	1.27	0.002	Circuit 166 - Outage Exceeding 500,000 Customer Minutes
5	5/6/2012	0.79	0.003	Circuit 323 - Outage Exceeding 500,000 customer minutes
6	2/27/2012	0.76	0.004	February 27 - Storm
7	4/28/2012	0.67	0.002	Circuit 582 - Outage Exceeding 500,000 customer minutes
8	3/26/2012	0.64	0.003	Point Loma Substation Bank 10 Outage
9	8/12/2012	0.63	0.003	Circuit 57 - Outage Exceeding 500,000 customer minutes
10	3/17/2012	0.62	0.004	March 17 - Storm

2011

Historical 10 Largest Unplanned Outage Events				
Rank	**Date**	**SAIDI**	**SAIFI**	**Description**
1	9/8/2011	513.4	0.999	Pacific Southwest Electrical Outage
2	6/28/2011	1.52	0.004	Circuits 486 & 487 - Multiple 12kV Outage
3	10/16/2011	0.68	0.002	Circuit 81 - Outage Exceeding 500,000 customer minutes
4	3/15/2011	0.64	0.004	Circuit 497 - Outage Exceeding 500,000 customer minutes
5	8/4/2011	0.57	0.004	Circuit 497 - Outage Exceeding 500,000 customer minutes
6	8/28/2011	0.51	0.003	August 28 - Storm
7	10/22/2011	0.48	0.004	Circuit 152 - Outage Exceeding 500,000 customer minutes
8	12/23/2011	0.45	0.001	Circuit 243 - Outage Exceeding 500,000 customer minutes
9	6/29/2011	0.44	0.002	Circuit 38 - Outage Exceeding 500,000 customer minutes
10	11/4/2011	0.43	0.006	Capistrano Substation Outage

2010

Historical 10 Largest Unplanned Outage Events				
Rank	**Date**	**SAIDI**	**SAIFI**	**Description**
1	1/18/2010	12.61	0.085	January 18 - Heavy Rain Storm - CPUC Event
2	12/20/2010	4.93	0.023	December 20 - Heavy Rain Storm - CPUC Event
3	4/1/2010	4.40	0.211	Load Curtailment
4	9/30/2010	2.88	0.036	September 30 - Heavy Rain Storm
5	1/5/2010	1.57	0.004	Circuits 703 & 1297 - Multiple 12kV Outage
6	9/26/2010	1.42	0.010	September 26 - Heat Storm
7	9/30/2010	1.34	0.004	Circuits 900 & 904 - Multiple 12kV Outage
8	10/21/2010	1.33	0.002	Circuits 222, 221 & 79 - Outage over 500,000 customer min
9	4/4/2010	1.22	0.003	Circuits 794, 170 & SW2 - Earthquake w/over customer 500,000 Min
10	10/19/2010	1.12	0.014	October 19 - Heavy Rain and Lightning Storm

2009

Historical 10 Largest Unplanned Outage Events				
Rank	**Date**	**SAIDI**	**SAIFI**	**Description**
1	12/7/2009	11.11	0.045	December 7 - Heavy Rain Storm
2	12/13/2009	4.49	0.016	Transmission Lines 13802 & 13802 - Broken Insulator/Relay
3	12/7/2009	1.17	0.003	Circuits 362 - Tee caused Failure w/over 500,000 Customer Min
4	8/20/2009	1.05	0.004	Circuit 152 - Vehicle Contact
5	6/3/2009	0.97	0.006	June 3 - Lightning Storm
6	2/9/2009	0.86	0.009	February 9 - Heavy Rain and Snow Storm
7	11/18/2009	0.53	0.003	Circuit 365 - Faulted Cable
8	11/28/2009	0.50	0.006	November 28 - Heavy Rain Storm
9	11/23/2009	0.48	0.003	Circuits 936 & 178 Tie Switch closed into a fault
10	11/9/2009	0.47	0.005	Circuits 268 & 269 - Dig-in w/over 500,000 Customer Min

SECTION 9 – NUMBER OF CUSTOMER INQUIRIES ON RELIABILITY DATA AND THE NUMBER OF DAYS PER RESPONSE

CUSTOMER INQUIRIES ON RELIABILITY DATA (2018)

SDG&E received 264 customer inquiries for reliability data in 2018.

The average response time was 7 calendar days.

The much higher number of outage-related customer inquiries in 2018 (2018: 264, 2017: zero, 2016: one) is due to a new local Air Pollution Control Division (APCD) enforcement regulation on emergency generator usage. The new regulation requires an entity running an electric generator for backup electric service purposes to provide documentation regarding the electric outage that initiated each such use. SDG&E's commercial, industrial, and residential customers who own and operate permitted emergency generators began requesting outage history to fulfill this requirement in March of 2018.