

# Energy Division Central Files Document Coversheet

<b>A. Document Name</b>
Today's Date (Date of Submittal) 7/16/2018 <b>Name:</b> 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): 2017 5. Name Suffix: <b>Cov</b> (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 2017 Cov 7. Identify whether this filing is <input checked="" type="checkbox"/> original or <input type="checkbox"/> revision to a previous filing. a. If revision, identify date of the original filing:
<b>B. Documents Related to a Proceeding</b>
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
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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
<b>D. Document Summary</b>
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.
<b>E. Sender Contact Information</b>
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<b>F. Confidentiality</b>
1. Is this document confidential? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes a. If Yes, provide an explanation of why confidentiality is claimed and identify the expiration of the confidentiality designation (e.g. Confidential until December 31, 2020.) <a href="#">Click here to enter text.</a>
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**SDGE**

A  Sempra Energy utility<sup>®</sup>

***ELECTRIC SYSTEM RELIABILITY  
ANNUAL REPORT 2017***

**Prepared for  
California Public Utilities Commission  
(Per Decision 16-01-008)**

July 16, 2018

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## EXECUTIVE SUMMARY

### Background:

The Electric System Reliability Annual Report for 2017 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.

### 2017 Reliability Indices

#### Overview:

SDG&E's 2017 SAIDI and SAIFI numbers were near system average for the past 5-years, with the final indices values representing a 11% decrease from 2016 SAIDI values.

Additionally, San Diego Gas & Electric experienced extremely dry conditions combined with high Santa Ana winds in the 4<sup>th</sup> quarter of 2017, which triggered proactive de-energization of lines in targeted high risk wildfire areas for community safety. Outage impacts from proactive de-energizing events in 2017 totaled 29.49 SAIDI min. and 0.015 SAIFI. Most of these unplanned outage impacts meet Major Event Day exclusion criteria, but approximately 4.07 SAIDI min. and 0.003 SAIFI are not excluded in this report. SDG&E internally tracks its indices excluding impacts from these pro-active de-energization events as its measure of its performance. The totals excluding de-energization events are listed below for reference.

	MED, Planned and Proactive De-energization Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI
2017	60.44	0.509	118.74	0.311

### Identified Mitigation/Efforts to Improve System Reliability

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

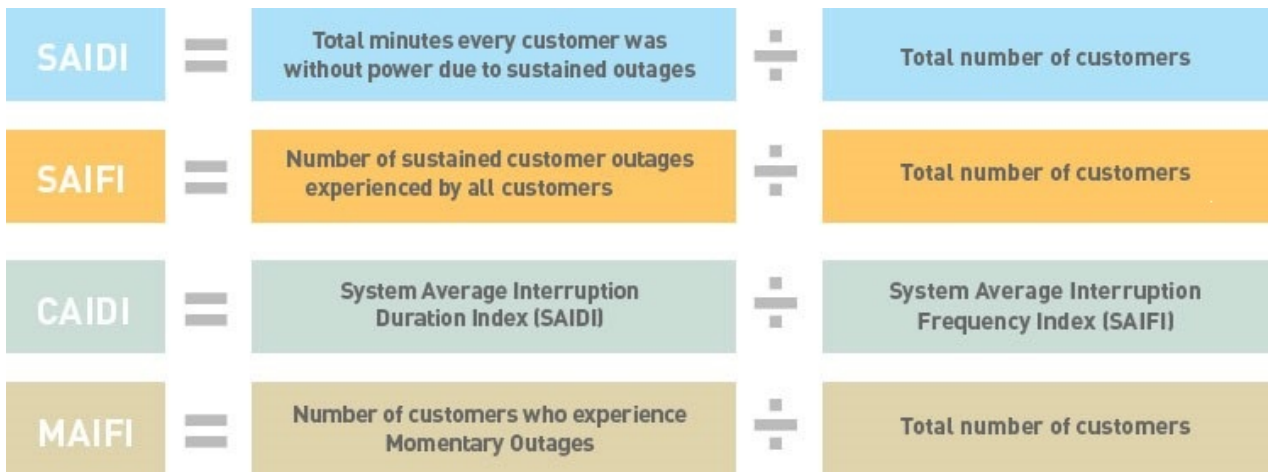
- Expanding the number of automated sectionalizing switch locations within its circuits to minimize customers that see each outage.
- Adding more automated tie-point switches, allowing for faster outage restoration of customers.
- Expanding and enabling more Fault Location, Isolation, and Service Restoration (FLISR) technology on the distribution system. The technology associated with FLISR enables a fault to be safely and autonomously identified and isolated, thus restoring service to our customer quicker than would occur with human intervention.
- Replacing aging electric substation, underground cable, and connector infrastructure, minimizing the failure rate of equipment driving impacts to customers.

### 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 (System Average Interruption Duration Index)** - minutes of sustained outages per customer per year.
2. **SAIFI (System Average Interruption Frequency Index)** - number of sustained outages per customer per year.
3. **CAIDI (Customer Average Interruption Duration Index)** – is the average time required to restore service to a utility customer.
4. **MAIFI (Momentary Average Interruption Frequency Index)** - 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 2017 was 4.27 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 2008 - 2017								
MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI
2008	59.17	0.517	114.56	0.380	59.17	0.517	114.56	0.380
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

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

San Diego Gas & Electric Distribution System Reliability Data 2008 - 2017								
MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI
2008	58.28	0.506	115.24	0.368	58.28	0.506	115.24	0.368
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

Note: Distribution System Indices includes substation distribution.



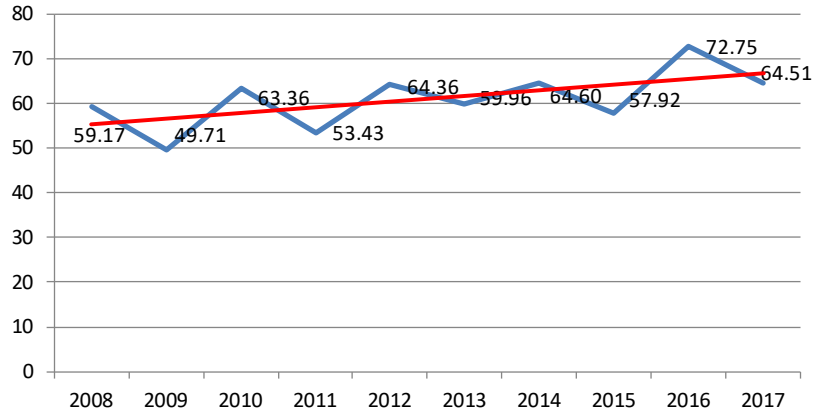
**Table 1-3: Transmission System Indices (MED included and excluded)**

San Diego Gas & Electric								
Transmission System Reliability Data 2008 - 2017								
MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI
2008	0.89	0.011	82.84	0.013	0.89	0.011	82.84	0.013
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

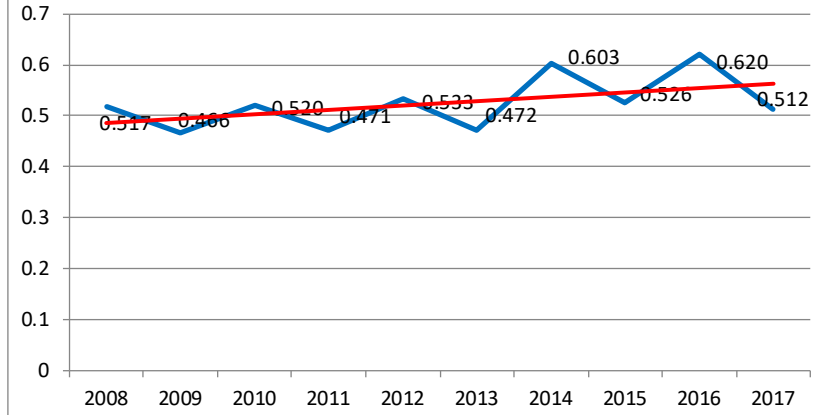
Note: Transmission System Indices includes substation transmission.

## System Indices (Excludes Planned, ISO and MED)

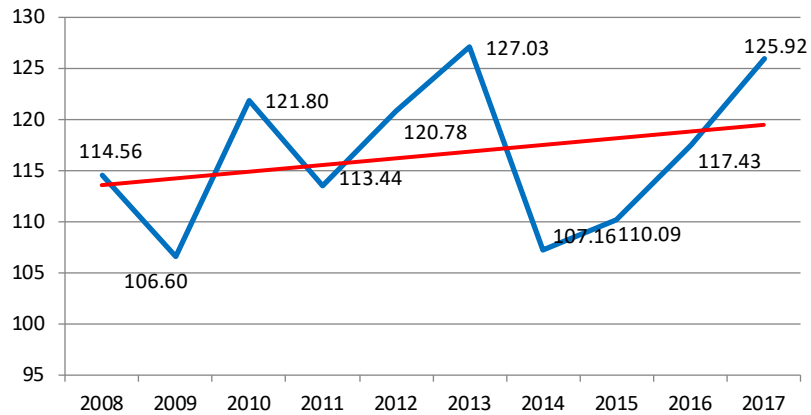
### System - SAIDI



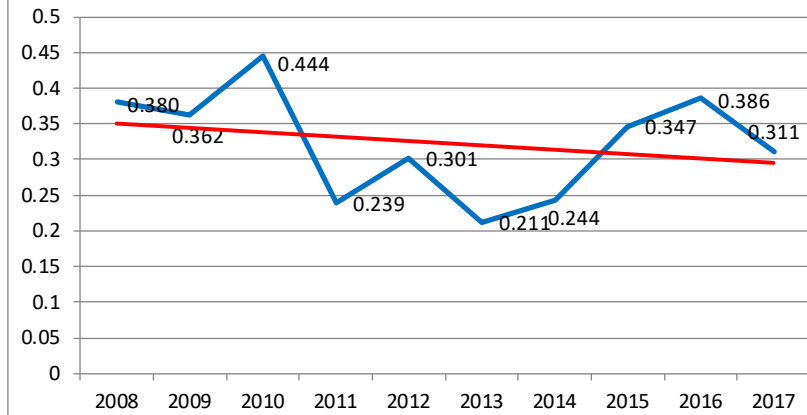
### System - SAIFI



### System - CAIDI

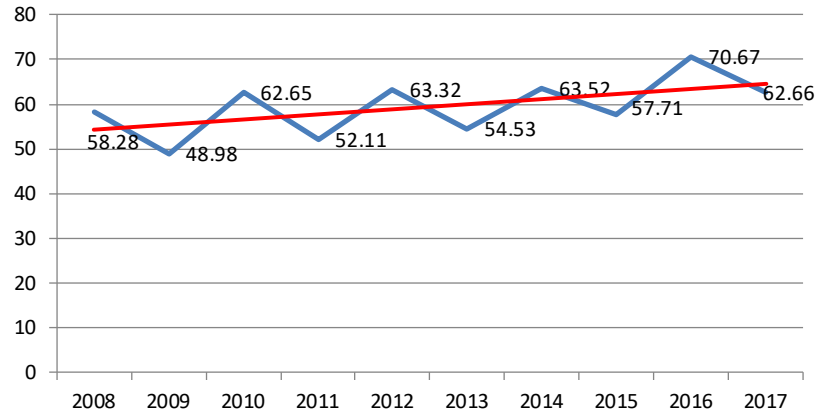


### System - MAIFI

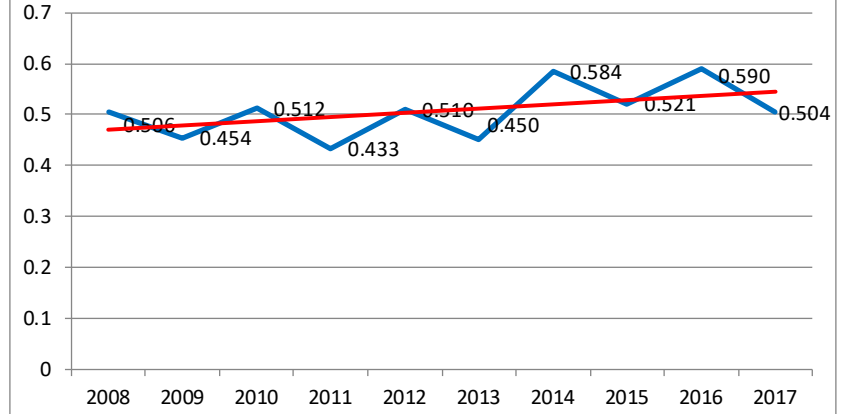


## Distribution System Indices (Excludes Planned, ISO and MED)

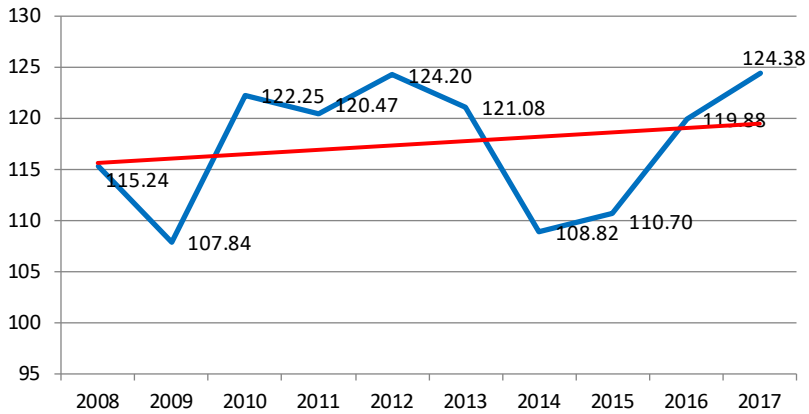
### Distribution - SAIDI



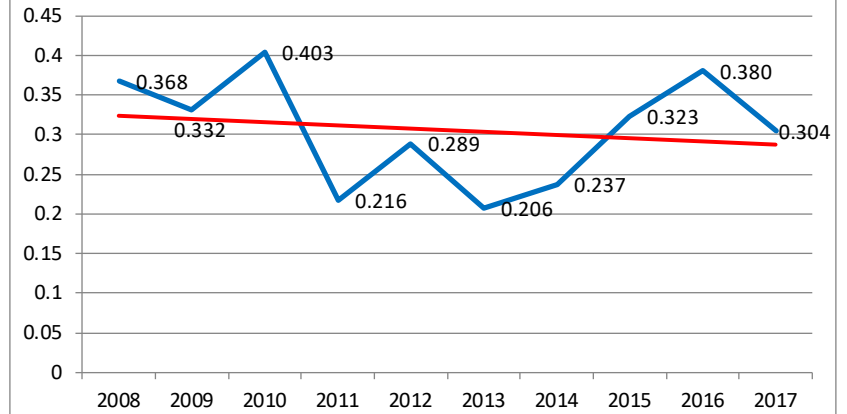
### Distribution - SAIFI



### Distribution - CAIDI

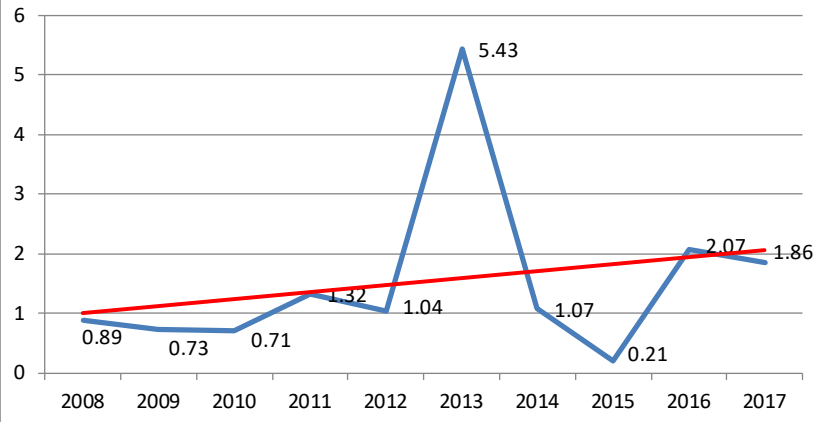


### Distribution - MAIFI

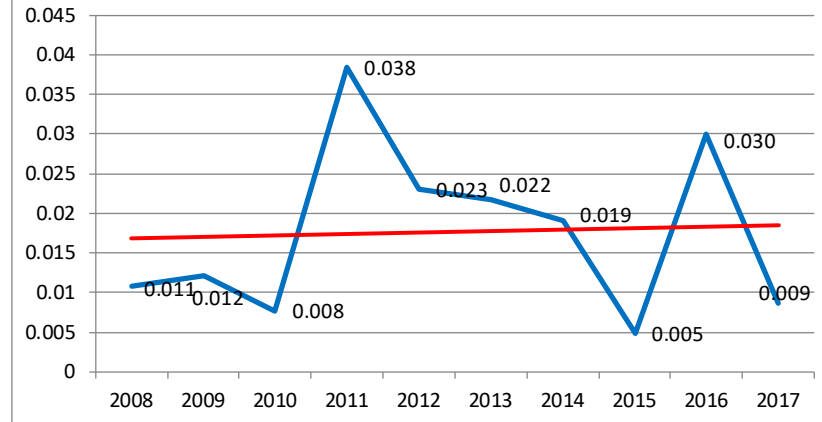


## Transmission System Indices (Excludes Planned, ISO and MED)

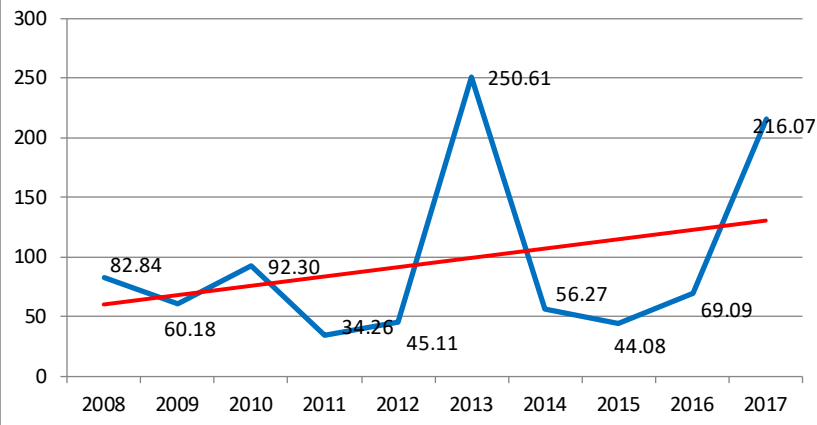
### Transmission - SAIDI



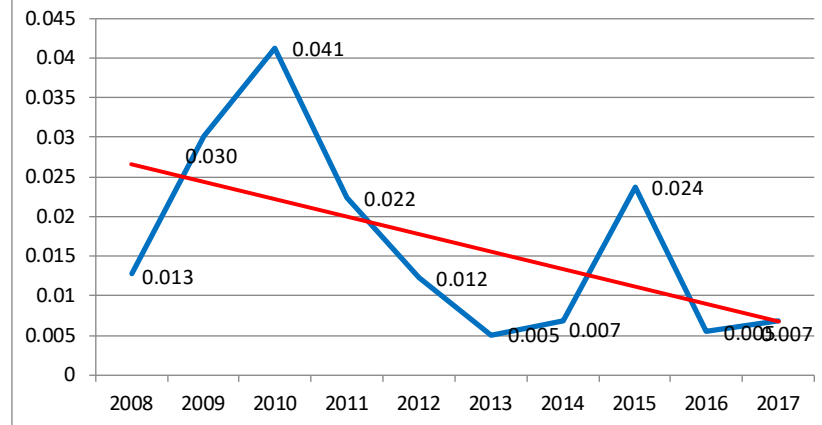
### Transmission - SAIFI



### Transmission - CAIDI



### Transmission - MAIFI



**Note:** The spike in 2013 is due to the Borrego Outage events caused by extreme weather

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

**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 ISO OUTAGES)**

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

**Table 2-1: Beach Cities – District Reliability Indices (2008 – 2017)**

MED Included					MED Excluded				
Year	SAIDI	SAIFI	CAIDI	MAIFI		SAIDI	SAIFI	CAIDI	MAIFI
2008	38.67	0.334	115.85	0.144		38.67	0.334	115.85	0.144
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

**Table 2-2: Eastern - District Reliability Indices (2008 – 2017)**

MED Included					MED Excluded				
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI	
2008	54.52	0.523	104.16	0.498	54.52	0.523	104.16	0.498	
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	

**Table 2-3: Metro - District Reliability Indices (2008 – 2017)**

MED Included					MED Excluded				
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI	
2008	43.81	0.429	102.03	0.399	43.81	0.429	102.03	0.399	
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	

**Table 2-4: North Coast - District Reliability Indices (2008 – 2017)**

MED Included					MED Excluded				
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI	
2008	77.01	0.599	128.61	0.436	77.01	0.599	128.61	0.436	
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	

**Table 2-5: Northeast - District Reliability Indices (2008 – 2017)**

MED Included					MED Excluded				
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI	
2008	82.22	0.677	121.49	0.544	82.22	0.677	121.49	0.544	
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	

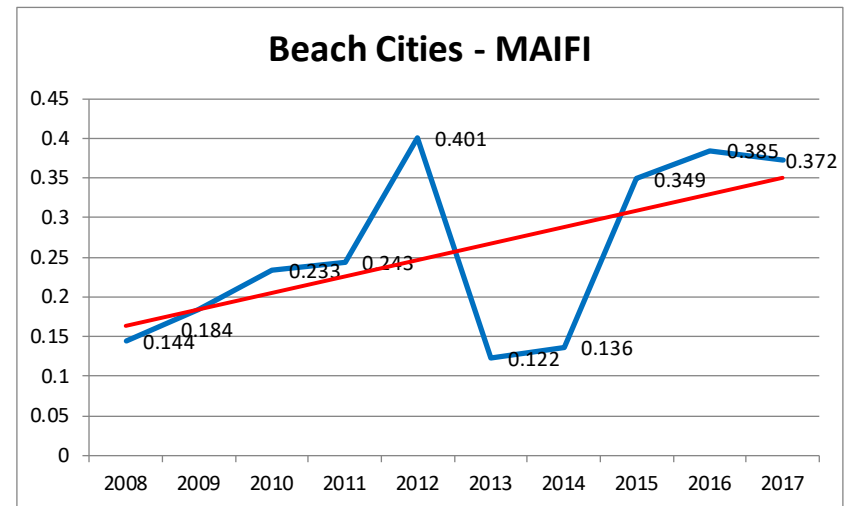
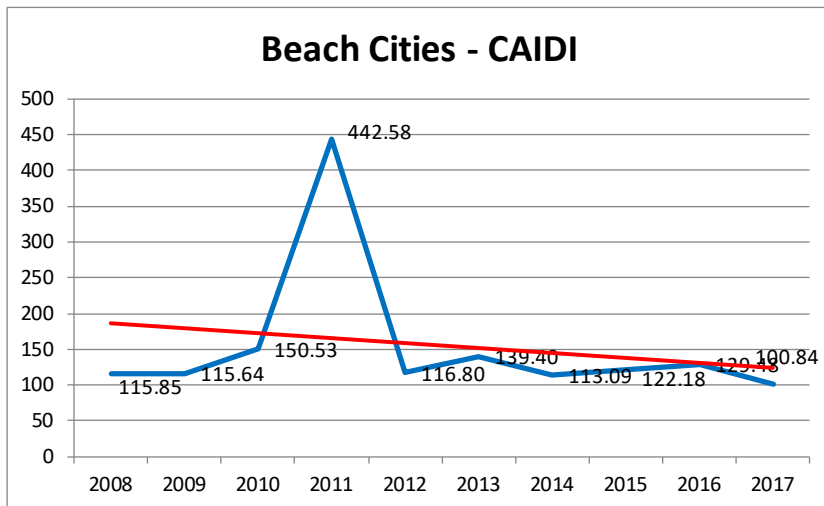
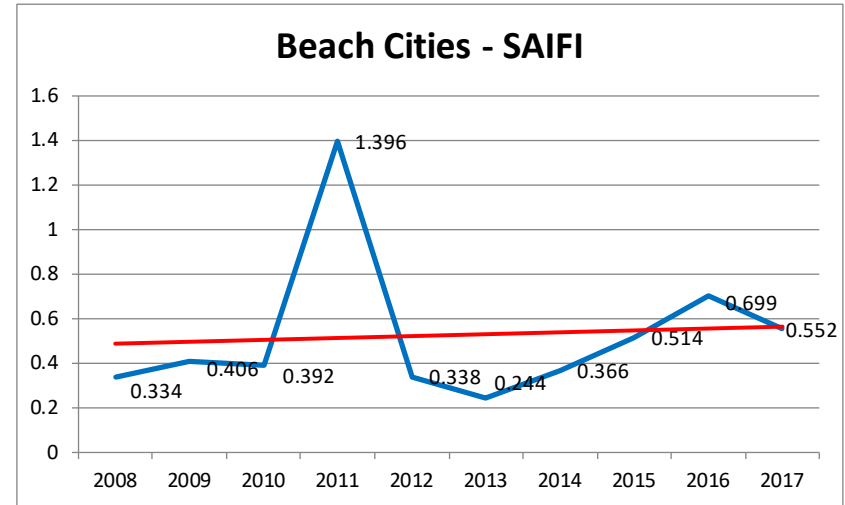
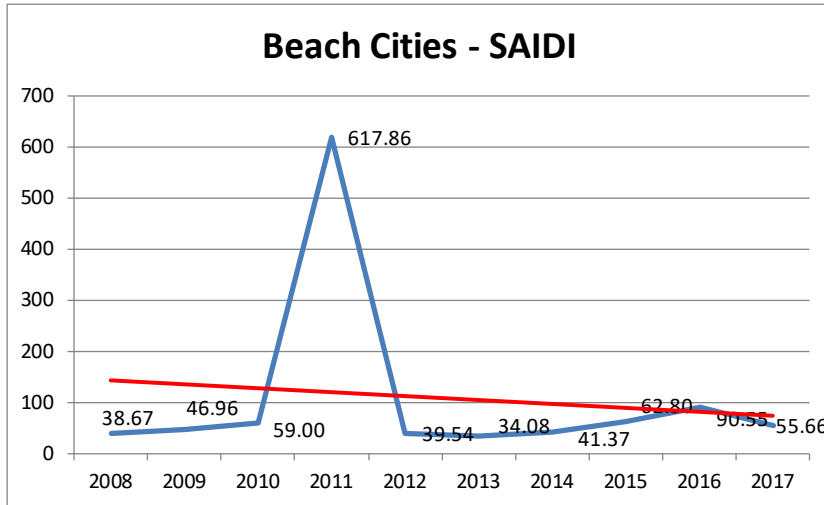
**Table 2-6: Orange County - District Reliability Indices (2008 – 2017)**

MED Included					MED Excluded				
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI	
2008	75.48	0.664	113.71	0.183	75.48	0.664	113.71	0.183	
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	



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

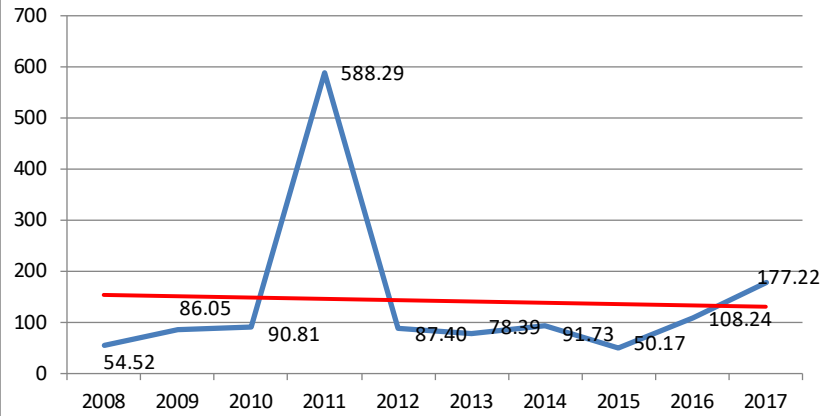
**District Reliability Indices (Excludes Planned and ISO; Includes MED)**



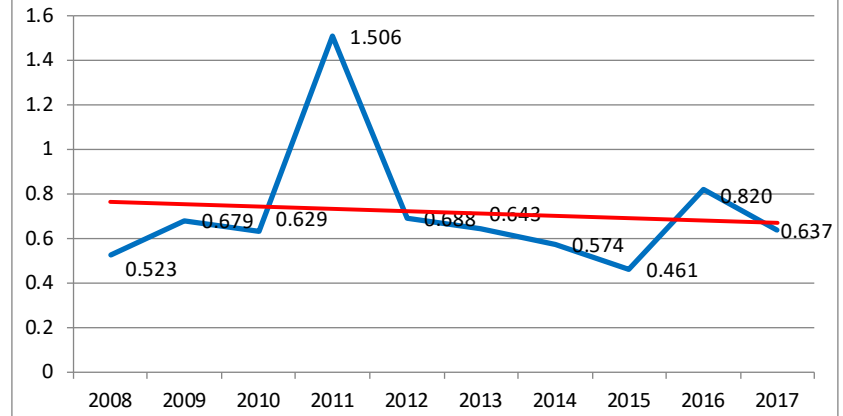
**Note:** The spike in 2011 is due to the Pacific Southwest Electric Outage (PSEO)

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

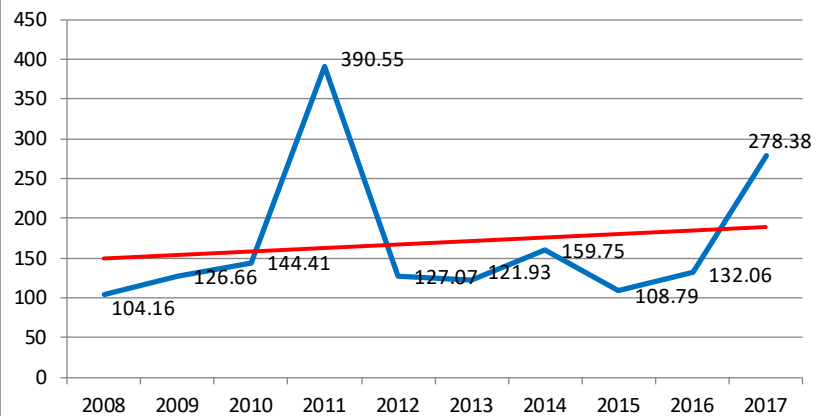
### Eastern - SAIDI



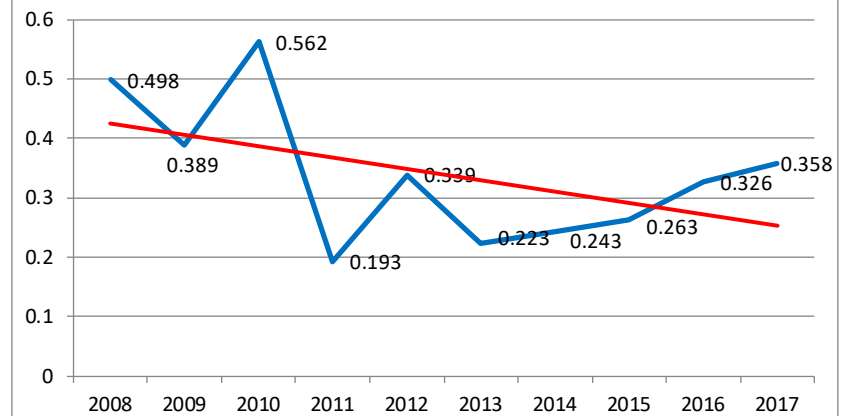
### Eastern - SAIFI



### Eastern - CAIDI

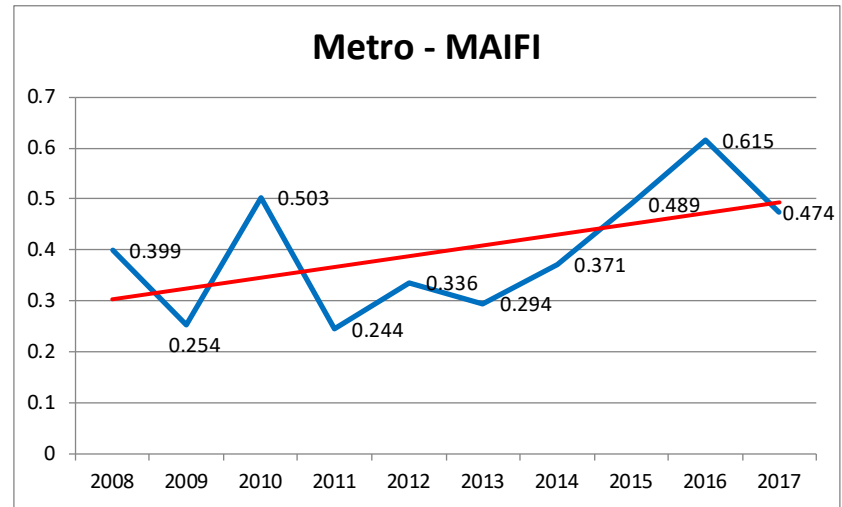
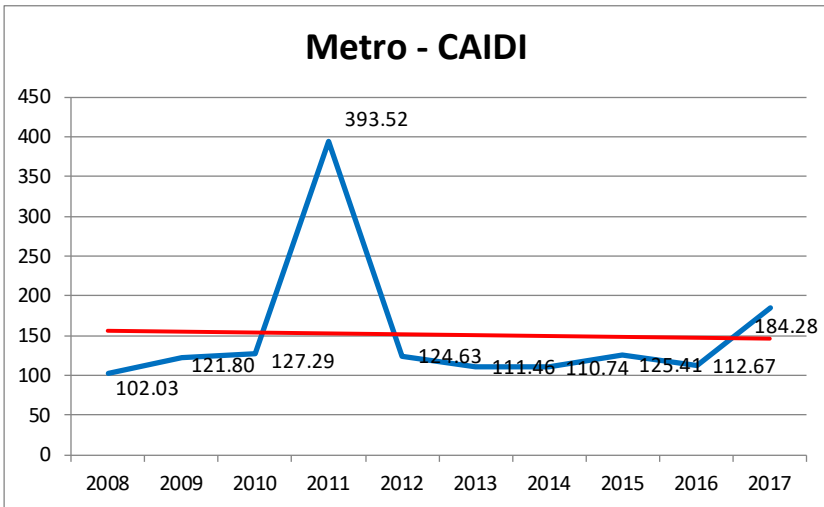
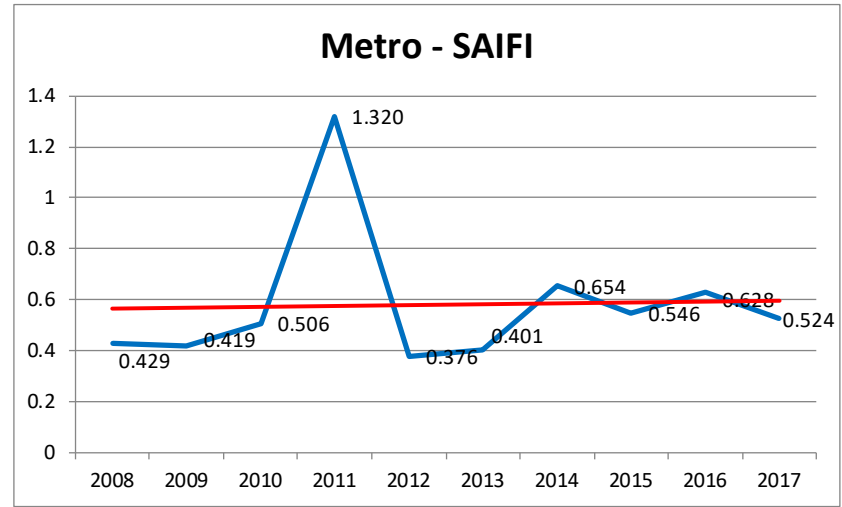
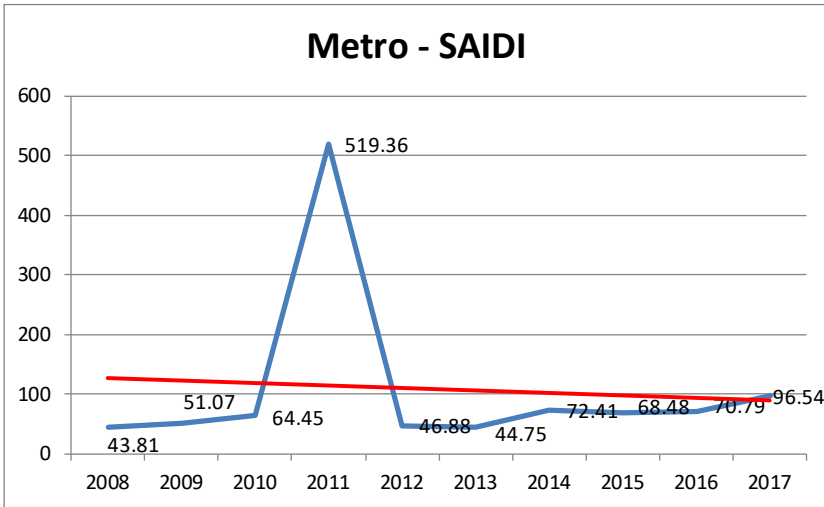


### Eastern - MAIFI



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

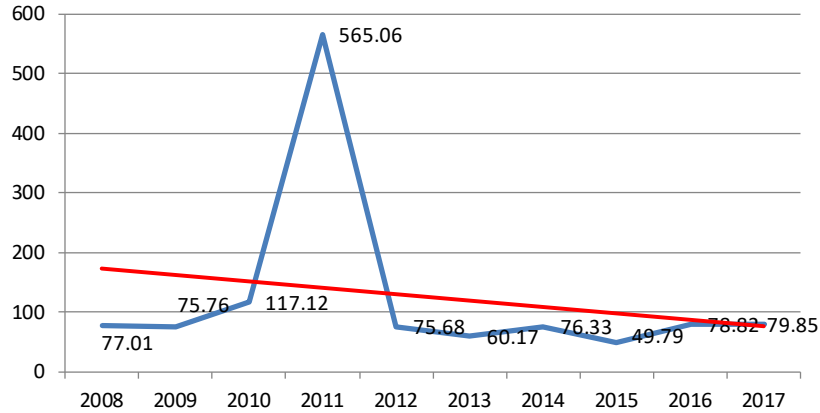
## District Reliability Indices (Excludes Planned and ISO; Includes MED)



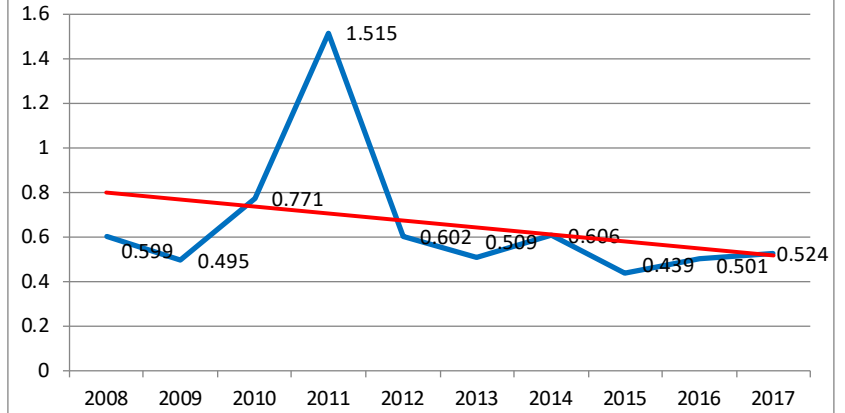
**Note:** The spike in 2011 is due to the Pacific Southwest Electric Outage (PSEO)

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

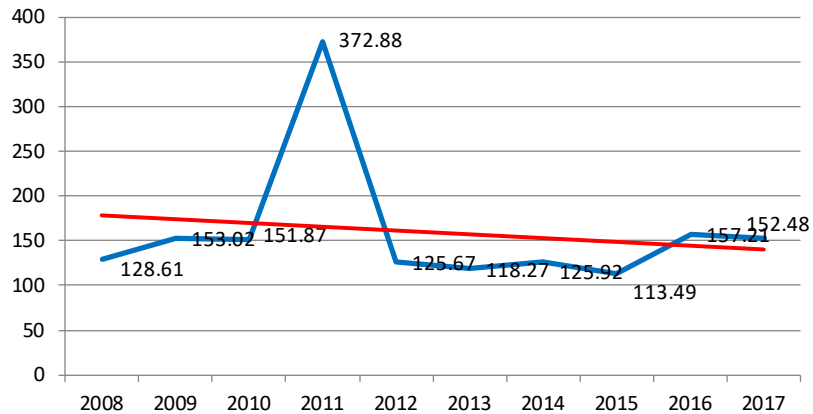
### North Coast - SAIDI



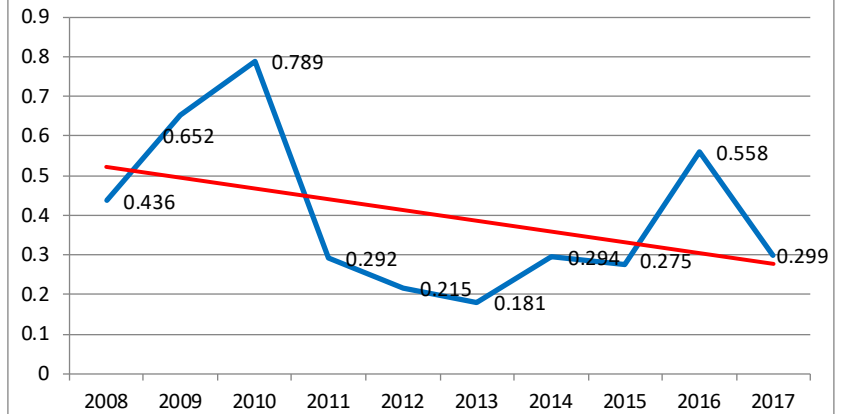
### North Coast - SAIFI



### North Coast - CAIDI



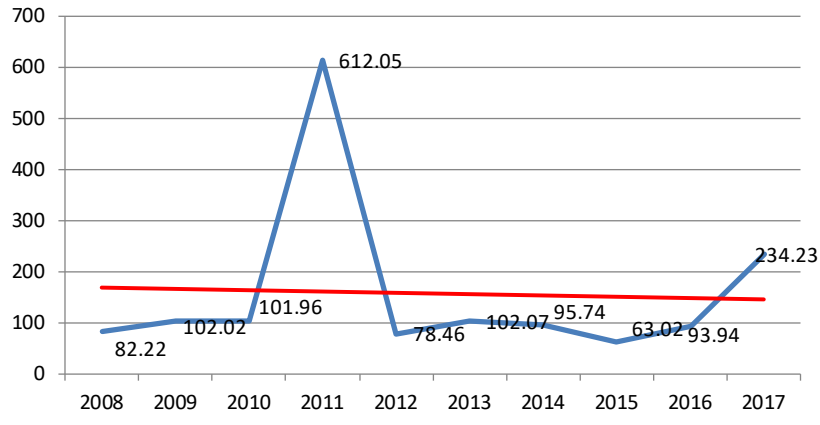
### North Coast - MAIFI



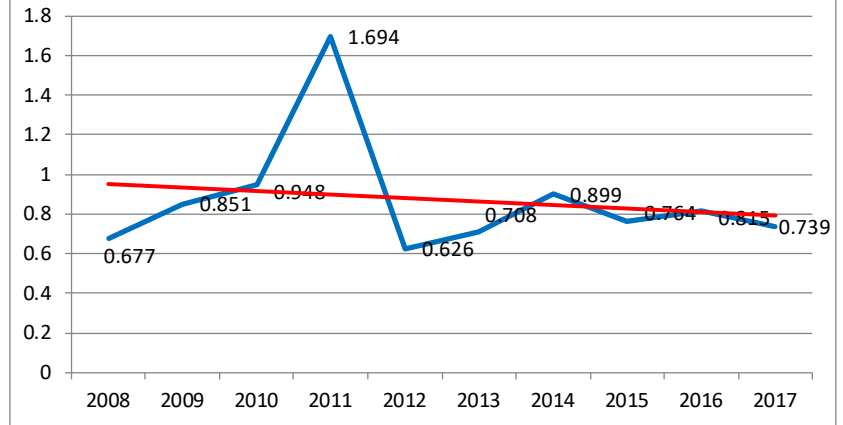
**Note:** The spike in 2011 is due to the Pacific Southwest Electric Outage (PSEO)

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

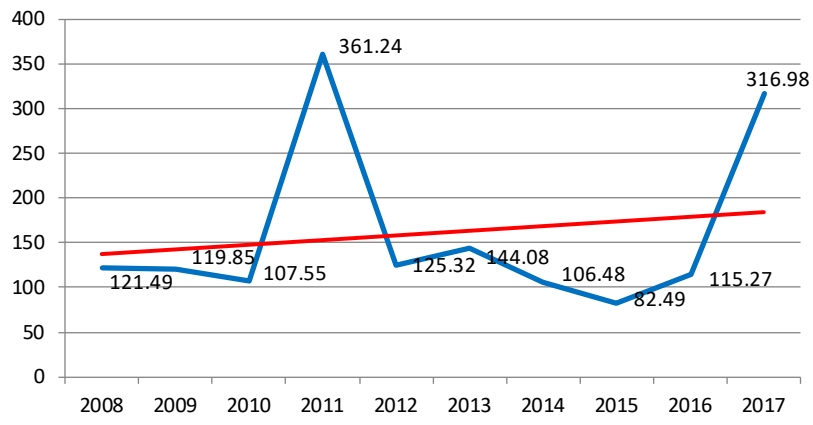
### Northeast - SAIDI



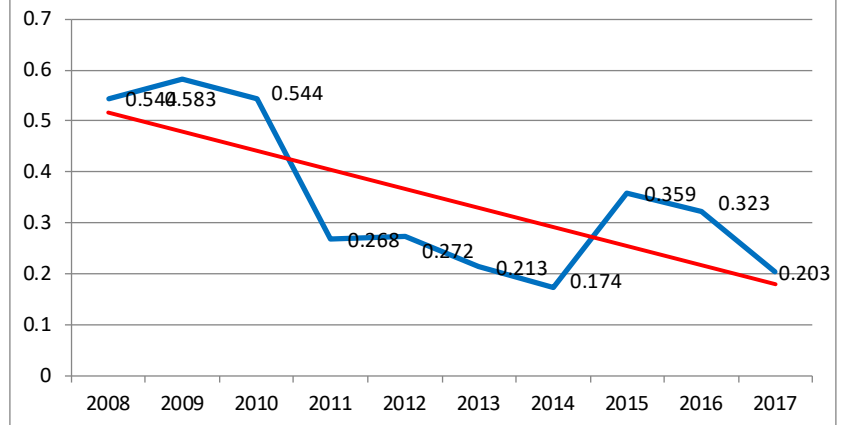
### Northeast - SAIFI



### Northeast - CAIDI

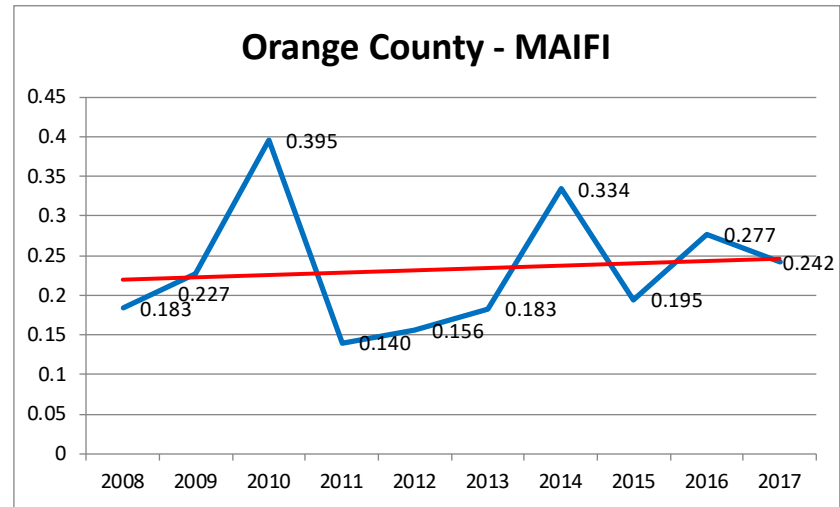
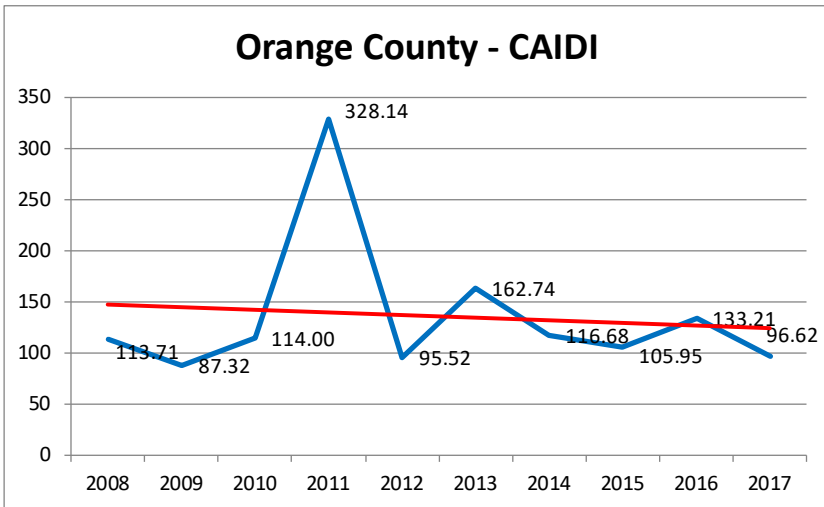
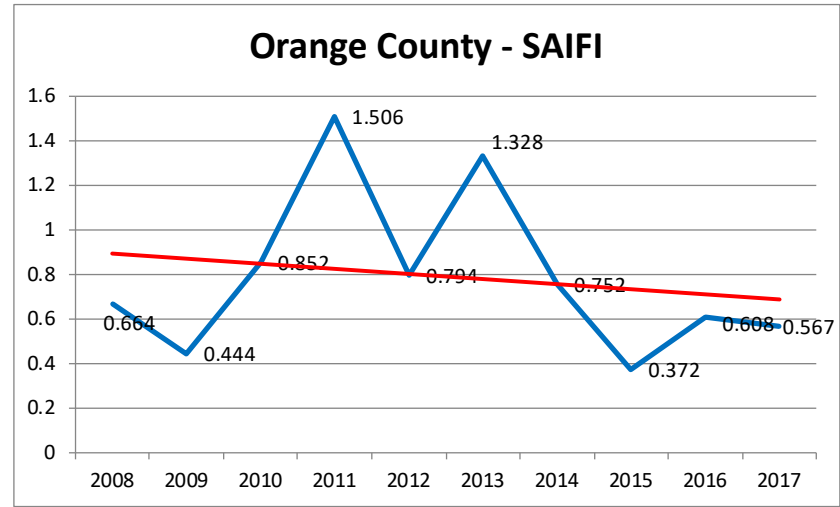
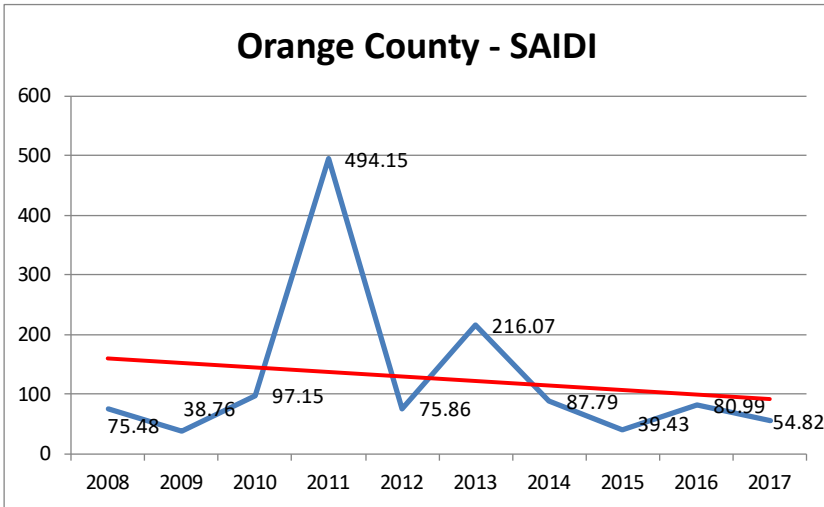


### Northeast - MAIFI



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

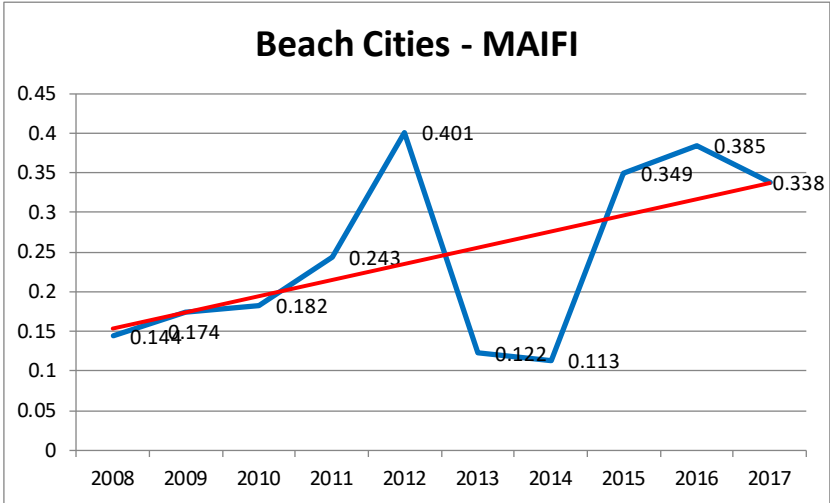
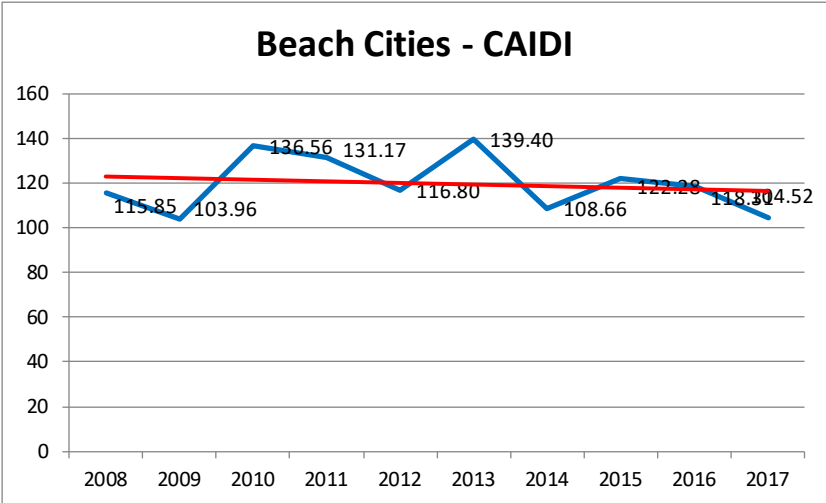
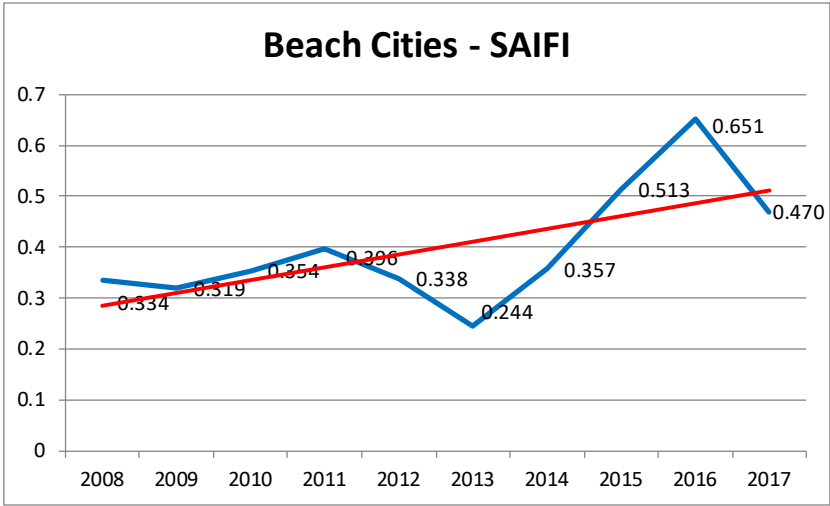
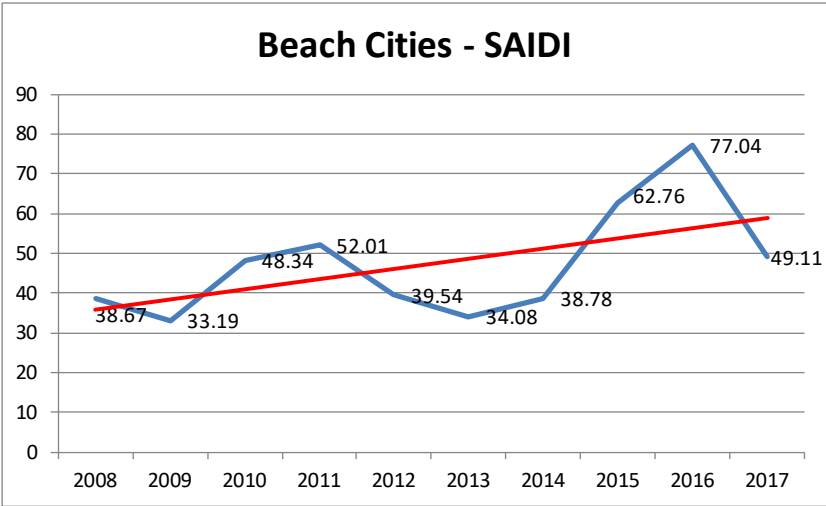
## District Reliability Indices (Excludes Planned and ISO; Includes MED)



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

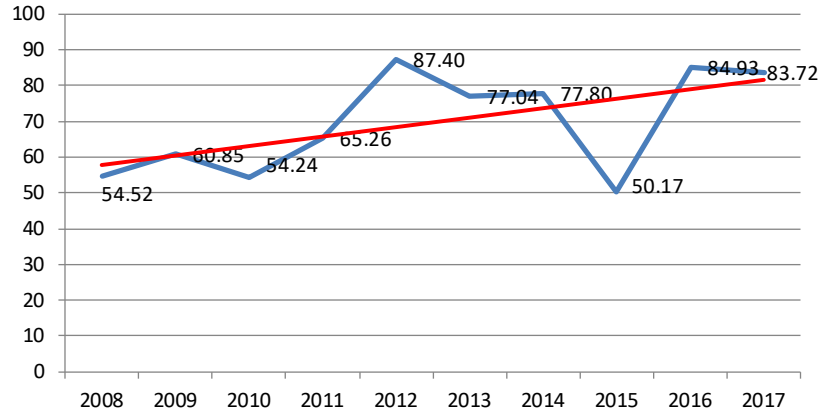
C. CHARTS FOR EACH OF SDG&E'S SIX DISTRICTS WITH LINEAR TREND LINE (EXCLUDES PLANNED, ISO AND MED)

**District Reliability Indices (Excludes Planned, ISO and MED)**

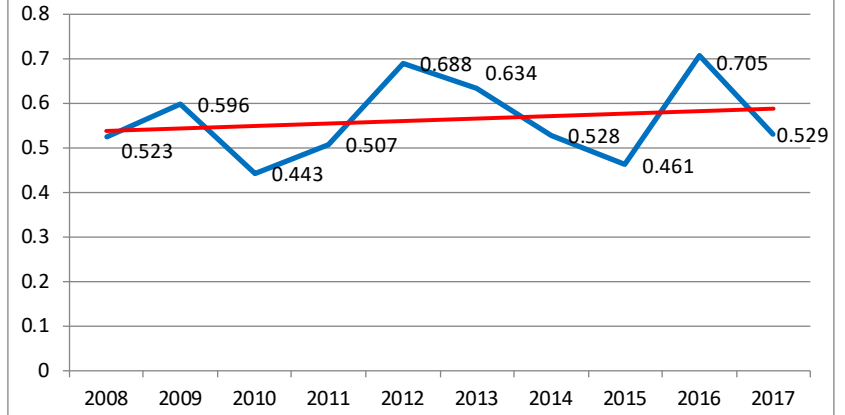


## District Reliability Indices (Excludes Planned, ISO and MED)

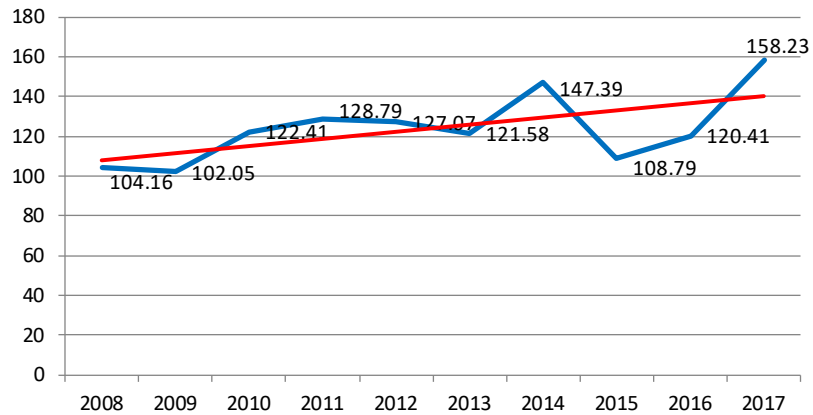
### Eastern - SAIDI



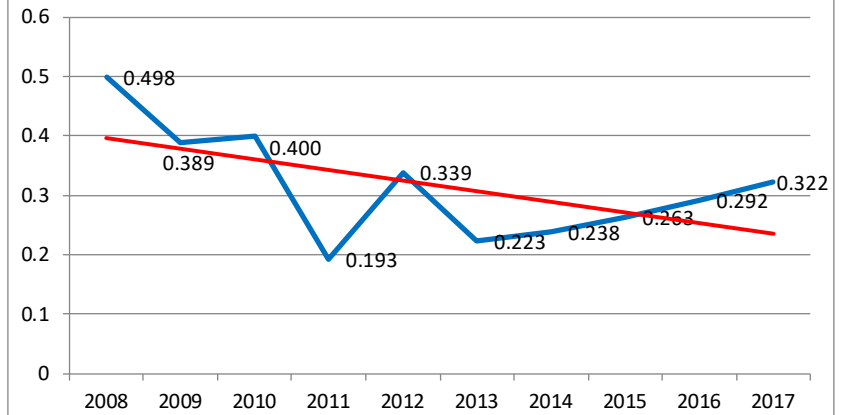
### Eastern - SAIFI



### Eastern - CAIDI



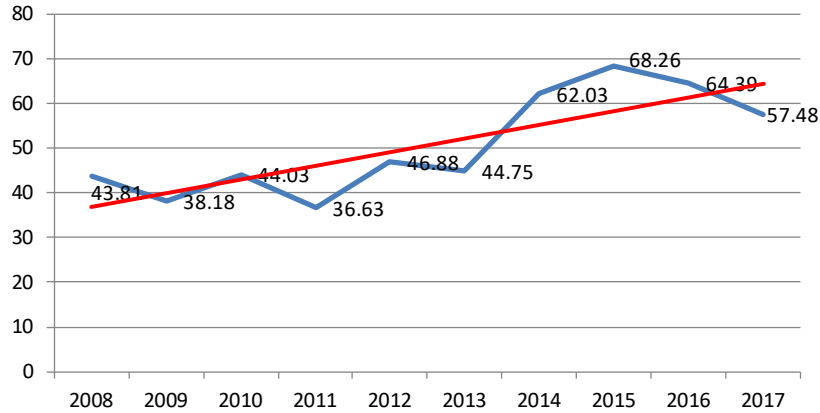
### Eastern - MAIFI



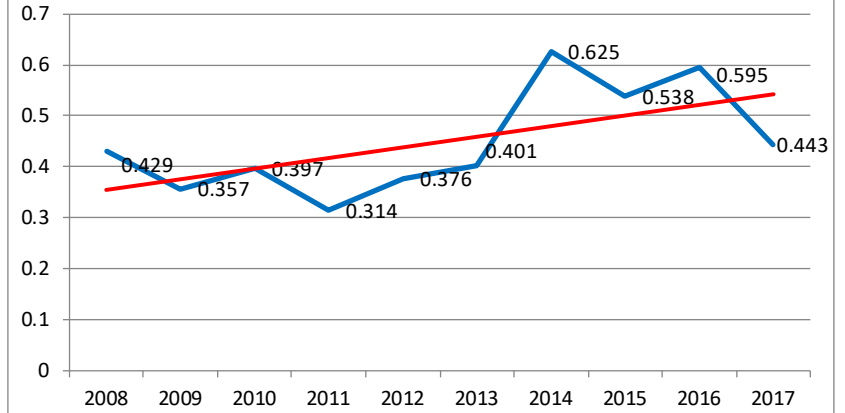


## District Reliability Indices (Excludes Planned, ISO and MED)

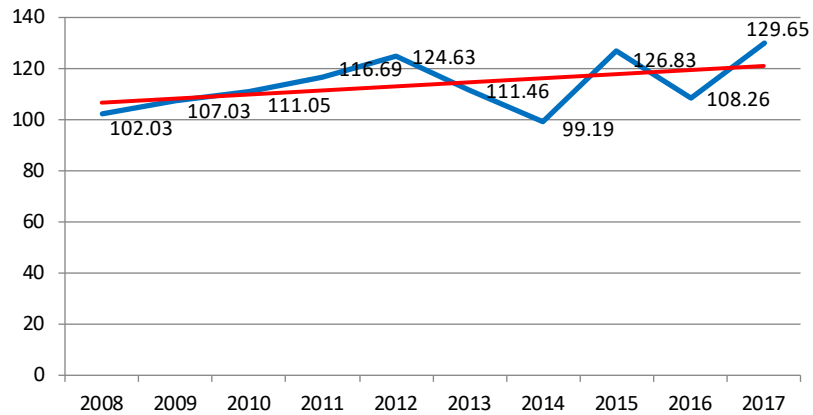
### Metro - SAIDI



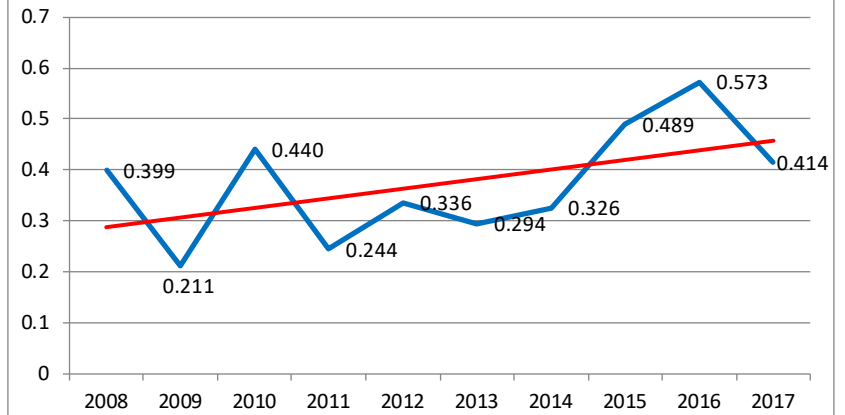
### Metro - SAIFI



### Metro - CAIDI

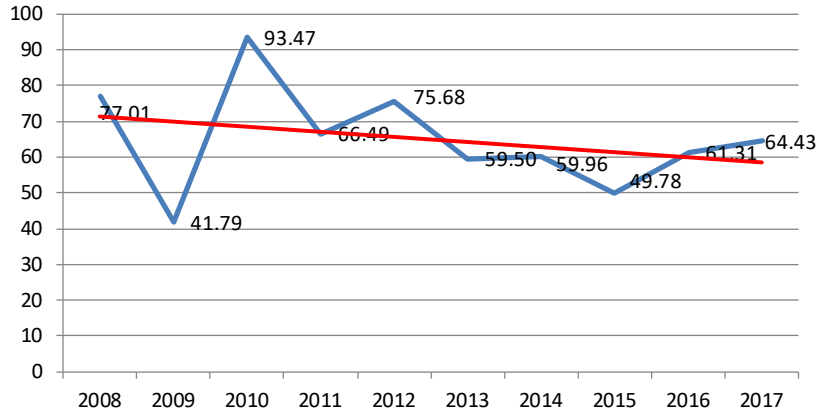


### Metro - MAIFI

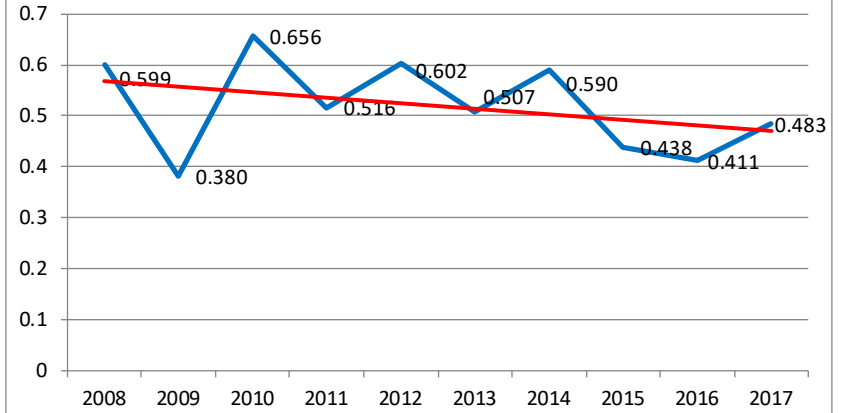


## District Reliability Indices (Excludes Planned, ISO and MED)

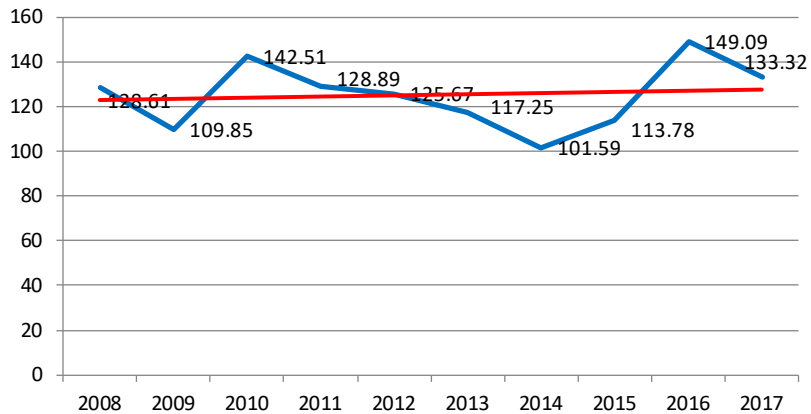
### North Coast - SAIDI



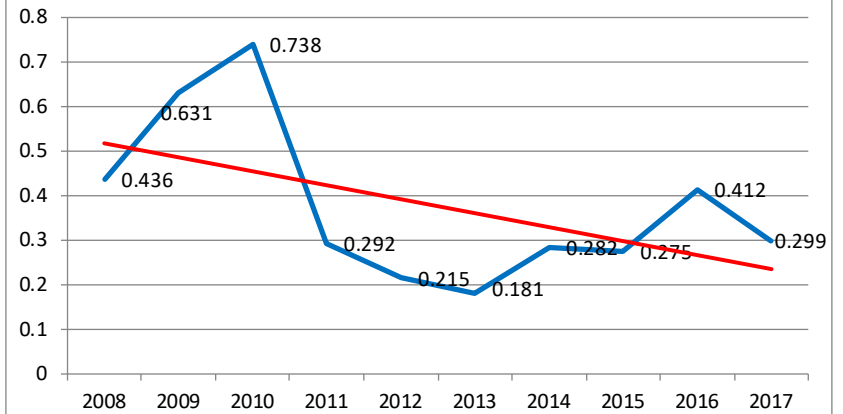
### North Coast - SAIFI



### North Coast - CAIDI

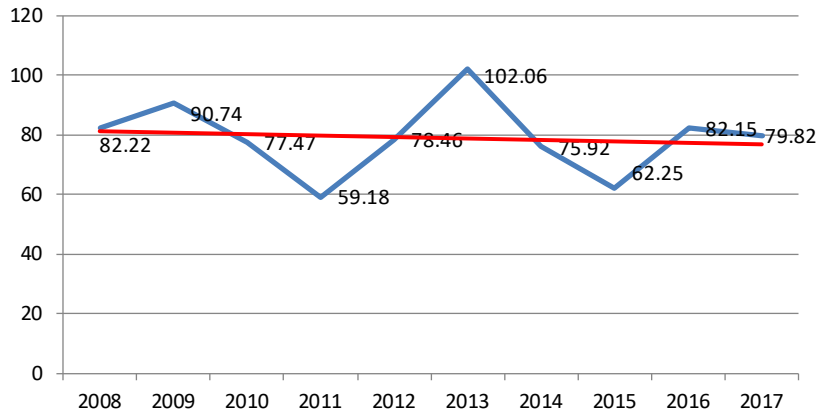


### North Coast - MAIFI

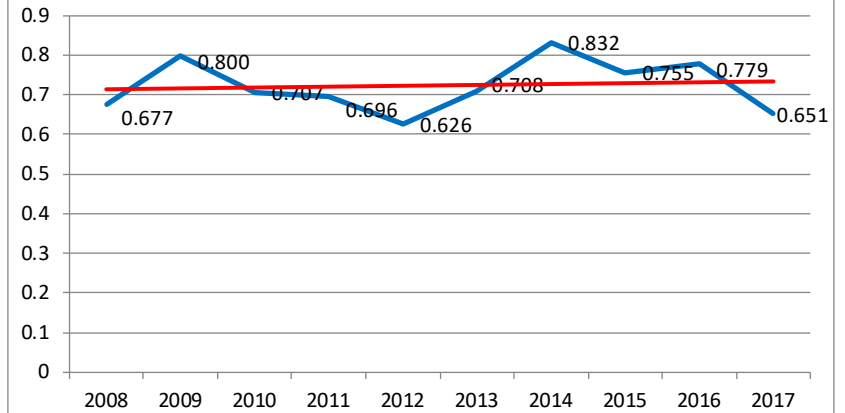


## District Reliability Indices (Excludes Planned, ISO and MED)

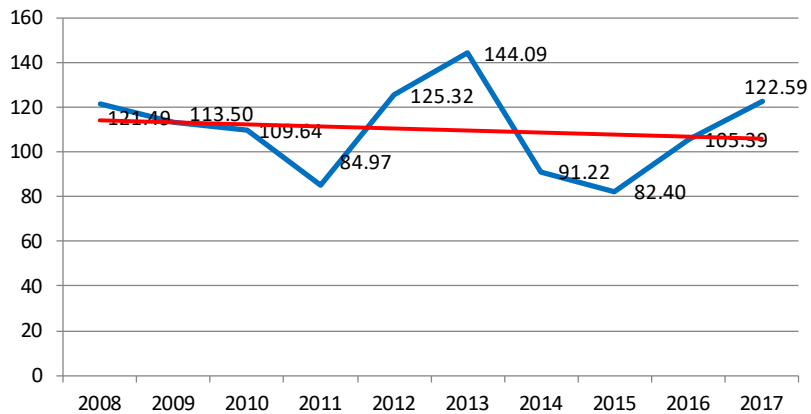
### Northeast - SAIDI



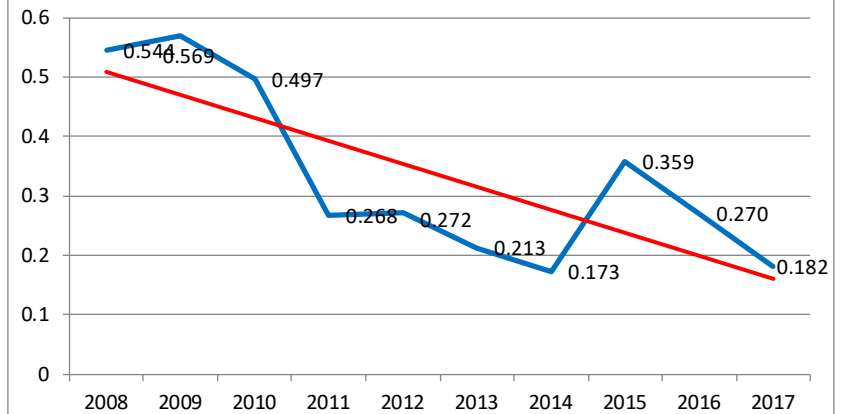
### Northeast - SAIFI



### Northeast - CAIDI

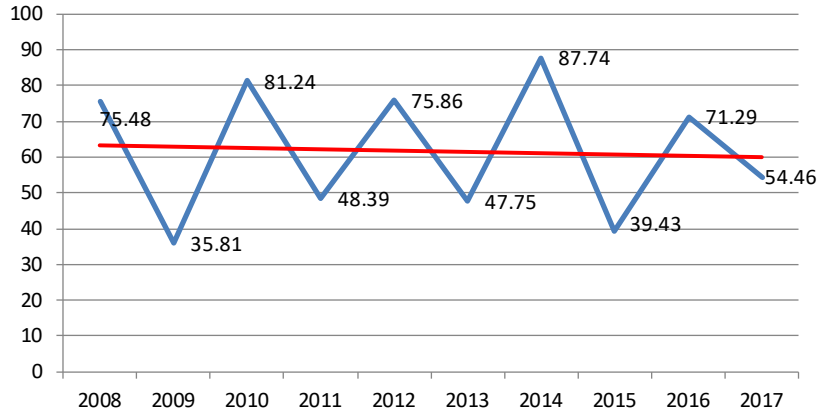


### Northeast - MAIFI

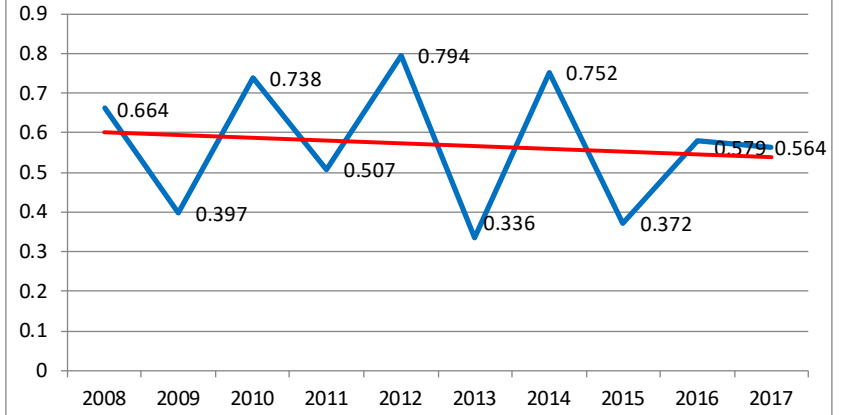


## District Reliability Indices (Excludes Planned, ISO and MED)

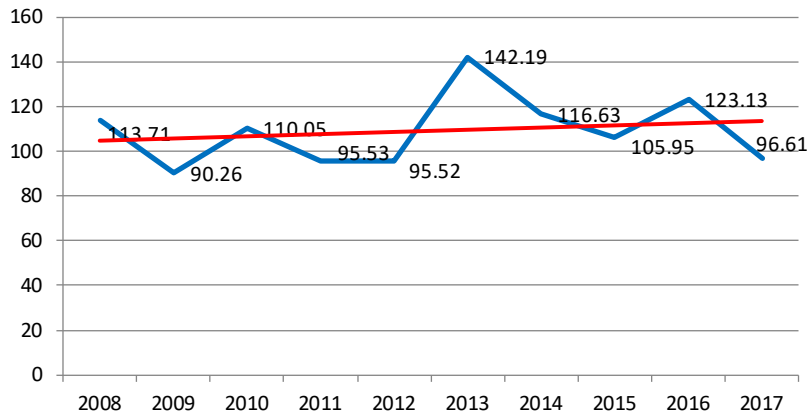
### Orange County - SAIDI



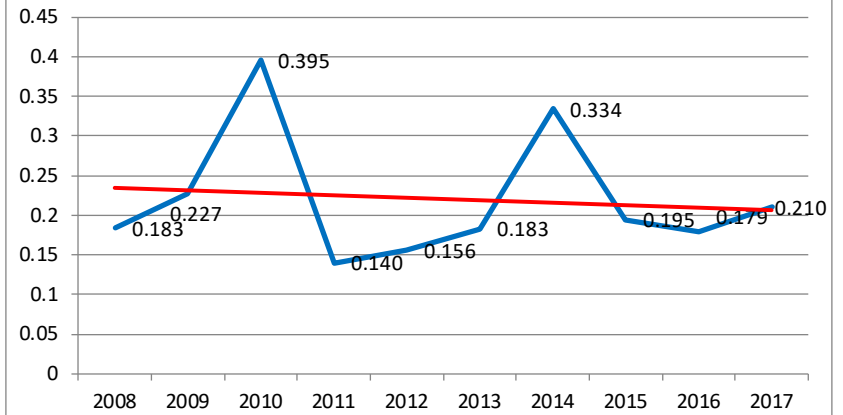
### Orange County - SAIFI



### Orange County - CAIDI



### Orange County - MAIFI



**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 – 2017) <sup>1</sup>								
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

<sup>1</sup> Values in the 2017 reliability report now excludes Secondary Outages for consistency with the rest of the report, resulting in an adjustments to numbers reported in prior years.

Beach Cites - District Indices (2013 – 2017)								
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

Eastern - District Indices (2013 – 2017)								
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

Metro - District Indices (2013 – 2017) 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

North Coast - District Indices (2013 – 2017) 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

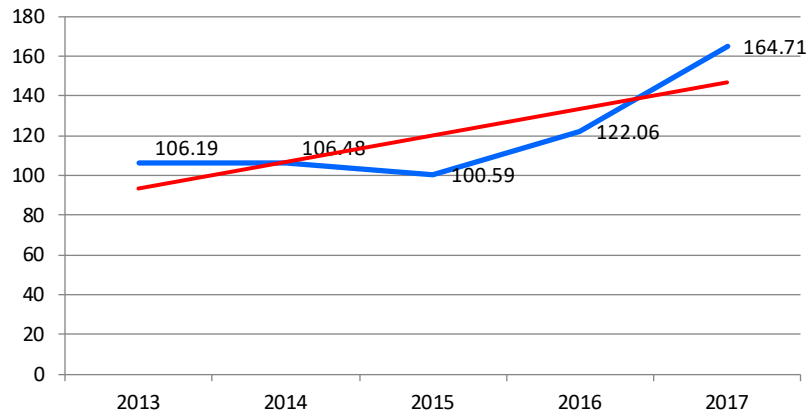
Northeast - District Indices (2013 – 2017) Planned and Unplanned								
MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI
2013	130.01	0.817	159.11	0.264	129.99	0.817	159.12	0.264
2014	121.17	1.016	119.20	0.217	101.35	0.950	106.72	0.215
2015	95.03	0.911	104.37	0.431	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

Orange County - District Indices (2013 – 2017) 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

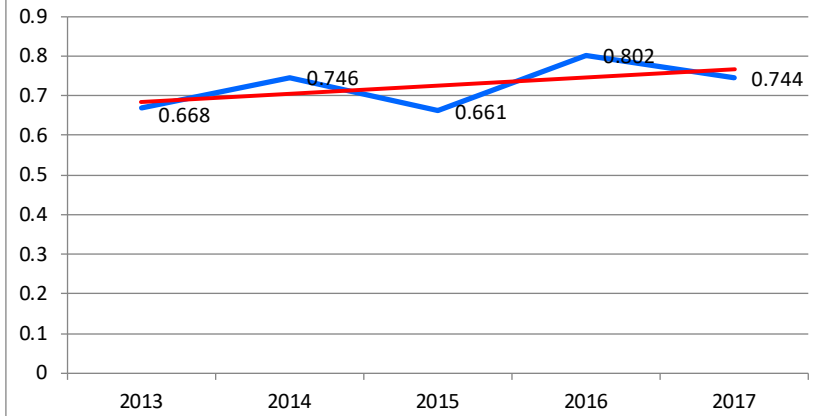


## System Indices - Planned and Unplanned (Excludes ISO; Includes MED)

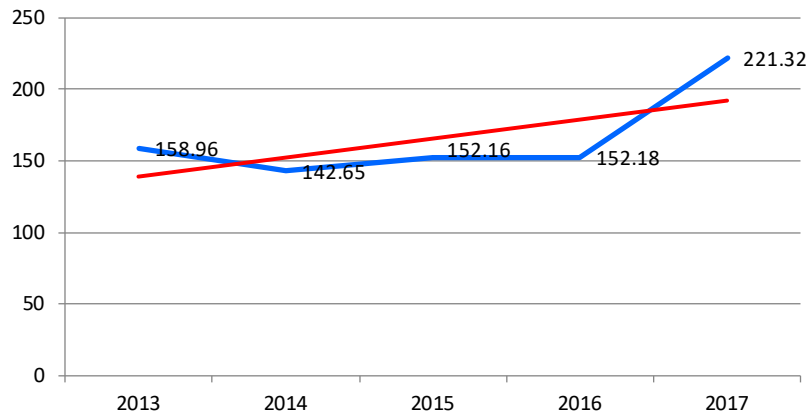
### System - SAIDI



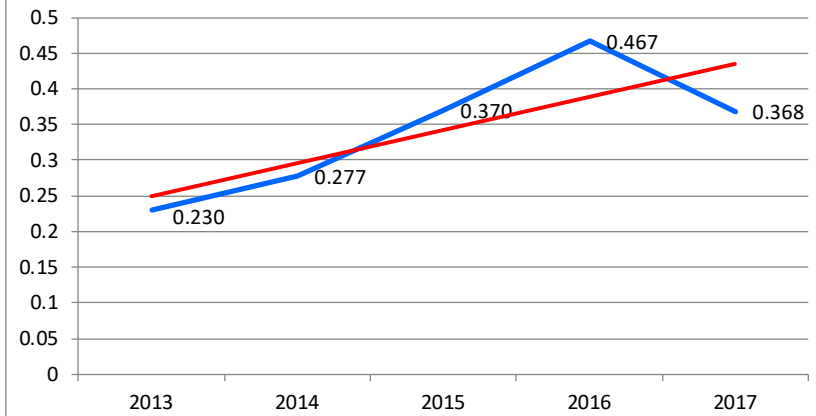
### System - SAIFI



### System - CAIDI

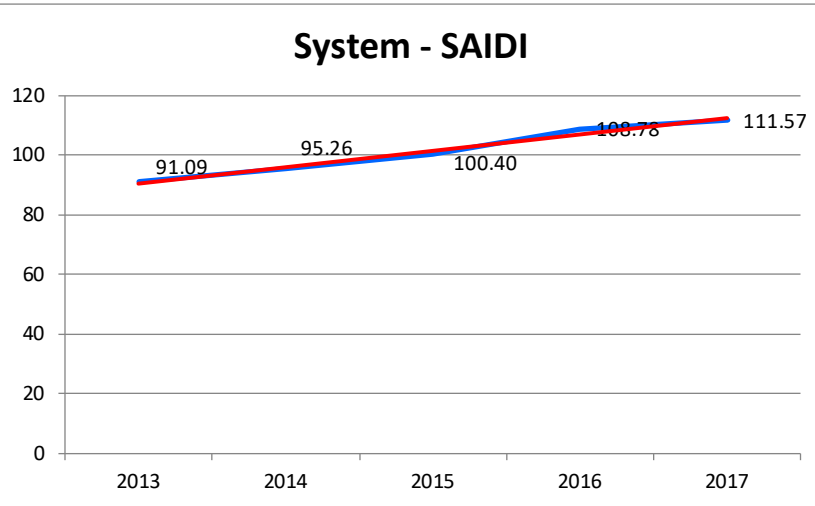


### System - MAIFI

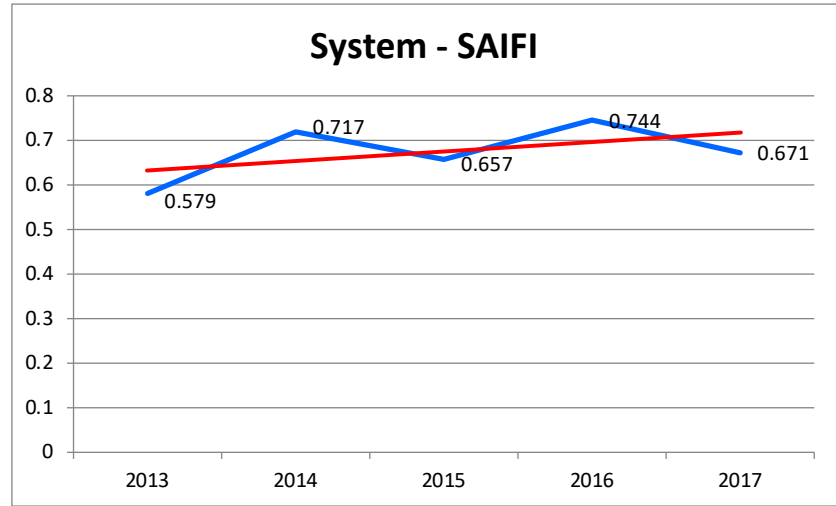


## System Indices - Planned and Unplanned (Excludes ISO and MED)

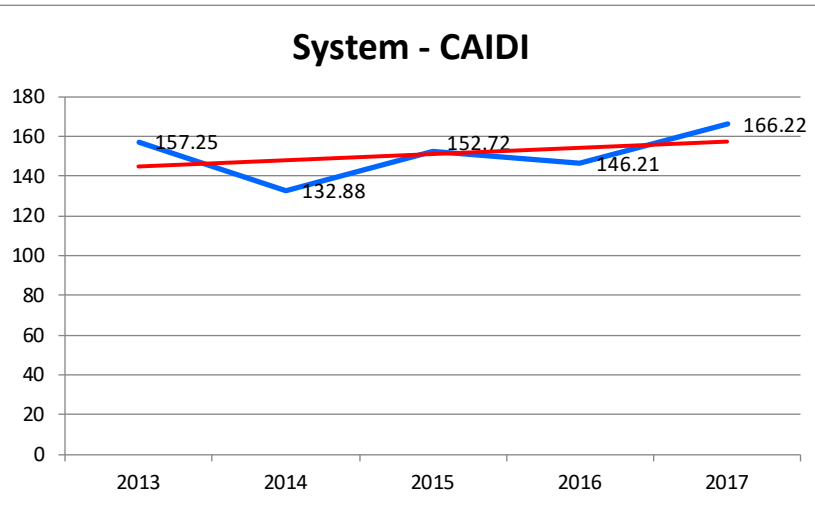
### System - SAIDI



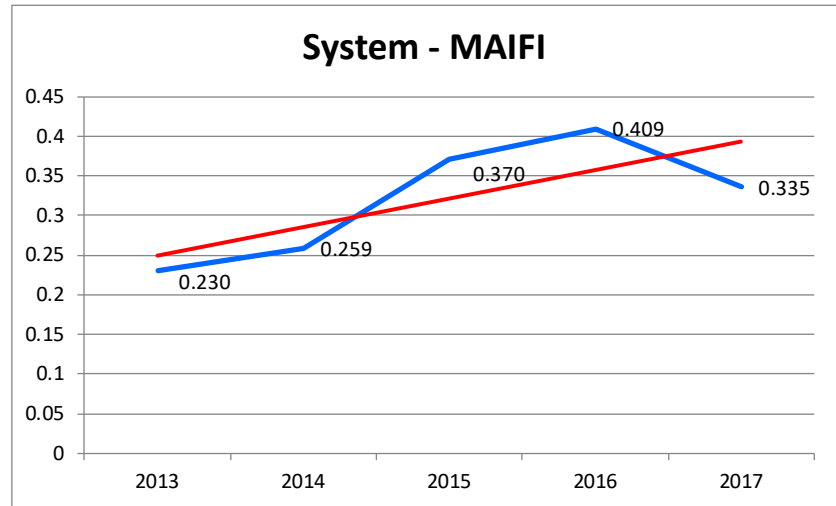
### System - SAIFI



### System - CAIDI

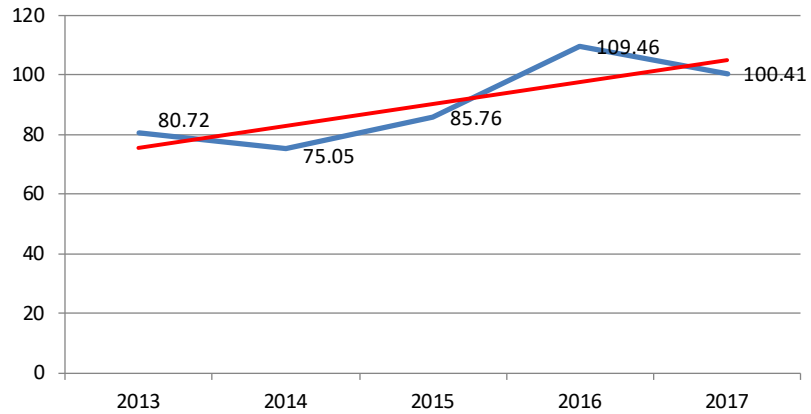


### System - MAIFI

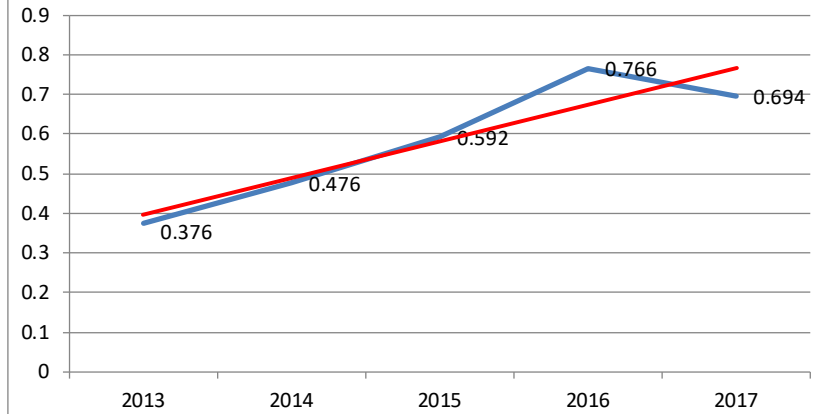


## District Indices - Planned and Unplanned (Excludes ISO; Includes MED)

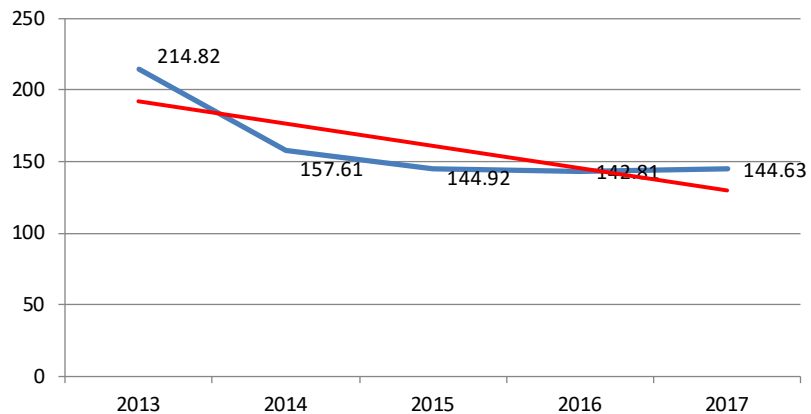
### Beach Cities - SAIDI



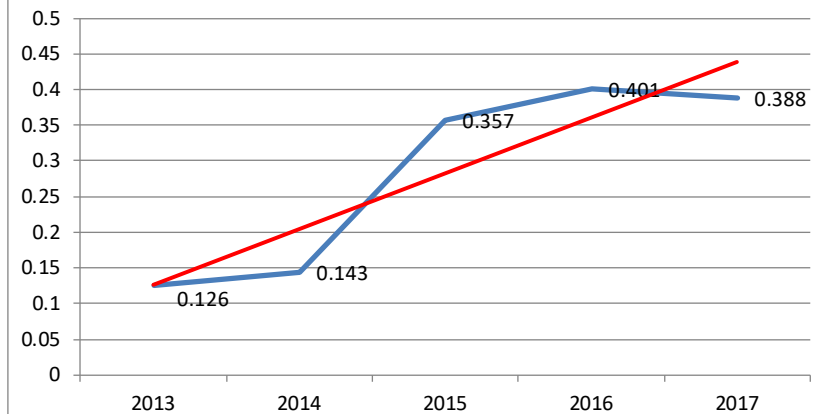
### Beach Cities - SAIFI



### Beach Cities - CAIDI

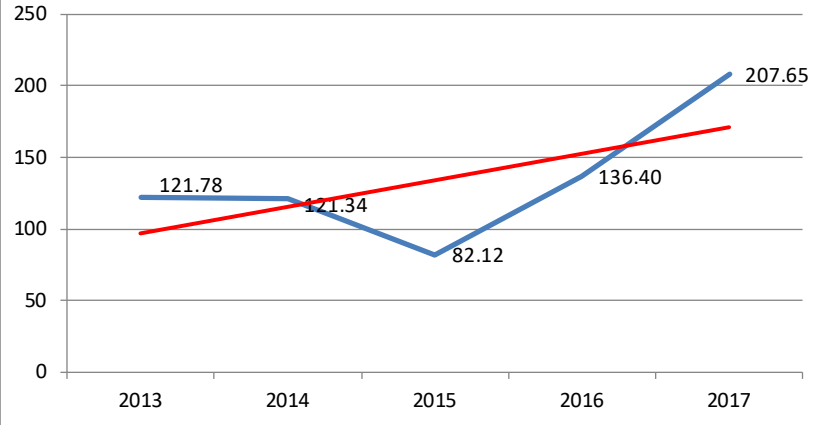


### Beach Cities - MAIFI

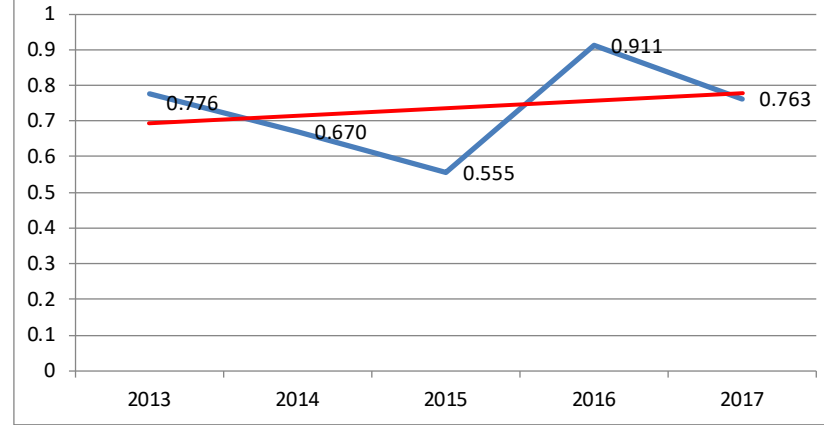


## District Indices - Planned and Unplanned (Excludes ISO; Includes MED)

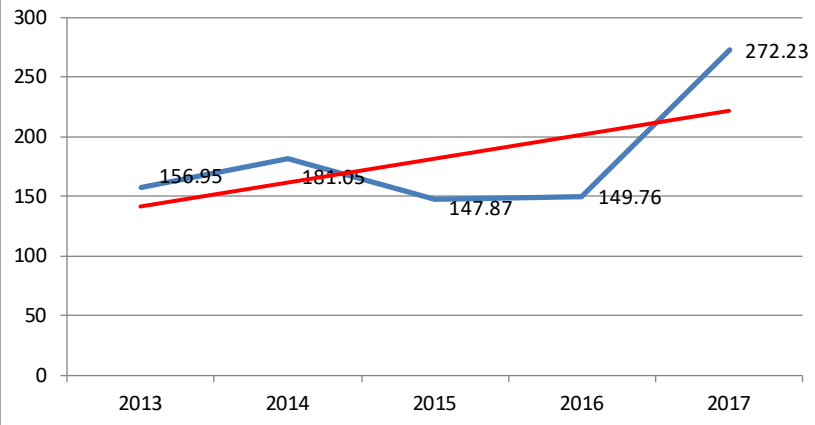
### Eastern - SAIDI



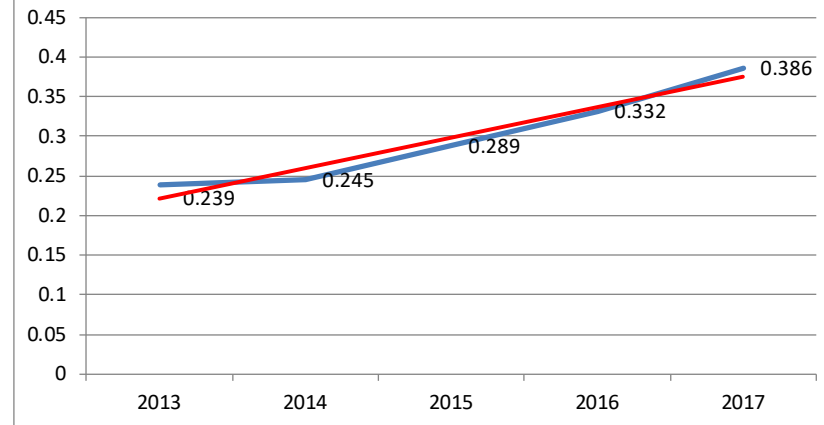
### Eastern - SAIFI



### Eastern - CAIDI

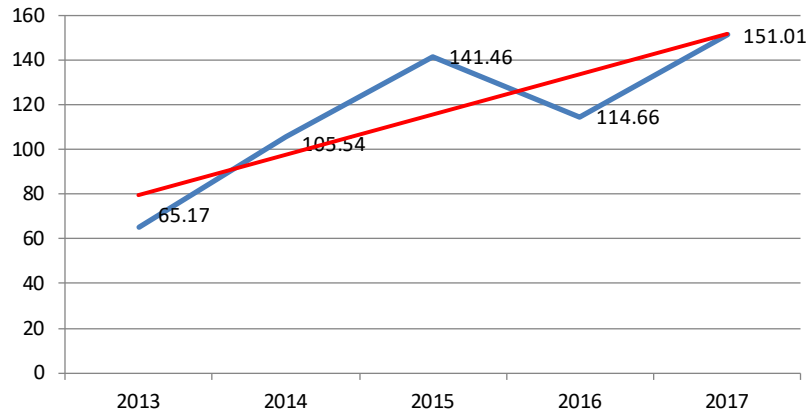


### Eastern - MAIFI

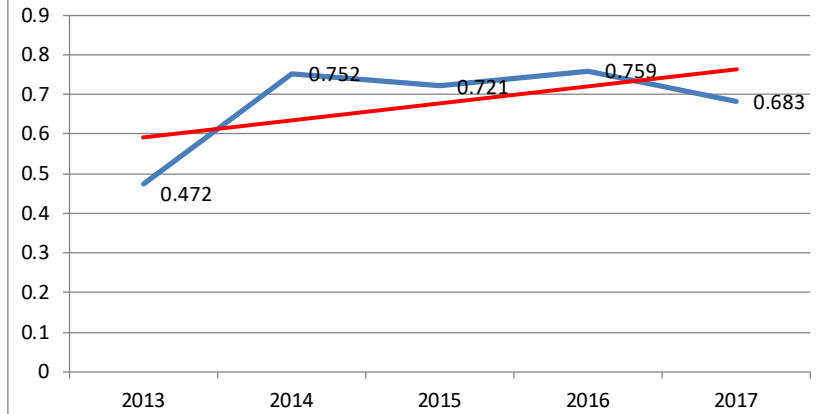


## District Indices - Planned and Unplanned (Excludes ISO; Includes MED)

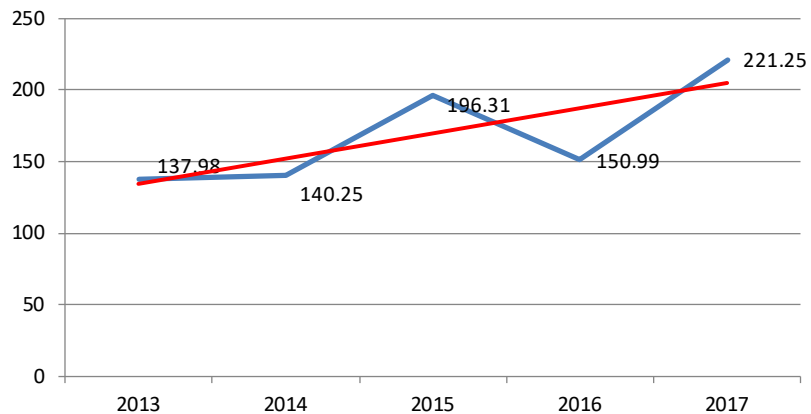
### Metro - SAIDI



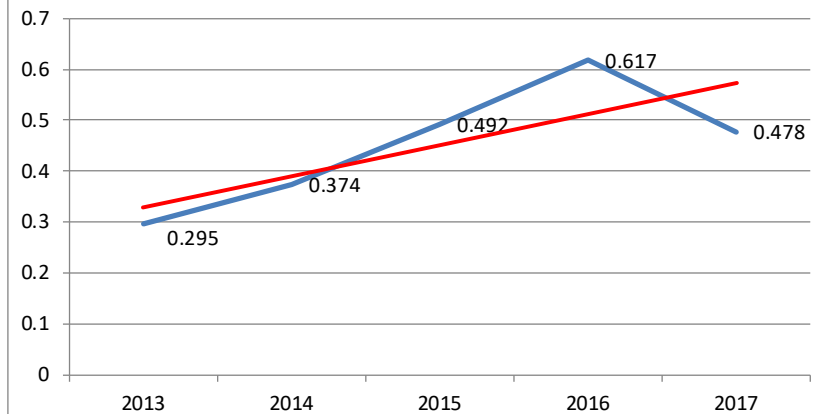
### Metro - SAIFI



### Metro - CAIDI

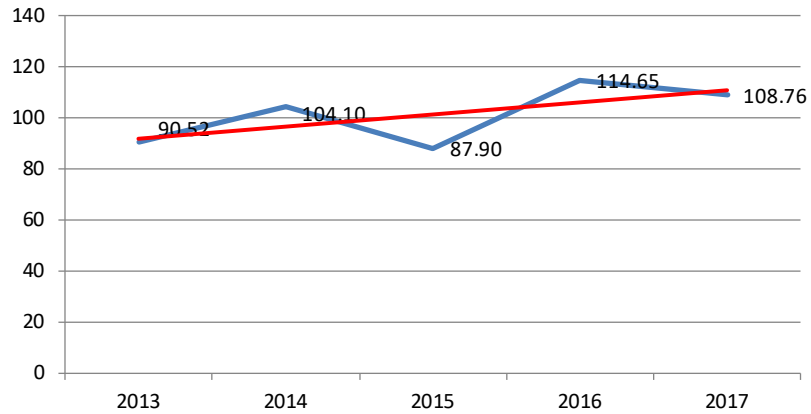


### Metro - MAIFI

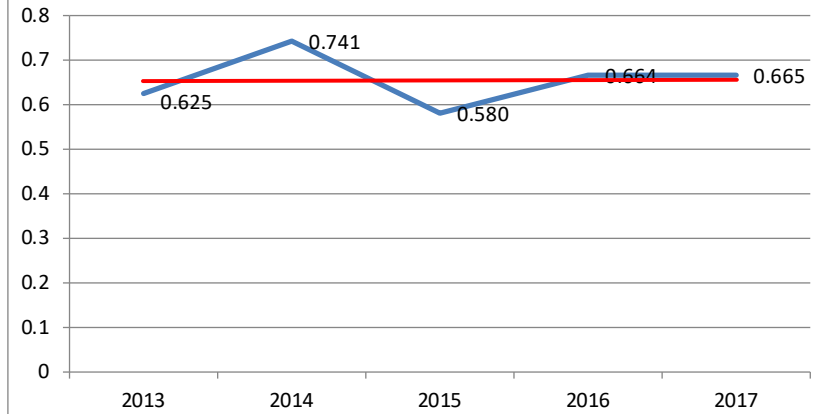


## District Indices - Planned and Unplanned (Excludes ISO; Includes MED)

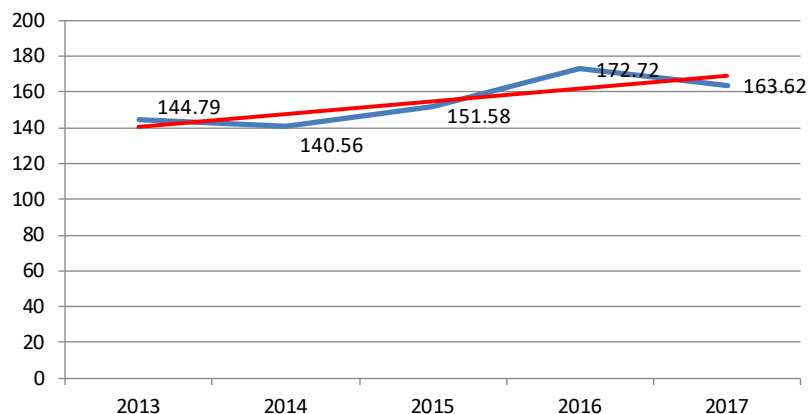
### North Coast - SAIDI



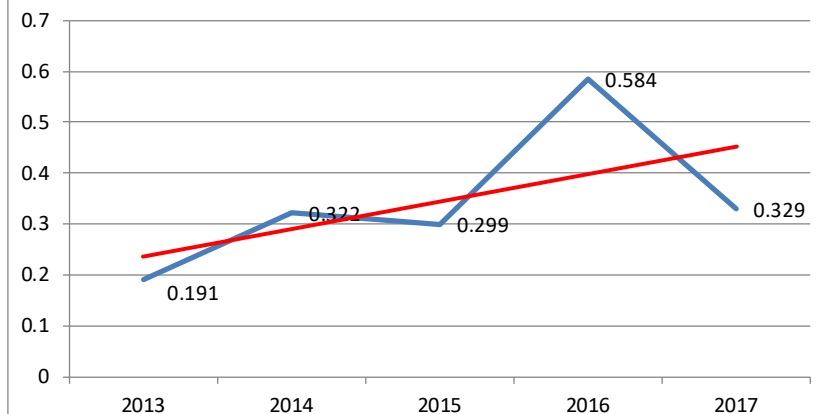
### North Coast - SAIFI



### North Coast - CAIDI

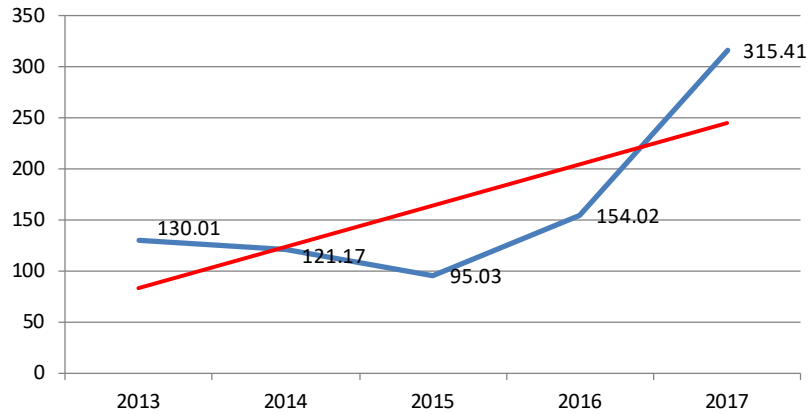


### North Coast - MAIFI

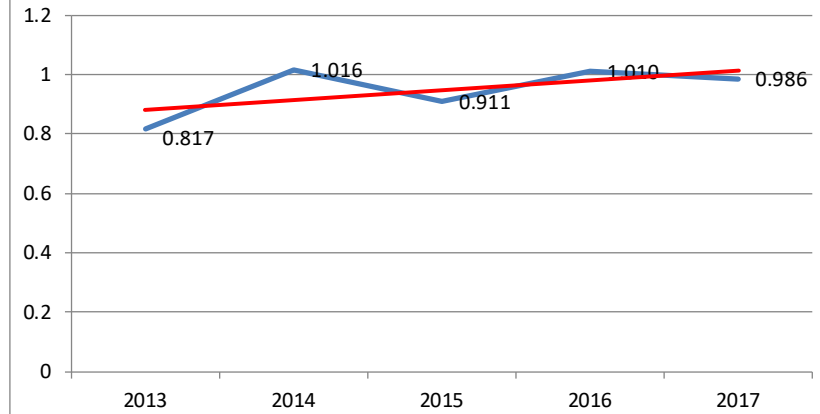


## District Indices - Planned and Unplanned (Excludes ISO; Includes MED)

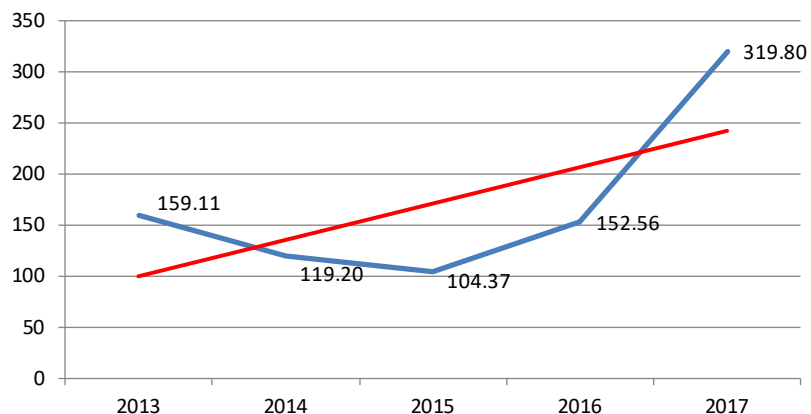
### Northeast - SAIDI



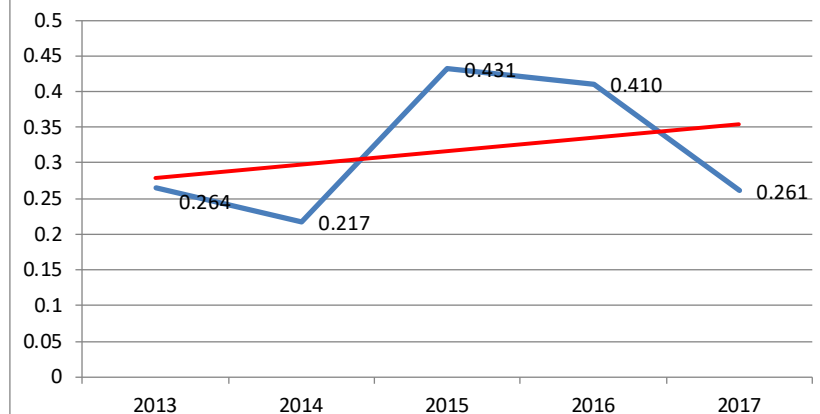
### Northeast - SAIFI



### Northeast - CAIDI

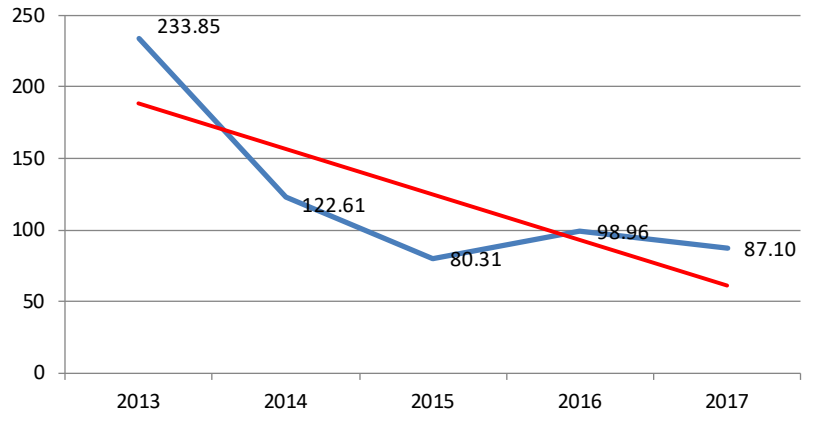


### Northeast - MAIFI

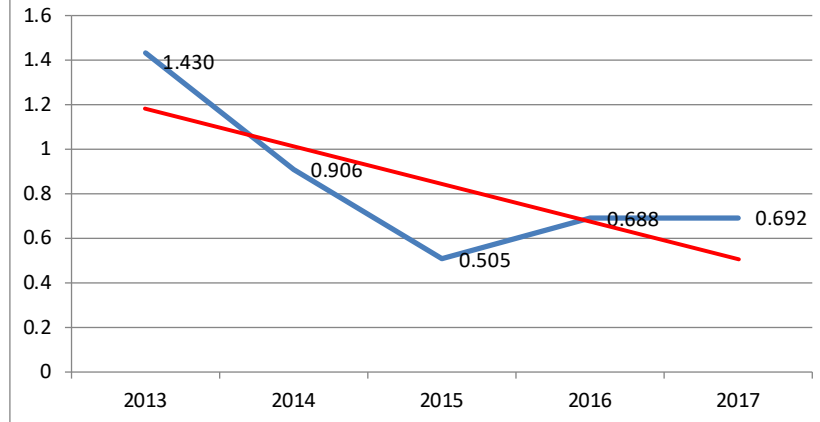


## District Indices - Planned and Unplanned (Excludes ISO; Includes MED)

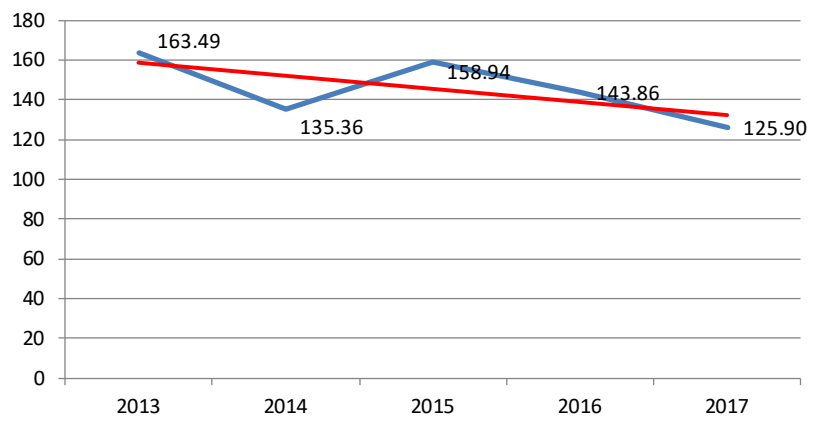
### Orange County - SAIDI



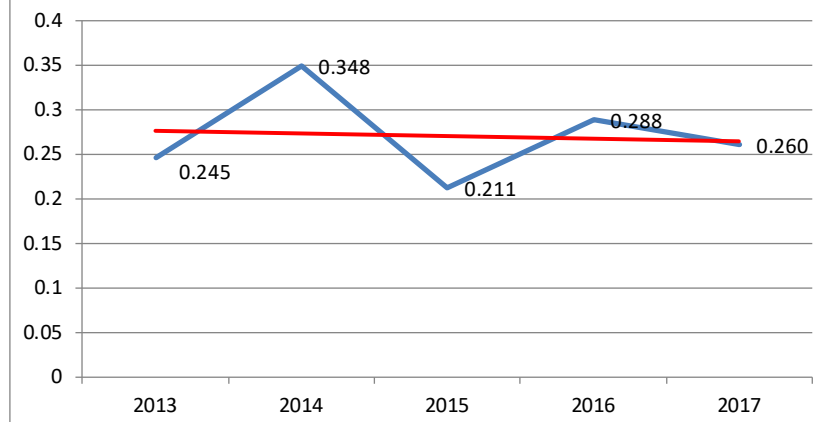
### Orange County - SAIFI



### Orange County - CAIDI



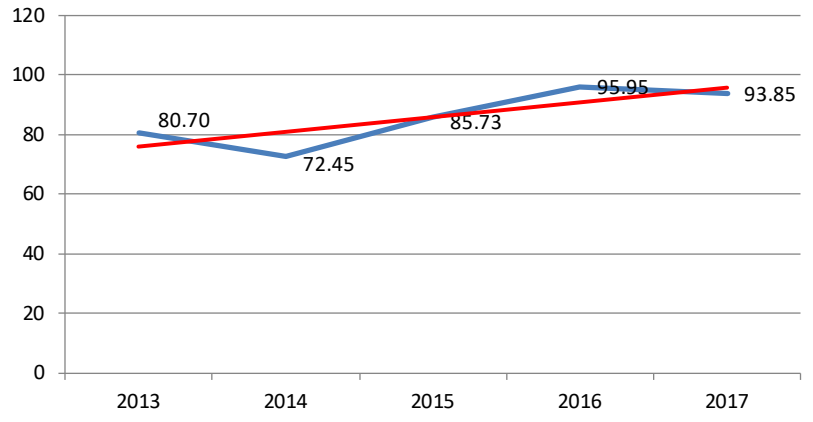
### Orange County - MAIFI



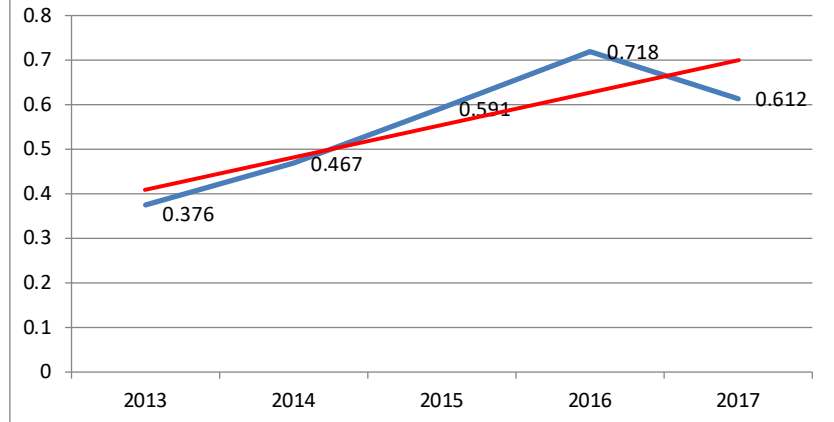


## District Indices - Planned and Unplanned (Excludes ISO and MED)

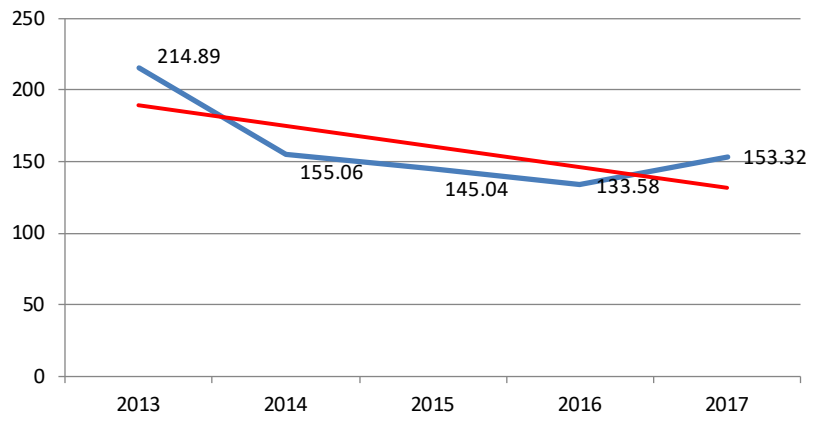
### Beach Cities - SAIDI



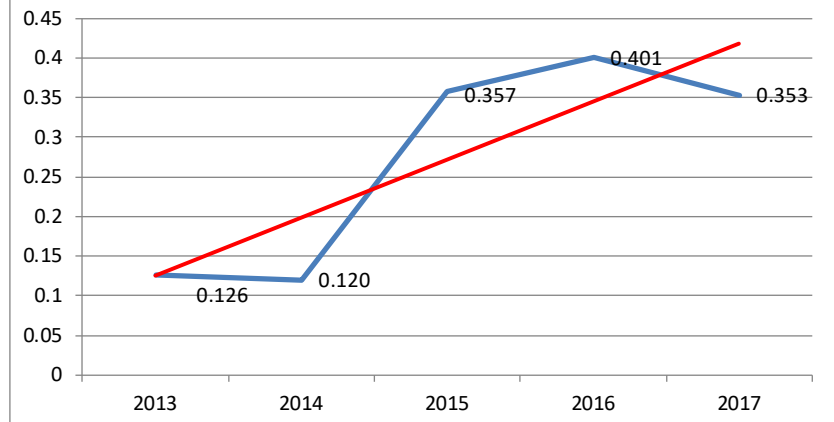
### Beach Cities - SAIFI



### Beach Cities - CAIDI

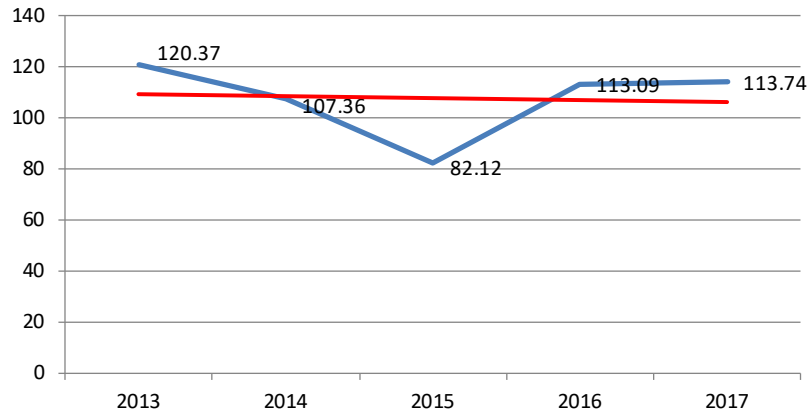


### Beach Cities - MAIFI

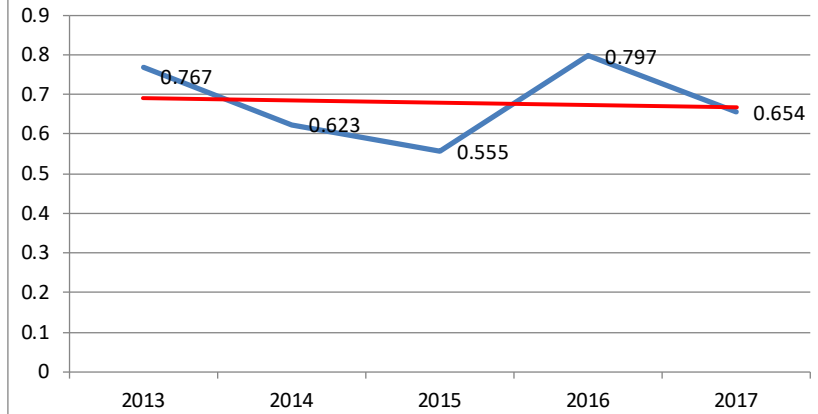


## District Indices - Planned and Unplanned (Excludes ISO and MED)

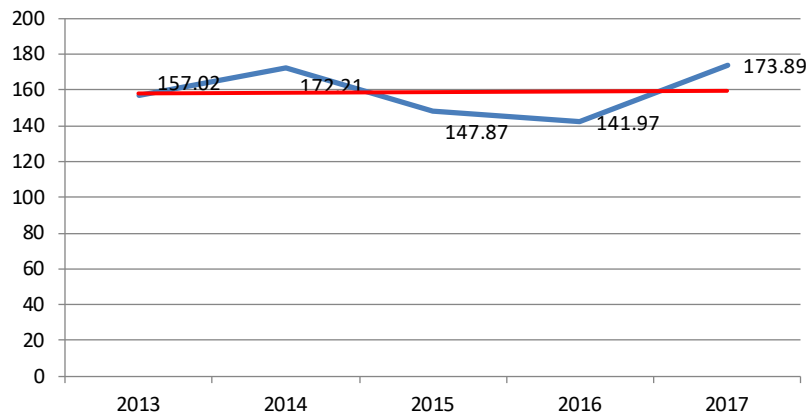
### Eastern - SAIDI



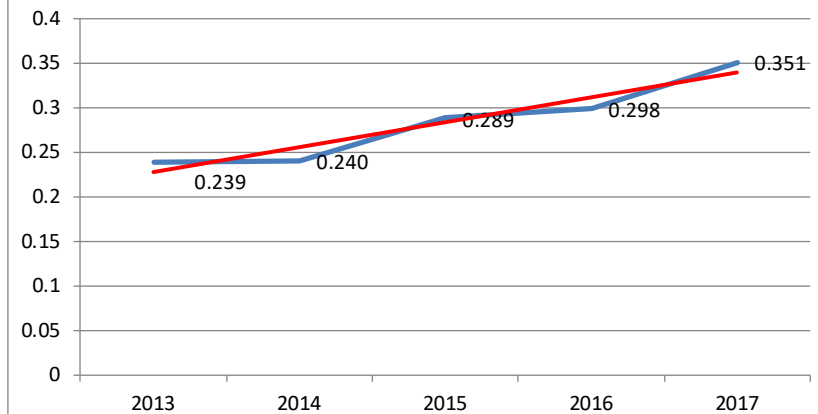
### Eastern - SAIFI



### Eastern - CAIDI

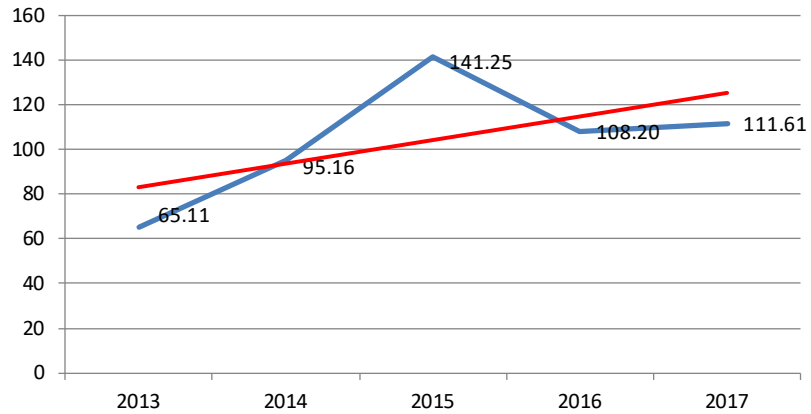


### Eastern - MAIFI

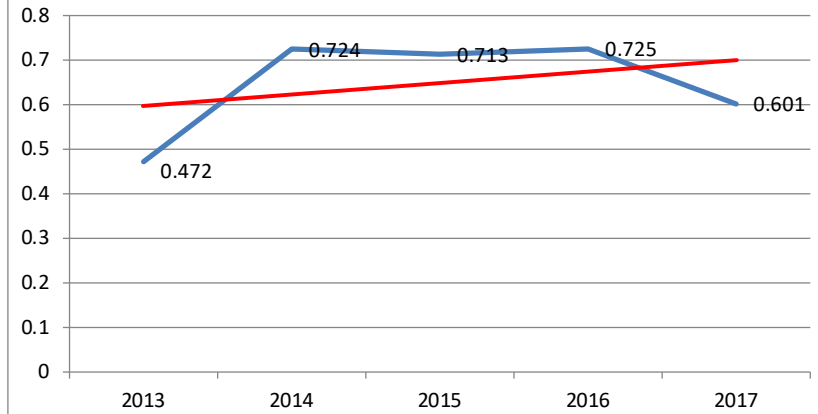


## District Indices - Planned and Unplanned (Excludes ISO and MED)

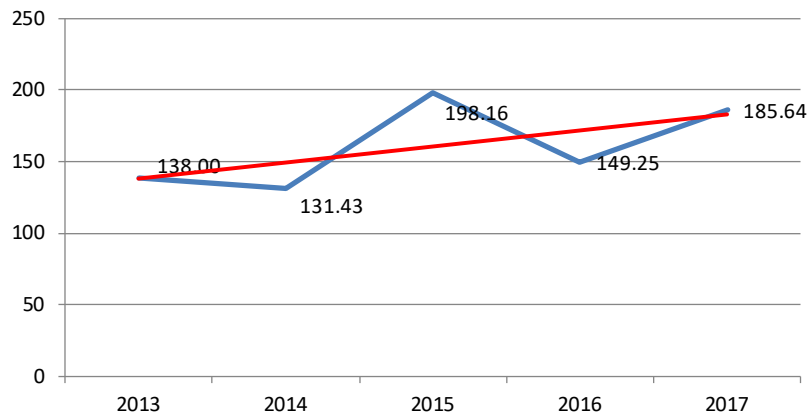
### Metro - SAIDI



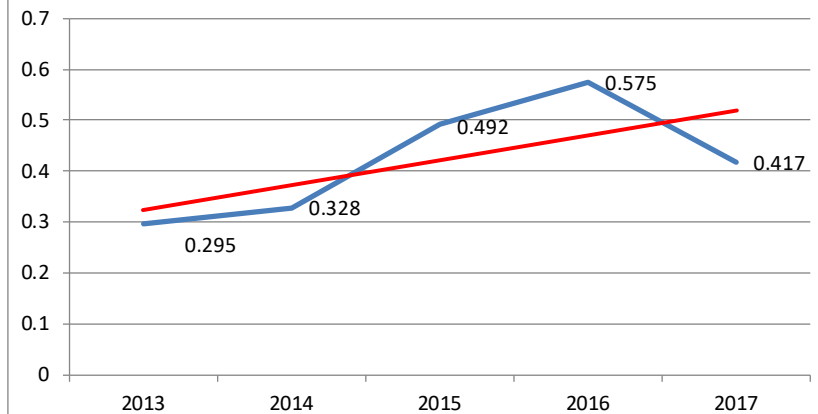
### Metro - SAIFI



### Metro - CAIDI

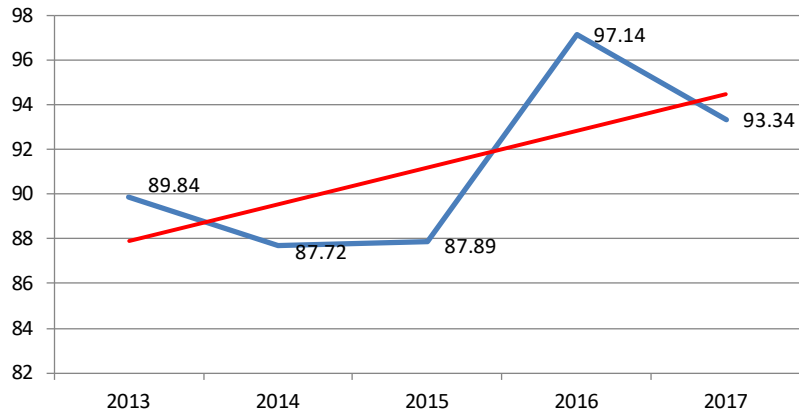


### Metro - MAIFI

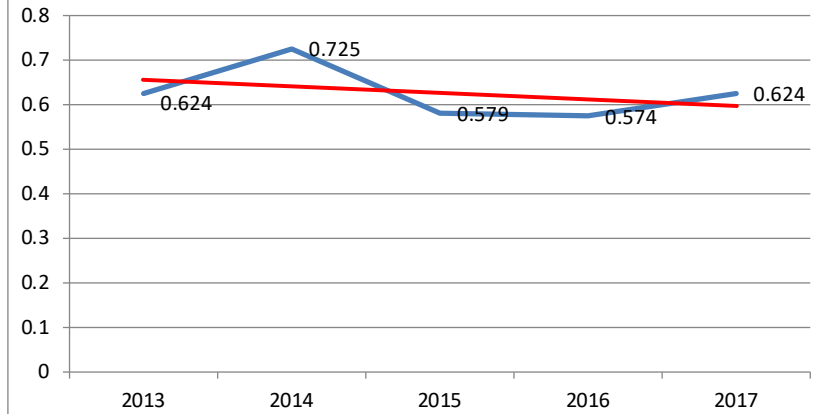


## District Indices - Planned and Unplanned (Excludes ISO and MED)

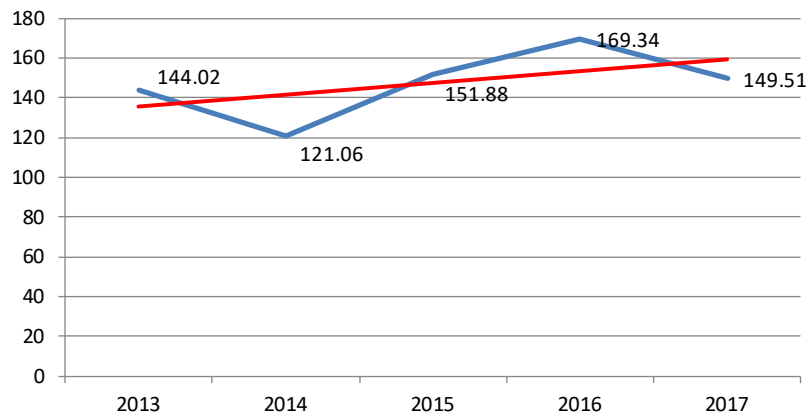
### North Coast - SAIDI



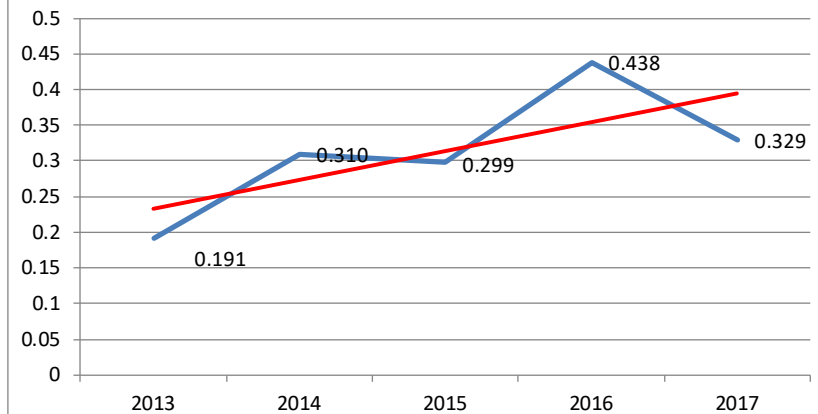
### North Coast - SAIFI



### North Coast - CAIDI

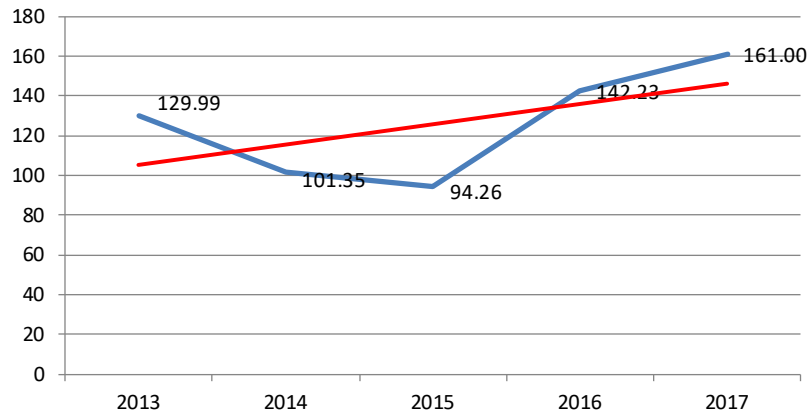


### North Coast - MAIFI

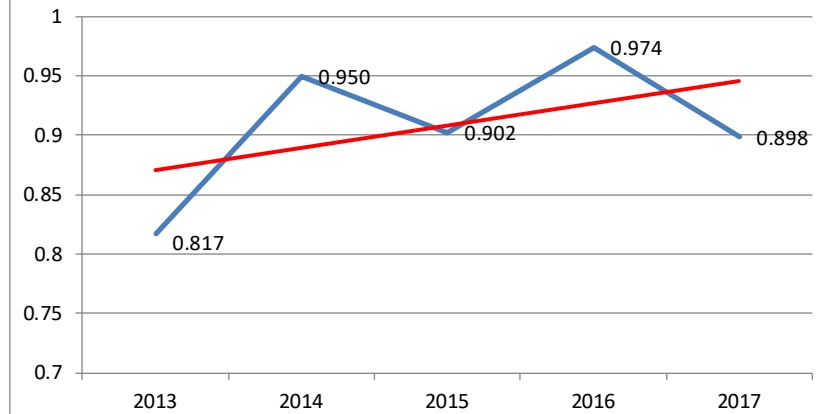


## District Indices - Planned and Unplanned (Excludes ISO and MED)

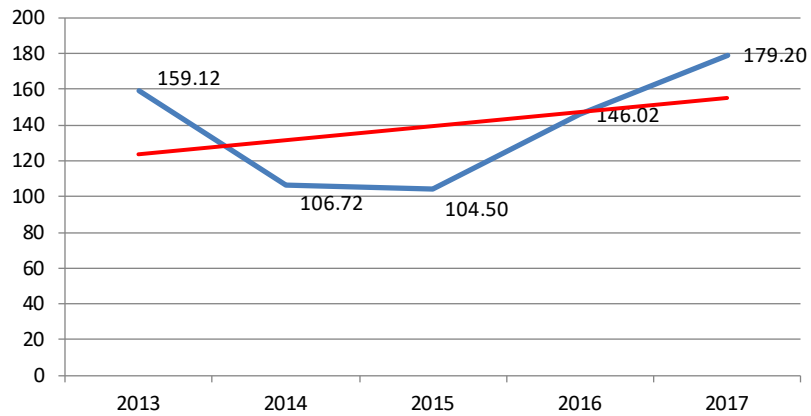
### Northeast - SAIDI



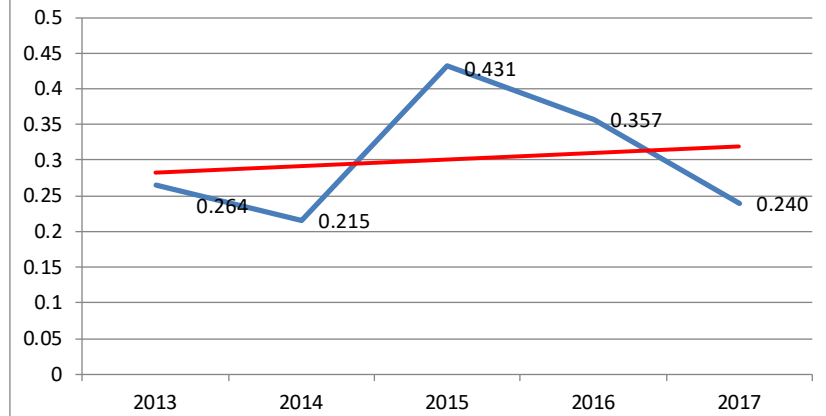
### Northeast - SAIFI



### Northeast - CAIDI

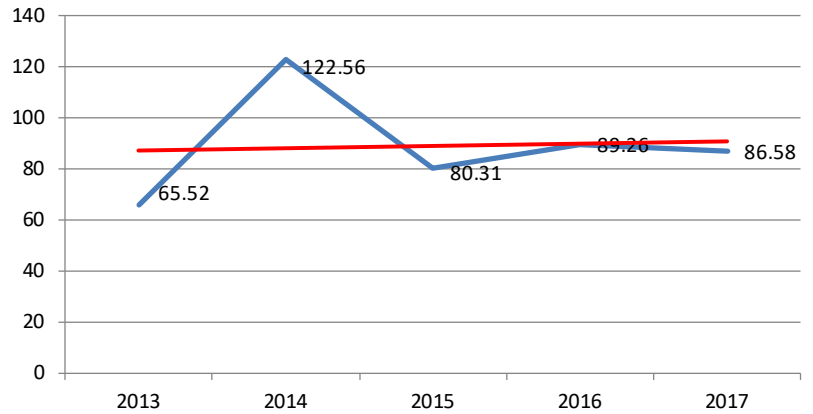


### Northeast - MAIFI

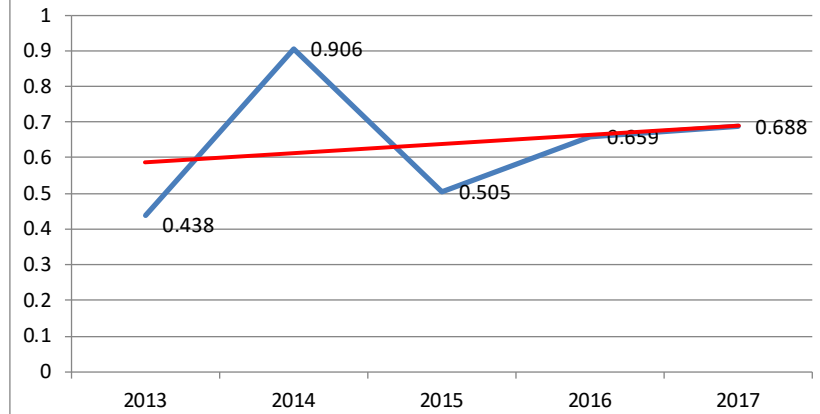


## District Indices - Planned and Unplanned (Excludes ISO and MED)

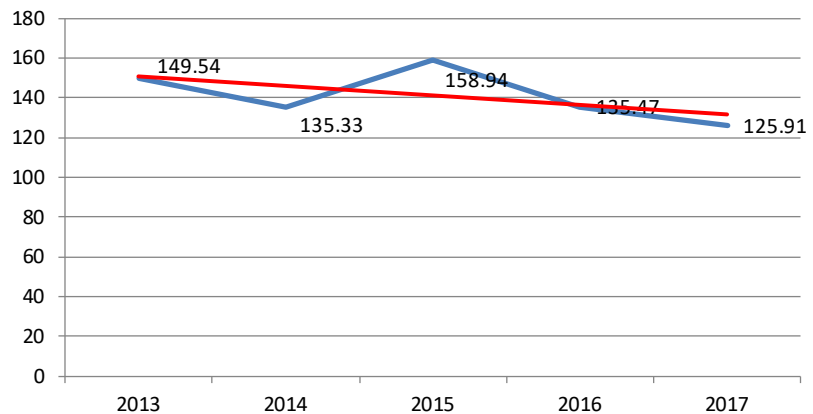
### Orange County - SAIDI



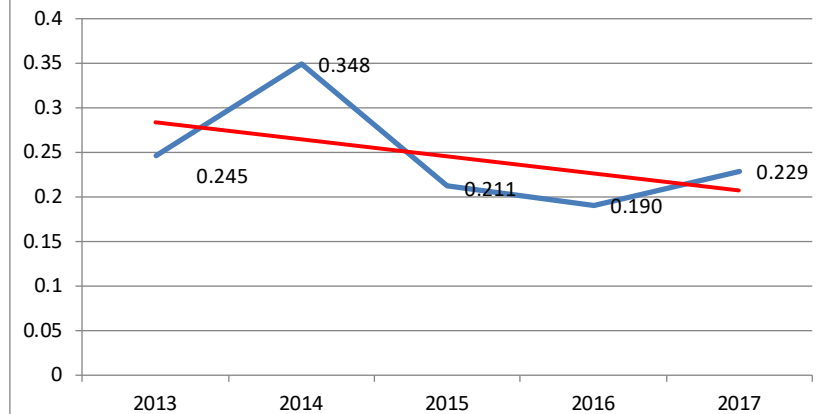
### Orange County - SAIFI



### Orange County - CAIDI



### Orange County - MAIFI



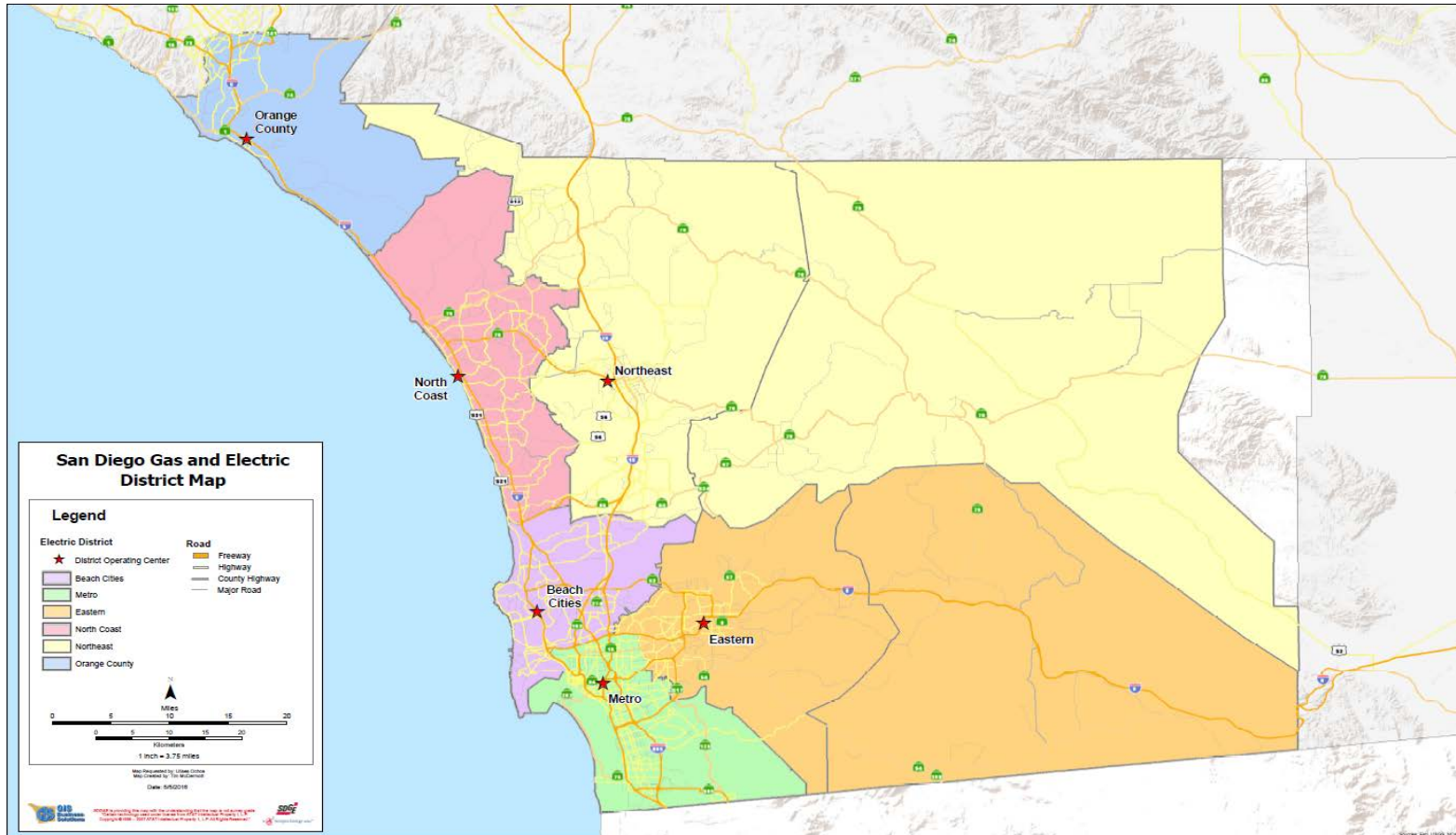
**NUMBER, DATE AND LOCATION OF PLANNED OUTAGES IN EACH DISTRICT (2017)**

<b><u>Planned Outages – 2017</u></b>						
<b>Month</b>	<b>Beach Cities</b>	<b>Eastern</b>	<b>Metro</b>	<b>North Coast</b>	<b>Northeast</b>	<b>Orange County</b>
<b>January</b>	22	20	15	36	59	18
<b>February</b>	39	29	15	42	59	12
<b>March</b>	34	60	26	51	119	18
<b>April</b>	20	50	29	35	106	16
<b>May</b>	28	40	46	53	81	26
<b>June</b>	28	45	29	33	101	31
<b>July</b>	19	49	36	29	70	20
<b>August</b>	26	41	36	21	63	23
<b>September</b>	13	39	29	20	56	16
<b>October</b>	25	36	27	21	72	17
<b>November</b>	24	42	33	23	102	16
<b>December</b>	19	32	23	8	66	11
<b>Totals</b>	<b>297</b>	<b>483</b>	<b>344</b>	<b>372</b>	<b>954</b>	<b>224</b>

**In 2017 there were 2674 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 (2007-2016)**

- 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<sup>2</sup>.

### **Preferred Metric is Circuit SAIDI**

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<sup>2</sup> 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:  
2017 Worst SAIDI Circuits List based upon 2016-2017 data (Excludes Planned and MED)**

Circuit	District	Circuit Customers	Substation Name	Circuit Miles	% OH	% UG	Annualized Feeder Outage Count	Annualized Total Circuit SAIDI **
212	Northeast	660	WARNERS	116.8	96%	4%	6	1293
*448	Eastern	994	CAMERON	86.7	94%	6%	4	1272
441	Eastern	105	GLENCLIFF	26.6	90%	10%	5	1145
*157	Eastern	1,015	BARRETT	114.6	97%	3%	4	1130
78	Eastern	265	DESCANSO	14.7	87%	13%	2	987
PE1	Northeast	133	PINE HILLS	7.0	96%	4%	5	867
1215	Eastern	151	CRESTWOOD	24.7	97%	3%	6	843
220	Northeast	330	SANTA YSABEL	54.7	95%	5%	2	820
222	Northeast	1,328	SANTA YSABEL	126.3	88%	12%	6	752
*440	Eastern	265	GLENCLIFF	23.2	86%	14%	5	731

\* Circuit appeared on the previous worst performance list

\*\* Circuit SAIDI represents the 2-year average (2016-2017) of all outages: Mainline, Feeder, Backbone, and Branch

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

**Table 5.2:**

**2017 Worst SAIFI Circuits List based upon 2016-2017 data (Excludes Planned and MED)**

Circuit	District	Circuit Customers	Substation Name	Circuit Miles	% OH	% UG	Annualized Feeder Outage Count	Annualized Total Circuit SAIFI **
*MAN1	Northeast	103	MANZANITA	3.9	100%	0%	6	6.4
*SL1	Northeast	227	SALTON	5.0	98%	2%	6	6.3
*221	Northeast	1,121	SANTA YSABEL	93.2	94%	6%	8	6.0
*OK1	Northeast	153	OAKS 1	8.6	98%	2%	6	5.9
973	Northeast	1,352	CREELMAN	50.5	46%	54%	6	5.3
PE1	Northeast	133	PINE HILLS	7.0	96%	4%	5	4.4
*440	Eastern	265	GLENCLIFF	23.2	86%	14%	5	4.3
222	Northeast	1,328	SANTA YSABEL	126.3	88%	12%	6	4.1
1215	Eastern	151	CRESTWOOD	24.7	97%	3%	6	4.1
*172	Northeast	991	BORREGO	58.4	67%	33%	5	4.0

\* Circuit appeared on the previous worst performance list

\*\* Circuit SAIFI represents the 2-year average (2016-2017) 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 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;

448 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	2016	2017
448	Circuit SAIDI	908	1635

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 because of a poor performing 2017 calendar year. The total circuit SAIDI contribution in 2017 was 1635 minutes, 1491 of which were from a single proactive de-energization event on 12/10/17. SDG&E de-energized customers on C448 in order to prevent inadvertent wildfire ignition due to extreme fire risk present.

- 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 will fire harden the circuit by replacing small wire on C448 in 2019. This includes replacement of the majority of the wire spans and poles on the circuit with new structures. Additionally, SDG&E will be removing a grounding bank and adding a gang operated switch to a normally open loop to create a redundant feed to normally radial customers on the circuit.

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

The primary cause of outages on C448 was proactive de-energization due to wildfire risk. Fire hardening structures and removing small wire from the system will reduce the risk of ignitions associated with utility infrastructure, but will not reduce the risk of proactive de-energization due to extreme wildfire conditions. Future performance of this circuit will depend largely on prevailing wildfire conditions.

## **Circuit 157**

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

C157 was listed as a worst circuit due to circuit SAIDI performance.

- ii. A historical record of the metric:

**C157: 2 Year Circuit SAIDI Data**

<b>Cir</b>	<b>Metric</b>	<b>2016</b>	<b>2017</b>
157	Circuit SAIDI	1443	817

Note: See methodology in section 5c

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

C157 was on the worst circuit SAIDI list due abnormally large impacts in 2016 (1443 min.) combined with a large impact in 2017 (817 min.). 557 of the 817 minutes were due to a single proactive de-energization event on 12/10/17. SDG&E de-energized customers on C157 in order to prevent inadvertent wildfire ignition due to extreme fire risk present.

- 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 will fire harden the circuit by replacing small wire on C157 in both 2018 and 2019. This includes replacement of roughly half of the wire spans and poles on the circuit with new structures. Additionally, SDG&E will be adding Supervisory Control and Data Acquisition (SCADA) capabilities to two tie switches, add a SCADA sectionalizing switch, and add a gang-operated switch for manual sectionalizing.

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

The primary cause of outages on C157 was proactive de-energization due to wildfire risk. Fire hardening structures and removing small wire from the system will reduce the risk of ignitions associated with utility infrastructure, but will not reduce the risk of proactive de-energization due to extreme wildfire conditions. Future performance of this circuit will largely depend on prevailing wildfire conditions.

## **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**

<b>Cir</b>	<b>Metric</b>	<b>2016</b>	<b>2017</b>
440	Circuit SAIDI	648	814
440	Circuit SAIFI	4.8	3.8

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 a single outage caused by wire down on 1/27/17, accounting for approximately 674 of the 814 annual minutes. C440 was on the worst circuit SAIFI list largely due to transmission level events that de-energized TL629, the sole feed into Glencliff substation, and C440.

- 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 rebuilt most of C440 with fire hardened structures and a large section will be undergrounded. The project will begin in late 2018 and conclude in 2020.

The final transmission configuration after the Cleveland National Forest project will leave 3x feeds into the transmission loop where Glencliff substation (and C440) are fed. 2x of these feeds share a single corridor and may be subject to concurrent outages as they share structures. The third feed is normally open to prevent overloads on the transmission system. A project was presented to the California ISO to install a phase-shifting transformer so that the third feed could be operated normally closed without causing overloads. The project was denied in 2017. SDG&E will resubmit the project for further consideration, but transmission caused outage frequencies in this transmission loop will remain high until a mitigating project is implemented.

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

Fire hardening efforts will 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. Efforts justifying this project are predicated on public health and safety improvements.

Future transmission performance will continue to be an issue until a mitigating project is approved.

**Circuits 221 / OK1 / SL1 / MAN1**

- 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, SL1, and MAN1 are 4kV circuits fed from circuit 221, so impacts from C221 also affect these circuits directly. 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**

<b>CIR</b>	<b>Metric</b>	<b>2016</b>	<b>2017</b>
221	Circuit SAIFI	6.9	5.1
OK1	Circuit SAIFI	6.8	4.9
SL1	Circuit SAIFI	7.7	5.0
MAN1	Circuit SAIFI	7.9	5.0

Note: See methodology in section 5c

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

C221 was on the WC SAIFI list due to 4x high customer count outage events. 1x was de-energized for safety to repair damaged aerial cable found through maintenance inspections. 2x events are related to SDG&E's use of extra sensitive relaying that can, in some instances, cause mis-coordination between isolating devices resulting in additional customer impacts for (what would otherwise be) smaller outages. This relaying is deployed to improve both crew safety and fault energy for wildfire ignition. The last outage was caused by an animal contact at the Santa Ysabel substation.

- 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 largely 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.

The primary cause of the high frequency of outages on C221 is related to wildfire and crew safety mitigation measures. Fire hardening structures and removing small wire from the system will reduce the risk of ignitions associated with utility infrastructure, but will not reduce the reliability impact of other measures on the system. Completion of work on this circuit though will reduce the frequency that extra sensitive relaying is enabled on the circuit due to crew safety measures.

**Circuit 172**

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

C172 was listed as a worst circuit due to circuit SAIFI performance.

- ii. A historical record of the metric:

**C172: 2 Year Circuit SAIFI Data**

<b>Cir</b>	<b>Metric</b>	<b>2016</b>	<b>2017</b>
172	Circuit SAIFI	6.5	1.5

Note: See methodology in section 5c

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

C172 was listed primarily due to the high number of whole circuit outage instances in 2016, with very little contribution from 2017. All instances of whole circuit outages on C172 in 2016 were due to inclement weather or issues with the transmission system feeding the area.



- 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 looked at numerous solutions of running new Transmission to the Borrego substation and deemed microgrid investment the most cost effective solution. SDG&E has constructed a microgrid that includes 1.75MW of energy storage, 3.6MW of diesel generation, and integrates 26MW of renewable generation from a third party. The Borrego Springs microgrid has reduced numerous planned and unplanned outages and has effectively carried the entire Borrego Springs community while islanded from the larger SDG&E grid. SDG&E continues to invest time and infrastructure to increase the effectiveness of the microgrid to improve the reliability of the customers it serves.

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

Once a thorough assessment is completed, an SDG&E Distributed Energy Resource Management System (DERMS) operator can remotely start the microgrid from the Distribution Control Center in Mission Valley. An average assessment takes 4 hours.

- 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 2017, 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 2017, 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 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 the Electric Risk Analysis team, a cross-functional team responsible for reducing risk and improving reliability in the service territory's rural areas.

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

### **TOP 10 MAJOR UNPLANNED OUTAGE EVENTS (2016)**

The table below captures the top 10 major unplanned outage events for 2017 including the cause and the location of the outage.

<b>Top 10 Major Unplanned Power Outage Events</b>						
<b>Rank</b>	<b>Outage Date</b>	<b>Cause</b>	<b>Location</b>	<b>Customer Impact</b>	<b>SAIDI</b>	<b>SAIFI</b>
1	7/25/2017	Substation - Animal Contact	CM	45200	1.93	0.031
2	1/20/2017	Rain / Wind Storm	All Districts	43848	11.48	0.030
3	12/7/2017	High Winds / RFW	BC, CM, EA, NC, NE	32820	18.32	0.023
4	12/5/2017	High Winds spanning multiple days	All Districts	14313	4.77	0.010
5	2/17/2017	Rain / Wind Storm	All Districts	12799	1.07	0.009
6	10/5/2017	Mylar Balloon	EA, NE	9715	0.93	0.007
7	12/21/2017	Vehicle Contact	CM	8370	0.62	0.006
8	12/5/2017	Substation - Relay Equipment	CM	7683	0.83	0.005
9	1/14/2017	Damaged Poles	BC	7289	0.59	0.005
10	6/4/2017	Faulted Cable	CM	7263	0.74	0.005

Based upon customer impact

**SECTION 7 – SUMMARY LIST OF MED PER IEEE 1366**

**2017 SUMMARY LIST OF MED (2017)**

The tables below summarize the four MED events occurring in 2017. The information includes the number of customers without services at periodic intervals, the cause and the location of the Major Event.

Table 7-1 2017 Summary List of 1/20/17 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		
January 20	Rain / Wind Storm	All Districts	59,302	0	318	369	1106	1106	622	620	620	620		
				Customers Interrupted - Hours Into the Event Day (continued)										
				9	10	11	12	13	14	15	16	17		
				620	429	630	2160	3164	5666	21880	29216	30314		
				Customers Interrupted - Hours Into the Event Day (continued)										
				18	19	20	21	22	23	24	25	26		
				23796	20349	18574	17161	16610	14755	11159	9786	7149		
				Customers Interrupted - Hours Into the Event Day (continued)										
				27	28	29	30	31	32	33	34	35		
				5690	5659	5637	5475	4337	3890	3655	3598	3558		
				Customers Interrupted - Hours Into the Event Day (continued)										
				36	37	38	39	40	41	42	43	44		
				3461	3451	3238	3034	3034	2979	2711	2679	2634		
				Customers Interrupted - Hours Into the Event Day (continued)										
				45	46	47	48	49	50	51	52	53		
				2572	2490	1773	212	212	147	147	147	46		
				Customers Interrupted - Hours Into the Event Day (continued)										
				54	55	56	57	58	59	60	...	138		
				46	46	46	46	46	4	4	4	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 2017 Summary List of 12/6/17 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	
December 6	Winds / RFW	CM, EA, NE	2,966	0	0	0	0	0	0	0	0	0	25
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>									
				<b>18</b>	<b>20</b>	<b>22</b>	<b>24</b>	<b>26</b>	<b>28</b>	<b>30</b>	<b>32</b>	<b>34</b>	
				98	227	1505	1505	1502	1502	1507	2878	2878	
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>									
				<b>36</b>	<b>38</b>	<b>40</b>	<b>42</b>	<b>44</b>	<b>46</b>	<b>48</b>	<b>50</b>	<b>52</b>	
				2878	2878	2878	2878	2878	2878	2878	2878	2878	
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>									
				<b>54</b>	<b>56</b>	<b>58</b>	<b>60</b>	<b>62</b>	<b>64</b>	<b>66</b>	<b>68</b>	<b>70</b>	
				2878	2878	2878	2878	2119	1610	665	559	92	
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>									
				<b>72</b>	<b>74</b>	<b>76</b>	<b>78</b>	<b>80</b>	<b>82</b>	<b>84</b>	<b>86</b>	<b>88</b>	
				92	92	92	92	92	92	92	92	92	
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>									
				<b>90</b>	<b>92</b>	<b>94</b>	<b>96</b>	<b>98</b>	<b>100</b>	<b>102</b>	<b>104</b>	<b>106</b>	
				92	92	92	92	92	92	92	92	92	
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>									
				<b>108</b>	<b>110</b>	<b>112</b>	<b>114</b>	<b>116</b>	<b>118</b>	<b>120</b>	<b>122</b>	<b>124</b>	
				92	92	92	92	92	92	92	92	92	
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>									
<b>126</b>	<b>128</b>	<b>130</b>	<b>132</b>	<b>134</b>	<b>136</b>								
92	92	2	2	2	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 7-3 2017 Summary List of 12/7/17 MED

Date of Outage	Description of Outage	Location	Number of Customers Out of Service	Customers Interrupted - Hours Into the Event Day *											
				0	3	6	9	12	15	18	21	24			
December 7	Winds / RFW Lilac Fire	BC, CM, EA, NC, NE	37,264	0	0	466	5139	8378	23296	14172	17309	17239			
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>											
				<b>27</b>	<b>30</b>	<b>33</b>	<b>36</b>	<b>39</b>	<b>42</b>	<b>45</b>	<b>48</b>	<b>51</b>			
				17239	17236	17003	14766	12269	8591	6264	4545	4481			
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>											
				<b>54</b>	<b>57</b>	<b>60</b>	<b>63</b>	<b>66</b>	<b>69</b>	<b>72</b>	<b>75</b>	<b>78</b>			
				4481	4481	4481	3275	3275	1850	1850	1850	1850			
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>											
				<b>81</b>	<b>84</b>	<b>87</b>	<b>90</b>	<b>93</b>	<b>96</b>	<b>99</b>	<b>102</b>	<b>105</b>			
				1850	1850	1620	1493	494	494	494	494	348			
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>											
				<b>108</b>	<b>111</b>	<b>114</b>	<b>117</b>	<b>120</b>	<b>123</b>	<b>126</b>	<b>129</b>	<b>132</b>			
				258	122	55	51	51	51	51	51	50			
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>											
				<b>135</b>	<b>138</b>	<b>141</b>	<b>144</b>	<b>147</b>	<b>150</b>	<b>153</b>	<b>156</b>	<b>159</b>			
				41	11	9	9	9	9	9	9	8			
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>											
				<b>162</b>	<b>165</b>	<b>168</b>	<b>171</b>	<b>174</b>	<b>177</b>	<b>180</b>					
				5	2	2	2	2	2	2	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 7-4 2017 Summary List of 12/9/17 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												
December 9	Winds / RFW	BC, CM, EA, NE	5,540	0	75	75	13	13	13	13	13	13	13											
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>																				
				9	10	11	12	13	14	15	16	17												
				253	739	1237	2632	2632	2633	2633	2633	2645												
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>																				
				18	19	20	21	22	23	24	25	26												
				2645	3852	2847	3259	2853	2837	3646	3646	3646												
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>																				
				27	28	29	30	31	32	33	34	35												
				3646	3646	3646	3646	3646	3646	3646	3646	3646												
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>																				
				36	37	38	39	40	41	42	43	44												
				3646	3646	3646	3646	3646	3646	3265	3265	3198												
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>																				
				45	46	47	48	49	50	51	52	53												
				3198	3198	3198	3198	3198	3198	3198	3198	3198												
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>																				
				54	55	56	57	58	59	60	61	62												
				3198	3198	3198	3012	3010	2860	2376	2084	513												
				<b>Customers Interrupted - Hours Into the Event Day (continued)</b>																				
63	64																							
203	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 (2008-2017)**

The tables below capture the ten largest unplanned outage events for each of the years from 2017 – 2008

#### **2017**

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



**2016**

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

**2015**

<b>Historical 10 Largest Unplanned Outage Events</b>				
<b>Rank</b>	<b>Date</b>	<b>SAIDI</b>	<b>SAIFI</b>	<b>Description</b>
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**

<b>Historical 10 Largest Unplanned Outage Events</b>				
<b>Rank</b>	<b>Date</b>	<b>SAIDI</b>	<b>SAIFI</b>	<b>Description</b>
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**

<b>Historical 10 Largest Unplanned Outage Events</b>				
<b>Rank</b>	<b>Date</b>	<b>SAIDI</b>	<b>SAIFI</b>	<b>Description</b>
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**

<b>Historical 10 Largest Unplanned Outage Events</b>				
<b>Rank</b>	<b>Date</b>	<b>SAIDI</b>	<b>SAIFI</b>	<b>Description</b>
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**

<b>Historical 10 Largest Unplanned Outage Events</b>				
<b>Rank</b>	<b>Date</b>	<b>SAIDI</b>	<b>SAIFI</b>	<b>Description</b>
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**

<b>Historical 10 Largest Unplanned Outage Events</b>				
<b>Rank</b>	<b>Date</b>	<b>SAIDI</b>	<b>SAIFI</b>	<b>Description</b>
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**

<b>Historical 10 Largest Unplanned Outage Events</b>				
<b>Rank</b>	<b>Date</b>	<b>SAIDI</b>	<b>SAIFI</b>	<b>Description</b>
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



**2008**

<b>Historical 10 Largest Unplanned Outage Events</b>				
<b>Rank</b>	<b>Date</b>	<b>SAIDI</b>	<b>SAIFI</b>	<b>Description</b>
1	12/17/2008	3.51	0.010	December 17 - Heavy Rain and Snow Storm Part II
2	1/5/2008	1.33	0.011	January '08 Rain & Lightning Storm -Multiple Areas
3	12/15/2008	1.02	0.006	December 15 - Heavy Rain and Snow Storm
4	5/31/2008	0.92	0.003	Circuits 138 & HC3 Tree Contact (also affecting Circuit 139 & 4kVs)
5	10/19/2008	0.91	0.001	Circuit 213 - Damaged UG Cable
6	6/22/2008	0.67	0.002	Circuit 990 - Faulted Terminator
7	4/8/2008	0.61	0.003	Circuit 486 - Motor Vehicle Contact, Terminator, Cable Repair
8	12/25/2008	0.58	0.004	Circuits 286 & EN2- Multiple Circuits affected during Restoration
9	5/23/2008	0.56	0.002	Circuit 159 - Pothead Failure
10	9/24/2008	0.56	0.004	Bank 20 WA3, WA4, WA5 and WA6 - Bad Relay

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

**CUSTOMER INQUIRIES ON RELIABILITY DATA (2017)**

SDG&E received no customer inquiries for reliability data in 2017.

## **APPENDIX**

### **FIRE RELATED OUTAGE INFORMATION**

#### **LILAC FIRE EVENT**

##### **I. DESCRIPTION OF THE EVENT**

On Thursday, December 7, 2017, the Lilac Fire affected northern San Diego County resulting in multiple outages to customers in the SDG&E service territory. This event affected 4,444 sustained customers.

##### **II. DATES OF THE EVENT**

The Event started on 12/7/17, with all customers restored by 12/14/17.

##### **III. THE NUMBER OF CUSTOMERS AFFECTED BY THE EVENT**

4,444 customers experienced a sustained outage.

##### **IV. LONGEST CUSTOMER INTERRUPTION IN HOURS**

The longest outage duration was 167 hours. The outage began on 12/7/17 at 12:25 pm, and was restored on 12/14/17 at 11:37 AM.

##### **V. THE NUMBER OF CUSTOMERS WHO HAVE REPEATED POWER INTERRUPTIONS DURING THE EVENT (DUE TO WEATHER, EQUIPMENT FAILURE, ETC.)**

0 customers were affected by repeated outage causes during the fire event.  
154 customers did experience a brief 2nd interruption (during the same outage event) for a total of 3 minutes.

##### **VI. THE NUMBER OF CUSTOMERS WHOSE POWER WAS INTERRUPTED IN ORDER TO RESTORE POWER SERVICE**

826 customers experienced a momentary interruption when power was being restored.

**VII. THE NUMBER OF CUSTOMERS WITHOUT POWER DURING THE EVENT IN HOURLY INTERVALS**  
**San Diego Gas & Electric - Summary of 2017 Lilac Fire Event**

Date of Event	Description of Event	Location	Total Number of Customers Out of Service	Customers Interrupted - Hours Into the Event *										
				0	1	13	14	15	16	19	20	34		
December 7 thru December 14	Lilac Fire	Northeast and North Coast Districts	4,444	0	0	741	1043	1863	3137	4074	4444	4290		
				<b>Customers Interrupted - Hours Into the Event (continued)</b>										
				<b>38</b>	<b>40</b>	<b>42</b>	<b>47</b>	<b>49</b>	<b>62</b>	<b>63</b>	<b>67</b>	<b>68</b>		
				3802	3450	3257	2984	2920	2728	2289	1792	1735		
				<b>Customers Interrupted - Hours Into the Event (continued)</b>										
				<b>86</b>	<b>87</b>	<b>89</b>	<b>91</b>	<b>105</b>	<b>108</b>	<b>109</b>	<b>110</b>	<b>111</b>		
				1564	1507	1413	407	350	259	237	134	121		
				<b>Customers Interrupted - Hours Into the Event (continued)</b>										
				<b>113</b>	<b>114</b>	<b>115</b>	<b>130</b>	<b>134</b>	<b>135</b>	<b>138</b>	<b>141</b>	<b>157</b>		
				57	55	51	50	43	41	12	10	9		
				<b>Customers Interrupted - Hours Into the Event (continued)</b>										
				<b>162</b>	<b>164</b>	<b>179</b>	<b>180</b>							
				5	2	2	0							

\* Customers reflected in the time increments represent all changes in customers experiencing outages at that point in time. The event day begins at midnight.

**VIII. COORDINATION WITH OTHER ELECTRIC, GAS, AND TELECOMMUNICATION COMPANIES**

On December 8, 2017, SoCalGas requested SDG&E assistance with portable generation at Fallbrook Pressure Limiting Station as a result of the Lilac Fire. EOC responders from SoCalGas and SDG&E coordinated to fulfill this task.

**IX. THE FACTORS THAT AFFECT THE RESTORATION OF POWER (LESSONS-LEARNED, COMMUNICATION, SAFETY, ACCESS, WEATHER, ETC.)**

- Public and employee safety
- Coordination with lead fire agency
- Forecasted current and future weather conditions
- Electric Operating Conditions based on fire potential

**X. THE NUMBER OF UTILITY STAFF AND OTHER UTILITY STAFF (MUTUAL ASSISTANCE) TO RESTORE SERVICES:**

<b>Operating Group</b>	<b>Number of Staff</b>
Electric Operations	163
Customer Services	128
Gas Distribution	107
Electric Engineering & Construction	88
CIO & Info Tech – SDG&E & SCG	21
Operations Support – SDG&E-SCG	20
Electric Systems Operations	16
Supply Mgmt & Logistics	14
Gas Transmission & Storage	10
External & State Legis Affrs	6
Asset Management	3
Regulator Affairs	1
COO SDG&E	1
Gas Engng & System Integrity	1
Enterprise Risk Management	1

**XI. ESTIMATED COST FOR THE UTILITY TO RESTORE ELECTRIC SERVICES FOR THE EVENT**

	2017 Activity Normalized for Jan Accrual Rev and Corrections			ormalized for Jan Accrual Rev an	
	2017 SAP	Reversals & MyTime Corrections	JE total - 2017	Total Net 2017 Normalized	Total Net 2018 Normalized
<b>CAPITAL</b>					
Capital - Disaster CEMA	\$ 921,075.75	\$ (380,163.35)	\$ (80,411.78)		
Capital - Support CEMA	\$ 2,100.00	\$ -	\$ -		
<b>Total Cost</b>	<b>\$ 923,175.75</b>	<b>\$ (380,163.35)</b>	<b>\$ (80,411.78)</b>	<b>\$ 462,600.62</b>	<b>\$ 155,862.26</b>
<b>Incremental</b>	<b>\$ 858,383.71</b>	<b>\$ (350,263.16)</b>	<b>\$ (66,201.86)</b>	<b>\$ 441,918.69 *</b>	<b>\$ 79,874.83 *</b>
<b>Non-incremental</b>	<b>\$ 64,792.04</b>	<b>\$ (29,900.19)</b>	<b>\$ (14,209.92)</b>		
<b>Total</b>	<b>\$ 923,175.75</b>	<b>\$ (380,163.35)</b>	<b>\$ (80,411.78)</b>		
<b>O&amp;M</b>					
O&M - Disaster CEMA	\$ 2,306,822.31	\$ (1,194,305.37)	\$ (639,503.00)		
O&M - Support	\$ 338,447.66	\$ (245,105.52)	\$ (20,643.87)		
<b>Total Cost</b>	<b>\$ 2,645,269.97</b>	<b>\$ (1,439,410.89)</b>	<b>\$ (660,146.87)</b>	<b>\$ 545,712.21</b>	<b>\$ 872,188.70</b>
<b>Incremental</b>	<b>\$ 2,027,893.44</b>	<b>\$ (1,108,363.11)</b>	<b>\$ (451,044.09)</b>	<b>\$ 468,486.24</b>	<b>\$ 624,521.32</b>
<b>Non-incremental</b>	<b>\$ 617,376.53</b>	<b>\$ (331,047.78)</b>	<b>\$ (209,102.78)</b>		
<b>Total</b>	<b>\$ 2,645,269.97</b>	<b>\$ (1,439,410.89)</b>	<b>\$ (660,146.87)</b>		
<b>REF</b>					
Refundable - Disaster CEMA	\$ 371,115.42	\$ (217,178.07)	\$ (59,641.44)		
Refundable - Support	\$ 11,740.42	\$ (9,062.85)	\$ -		
<b>Total Cost</b>	<b>\$ 382,855.84</b>	<b>\$ (226,240.92)</b>	<b>\$ (59,641.44)</b>	<b>\$ 96,973.48</b>	<b>\$ 73,016.78</b>
<b>Incremental</b>	<b>\$ 297,864.28</b>	<b>\$ (172,739.03)</b>	<b>\$ (48,448.91)</b>	<b>\$ 76,676.34</b>	
<b>Non-incremental</b>	<b>\$ 84,991.56</b>	<b>\$ (53,501.89)</b>	<b>\$ (11,192.53)</b>		
<b>Total</b>	<b>\$ 382,855.84</b>	<b>\$ (226,240.92)</b>	<b>\$ (59,641.44)</b>		<b>\$ 73,016.78</b>
				<b>2017</b>	<b>2018</b>
				<b>\$ 1,105,286.31</b>	<b>\$ 1,101,067.74</b>
					<b>Total</b>
					<b>\$ 2,206,354.05</b>

\* Will actually balance only Depreciation, Taxes & Return