



2021 Annual Electric Reliability Results

November 16, 2022

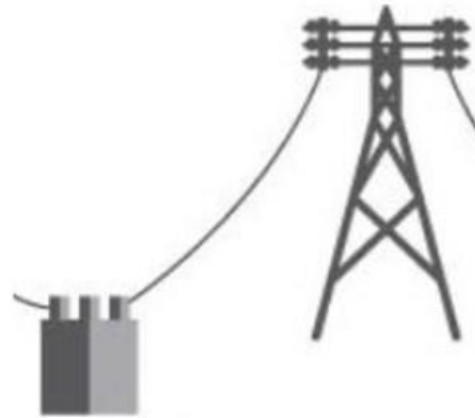


Classifications of our Assets



Transmission

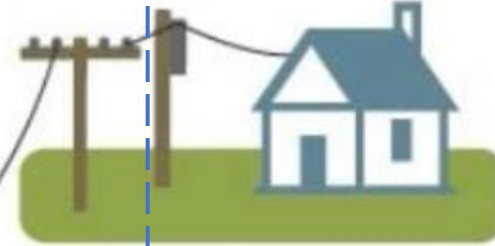
Transmission lines carry electricity long distances



Transformer steps up voltage for transmission

Distribution

Distribution lines carry electricity to houses



Neighborhood transformer steps down voltage

Services

Transformers on poles step down electricity before it enters houses

Source: Adapted from National Energy Education Development Project (public domain)

Reliability statistics are broken down by Transmission, Substation and Distribution

Reliability Goals & Metrics



- **Goals:**

- Provide our customers with safe and reliable power
- Improve reliability by reducing the number of outages, and their duration, experienced by our customers
- Review all outages and causes, validate trends, and mitigate for issues identified

- Four metrics to **measure performance:**

- System Average Interruption Duration Index (SAIDI)
- System Average Interruption Frequency Index (SAIFI)
- Customer Average Interruption Duration Index (CAIDI)
- Momentary Average Interruption Frequency Index (MAIFI)

- **Major Event Day (MED):** A day in which the daily SAIDI exceeds a threshold value

Reliability Programs

Building a strategy around overall system-wide performance in both outage duration and frequency

- **Electric System Hardening (ESH)** – Fire prevention, safety and reliability with a primary focus on helping reduce wildfire risk and optimizing reliability improvements. Includes wood to steel pole conversions, covered conductor and strategic undergrounding
- **Vegetation Management** – Annual systematic and schedule-based approach, including pre-inspection, tree pruning, brush clearing, etc.
 - SDG&E database tracks the existence and growth rates of ~490,000 trees throughout our service territory
 - Program recognized by the National Arbor Day Foundation for 19 consecutive years



Reliability Programs

- **“Tee” Modernization** – Upgrading major connection points on the underground distribution system to enhance ability to restore service to customers after unplanned outages
- **Supervisory Control and Data Acquisition (SCADA)** – Direct operator control of more than 4,000 switches across the distribution network for quick restoration
- **Business Services Project Coordination** – Customer outreach and outage notifications including restoration estimates

Reliability Programs

- **Meteorology** – Forecasting for proactive preparations for adverse weather conditions. Team expanded into a new ***Fire Science and Climate Adaptation*** department in 2018 to help focus combined efforts
- **Proactive Cable Replacement** – Planned replacement of underground distribution cables as a function of vintage and recent reliability performance
- **Aging Infrastructure Replacement**– Substations upgraded where major equipment has reached end of service life. Decades-old lower voltage distribution circuits commonly installed upgraded to higher voltage operation for increased capacity



Reliability Programs

- **Inoperative Switches** – Replacing or removing switches that are at end of service life to facilitate quicker, safer restoration. Some strategically-placed switches are replaced with automated (SCADA) switches for improved restoration
- **Reducing Vehicle Contacts with Equipment** – Relocating key devices to reduce the chances of recurring outages due to vehicle contacts. Avoiding typical trouble spots when installing new equipment
- **Non-Conductive Balloon Development** – Working with the party balloon industry to help develop an alternative material that will be less likely to cause outages when contacting overhead lines.
 - New legislation signed into law in 2022 by the governor to enforce the adoption of these new balloons in retail sales, which will be phased in over the next few years.



Awards & Recognition



- **PA Consulting ReliabilityOne® Awards** – Leader in Energy and Utilities Consultations
 - Outstanding Reliability “Best in the West” for 16 consecutive years
 - “Best in the Nation” for 2018
 - “Best in the Nation” for 2020 (Shared with Florida Power & Light)
 - Outstanding Technology and Innovation for 2016, 2017 and 2019
 - Outstanding Grid Sustainability for 2020



- **Edison Electric Institute** – 2018 Edison Award



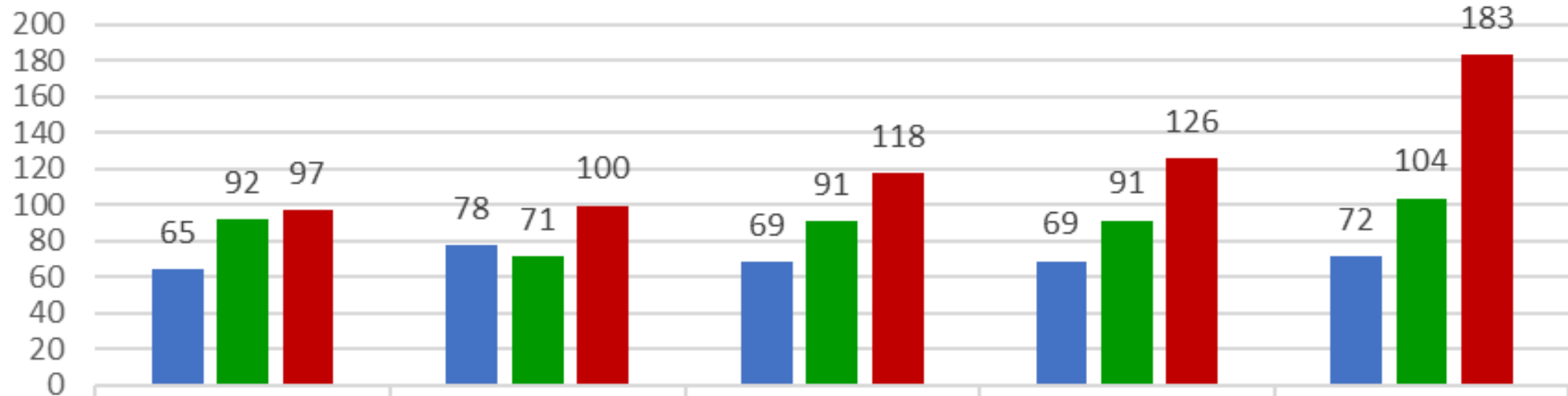
- **2016 CPUC Report** – Best Investor-Owned Utility in CA

How does SDG&E compare with the other large California utilities?

SAIDI Comparison – Past 5 Years



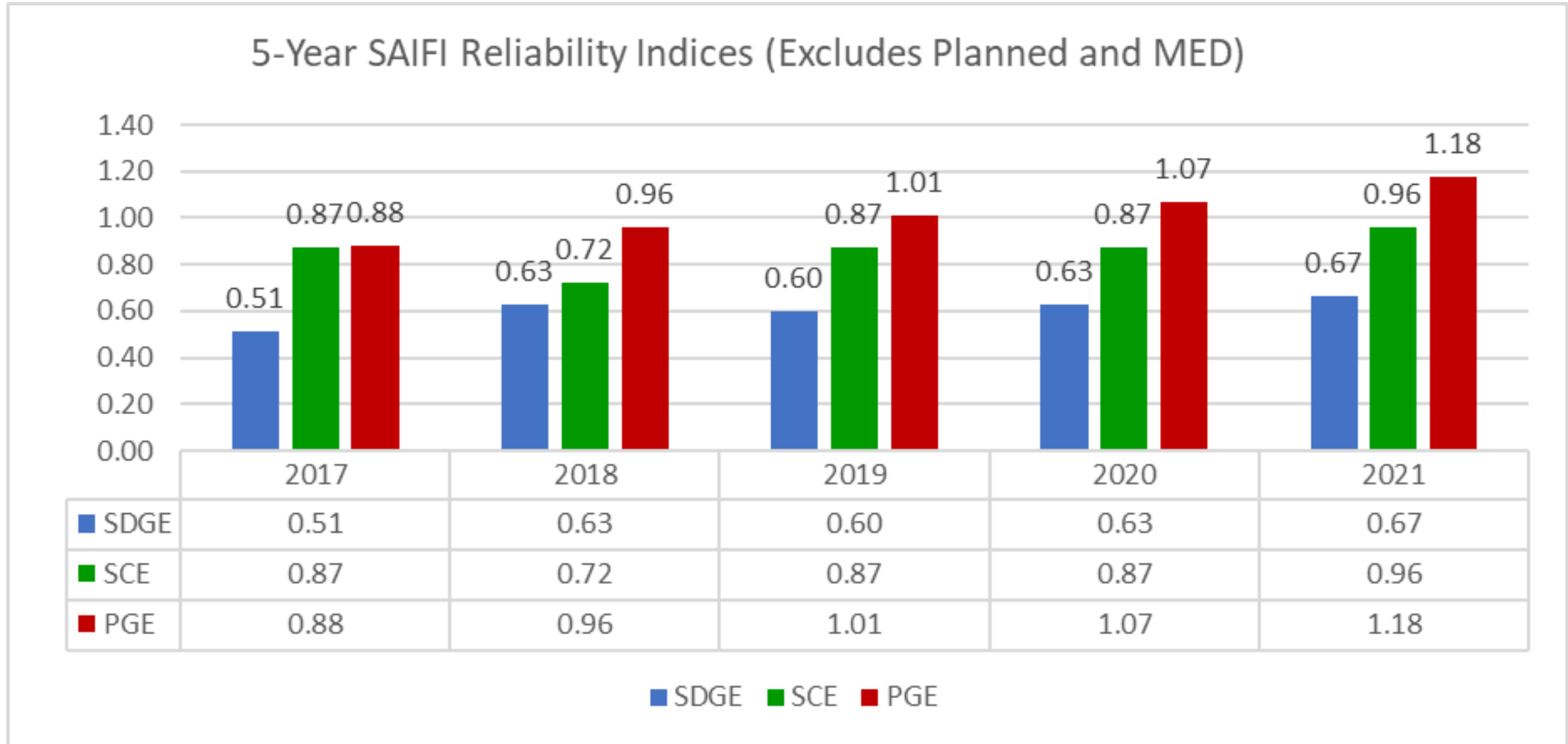
5-Year SAIDI Reliability Indices (Excludes Planned and MED)



	2017	2018	2019	2020	2021
■ SDGE	65	78	69	69	72
■ SCE	92	71	91	91	104
■ PGE	97	100	118	126	183

■ SDGE ■ SCE ■ PGE

SAIFI Comparison – Past 5 Years



SDG&E's Annual Report



- **Section 1** – System Indices for the last 10 years
- **Section 2** – District Reliability Indices for the past 10 years including and excluding MED
- **Section 3** – System and District Indices based on IEEE 1366 for past 10 years including planned outages and excluding MED
- **Section 4** – Service territory map including divisions of districts
- **Section 5** – Top 1% of Worst Performing Circuits (WPC) excluding MED
- **Section 6** – Top 10 major unplanned power outage events within a reporting year
- **Section 7** – Summary List of MED per IEEE 1366
- **Section 8** – Historical 10 largest unplanned outage events for the past 10 years
- **Section 9** – Number of customer inquiries on Reliability Data and the number of days per response

Section 1 – System Indices for the Past 10 Years



System Reliability

- Tables of reliability indices
- Graphs depicting indices

Table 1-1: System Indices

San Diego Gas & Electric									
System Reliability Data 2012 - 2021									
	MED Included					MED Excluded			
Year	SAIDI	SAIFI	CAIDI	MAIFI		SAIDI	SAIFI	CAIDI	MAIFI
2012	64.36	0.533	120.78	0.301		64.36	0.533	120.78	0.301
2013	75.03	0.561	133.84	0.211		59.96	0.472	127.03	0.211
2014	75.81	0.632	119.88	0.262		64.60	0.603	107.16	0.244
2015	58.11	0.530	109.68	0.347		57.92	0.526	110.09	0.347
2016	86.01	0.677	126.99	0.443		72.75	0.620	117.43	0.386
2017	117.49	0.585	200.87	0.344		64.51	0.512	125.92	0.311
2018	121.02	0.658	183.88	0.319		77.76	0.628	123.84	0.319
2019	122.96	0.639	192.38	0.299		68.64	0.596	115.23	0.299
2020	198.63	0.745	266.52	0.289		68.95	0.627	109.92	0.275
2021	76.93	0.670	114.84	0.421		71.64	0.665	107.66	0.421

Section 2 – District Indices for the Past 10 Years



SDG&E's service territory is divided into Six Districts

- Tables of reliability indices
- Graphs depicting indices

Table 2-2: Eastern – District Reliability Indices

Year	MED Included					MED Excluded			
	SAIDI	SAIFI	CAIDI	MAIFI		SAIDI	SAIFI	CAIDI	MAIFI
2012	87.40	0.688	127.07	0.339		87.40	0.688	127.07	0.339
2013	78.39	0.643	121.93	0.223		77.04	0.634	121.58	0.223
2014	91.73	0.574	159.75	0.243		77.80	0.528	147.39	0.238
2015	50.17	0.461	108.79	0.263		50.17	0.461	108.79	0.263
2016	108.24	0.820	132.06	0.326		84.93	0.705	120.41	0.292
2017	177.22	0.637	278.38	0.358		83.72	0.529	158.23	0.322
2018	203.88	0.688	296.39	0.362		108.94	0.654	166.62	0.362
2019	208.02	0.599	347.49	0.288		64.70	0.513	126.02	0.288
2020	400.19	0.888	450.66	0.364		103.07	0.695	148.40	0.355
2021	113.30	0.645	175.64	0.585		84.69	0.623	135.86	0.585

Section 3 – System & District Indices for the Past 10 Years, Including Planned Outages

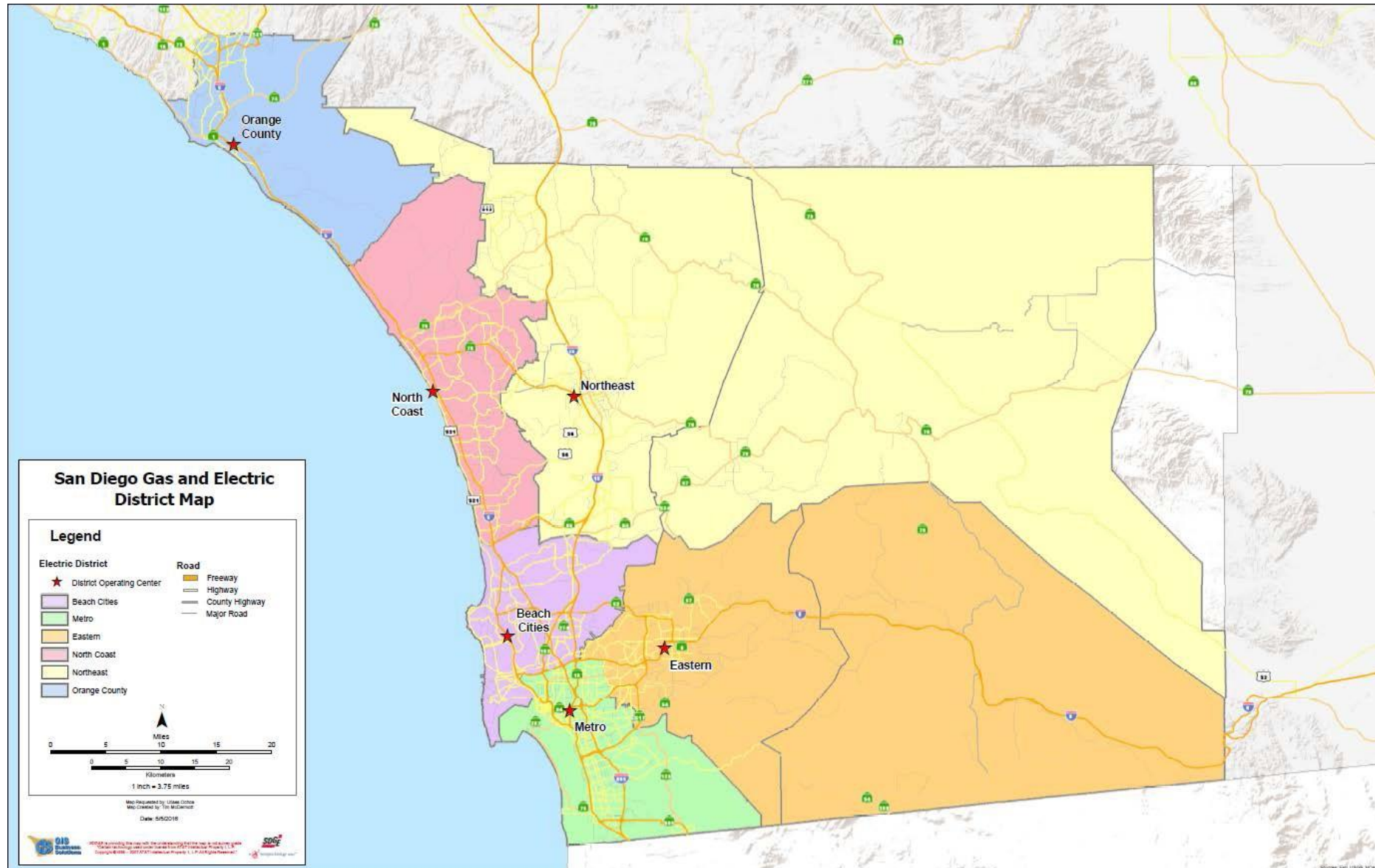


The data used to develop the planned outage indices in the report is from an outage management system implemented in late 2012

- Nine years of historical planned outage data is currently available
- Thousands of upgrades performed annually to improve service

System Indices (2013 – 2021) Planned and Unplanned								
MED Included				MED Excluded				
Year	SAIDI	SAIFI	CAIDI	MAIFI	SAIDI	SAIFI	CAIDI	MAIFI
2013	106.19	0.668	158.96	0.230	91.09	0.579	157.25	0.230
2014	105.94	0.746	141.92	0.277	94.72	0.717	132.13	0.259
2015	100.59	0.661	152.16	0.370	100.40	0.657	152.72	0.370
2016	122.06	0.802	152.18	0.467	108.78	0.744	146.21	0.409
2017	164.71	0.744	221.32	0.368	111.57	0.671	166.22	0.335
2018	167.13	0.827	202.15	0.344	123.87	0.796	155.52	0.344
2019	166.42	0.805	206.71	0.343	111.72	0.760	146.99	0.343
2020	244.05	0.917	266.09	0.326	114.19	0.798	143.02	0.312
2021	149.14	0.918	162.39	0.445	143.85	0.914	157.40	0.445

Section 4 – Service Area Map



Section 5 – Top 1% of Worst Performing Circuits (WPC), excluding MED



- Tables of Worst Performing Circuits
- Tables of deficient WPC
- Explanation of ranking as a deficient WPC

Table 5-1: Worst SAIDI Circuits based on 2020-2021 data (Excludes Planned and MED)

Circuit	District	Circuit Customers	Substation Name	Circuit Miles	% OH	% UG	Annualized Feeder Outage Count	Annualized Total Circuit SAIDI **
*445	Eastern	969	BOULEVARD	110.1	93%	7%	10	2584
*220	Northeast	322	SANTA YSABEL	54.2	95%	5%	3	1432
RB1	Northeast	264	RAINBOW 1	17.2	91%	9%	7	1060
*79	Eastern	891	DESCANSO	80.6	86%	14%	8	879
78	Eastern	277	DESCANSO	15.0	83%	17%	3	804
157	Eastern	1,026	BARRETT	114.8	97%	3%	8	761
PE1	Northeast	115	PINE HILLS	5.2	95%	5%	5	710
215	Northeast	514	RINCON	30.2	78%	22%	3	709
222	Northeast	1,358	SANTA YSABEL	132.0	88%	12%	7	706
217	Northeast	1,168	RINCON	84.7	83%	17%	2	643

* Circuit appeared on previous years worst performance list

** Circuit SAIDI represents all outages: Feeder and Branch

Section 6 – Top 10 Major Unplanned Outages in 2021



- Based on customer impact
- Severe weather played a substantial role, causing four of our top five major unplanned outages in 2021 and impacting over 80k SDG&E customers

Top 10 Major Unplanned Power Outage Events						
Rank	Outage Date	Cause	Location	Customer Impact	SAIDI	SAIFI
1	12/13/2021	Cap Bank Bus Disconnect	NC	32,211	2.18	0.022
2	10/4/2021	Severe Weather / Lightning	BC, CM, EA, NC, NE	27,286	2.29	0.018
3	12/14/2021	Severe Weather / High Winds	All Districts	25,588	2.11	0.017
4	1/25/2021	Severe Weather / High Winds	All Districts	16,909	1.21	0.011
5	8/31/2021	Severe Weather / Lightning	NE	13,973	0.85	0.009
6	9/4/2021	Substation Bus Disconnect	OC	12,845	0.64	0.009
7	9/26/2021	Tee Connector	CM	9,588	0.30	0.006
8	3/7/2021	Pothead Equipment	OC	8,956	0.43	0.006
9	1/25/2021	Tee Connector	OC	7,890	0.36	0.005
10	1/21/2021	Undetermined Cause	NE	7,088	0.03	0.005

Section 7 – Summary List of 2021 Major Event Days (MED)



Date of Event	Description of Event	Location	Number of Customers Out of Service	Customers Interrupted - Hours Into the Event Day												
				0	1	2	3	4	5	6	7	8				
November 25	High Winds / RFW	NE, EA, CM	6,694	0	219	0	196	449	748	2076	2373	3888				
				Customers Interrupted - Hours Into the Event Day (continued)												
				9	10	11	12	13	14	15	16	17				
				4333	4525	4333	4333	4256	3466	3671	3821	4205				
				Customers Interrupted - Hours Into the Event Day (continued)												
				18	19	20	21	22	23	24	25	26				
				4205	4205	4205	4759	4759	4759	4759	4759	4759				
				Customers Interrupted - Hours Into the Event Day (continued)												
				27	28	29	30	31	32	33	34	35				
				4759	4759	4759	4759	4759	4759	4471	3224	3042				
				Customers Interrupted - Hours Into the Event Day (continued)												
				36	37	38	39	40	41	42	43	44				
				1537	1527	521	521	152	0	0	0	0				
				Customers Interrupted - Hours Into the Event Day (continued)												
				45	46	47	48	49	50	51	52	53				
				0	0	0	0	0	0	0	0	0				
				Customers Interrupted - Hours Into the Event Day (continued)												
				54	55	56	57	58	59	60						
				0	0	0	0	0	0	0						

- Public Safety Power Shutoff in November 2021 during Santa Ana Winds/Red Flag Warning (RFW).
- Time increments = customers experiencing sustained outage at that point in time.
- The event day begins at midnight.

Section 8 – Historical 10 Largest Unplanned Outage Events for the past 10 Years



Shows the ten largest unplanned outages per year (2012 – 2021).

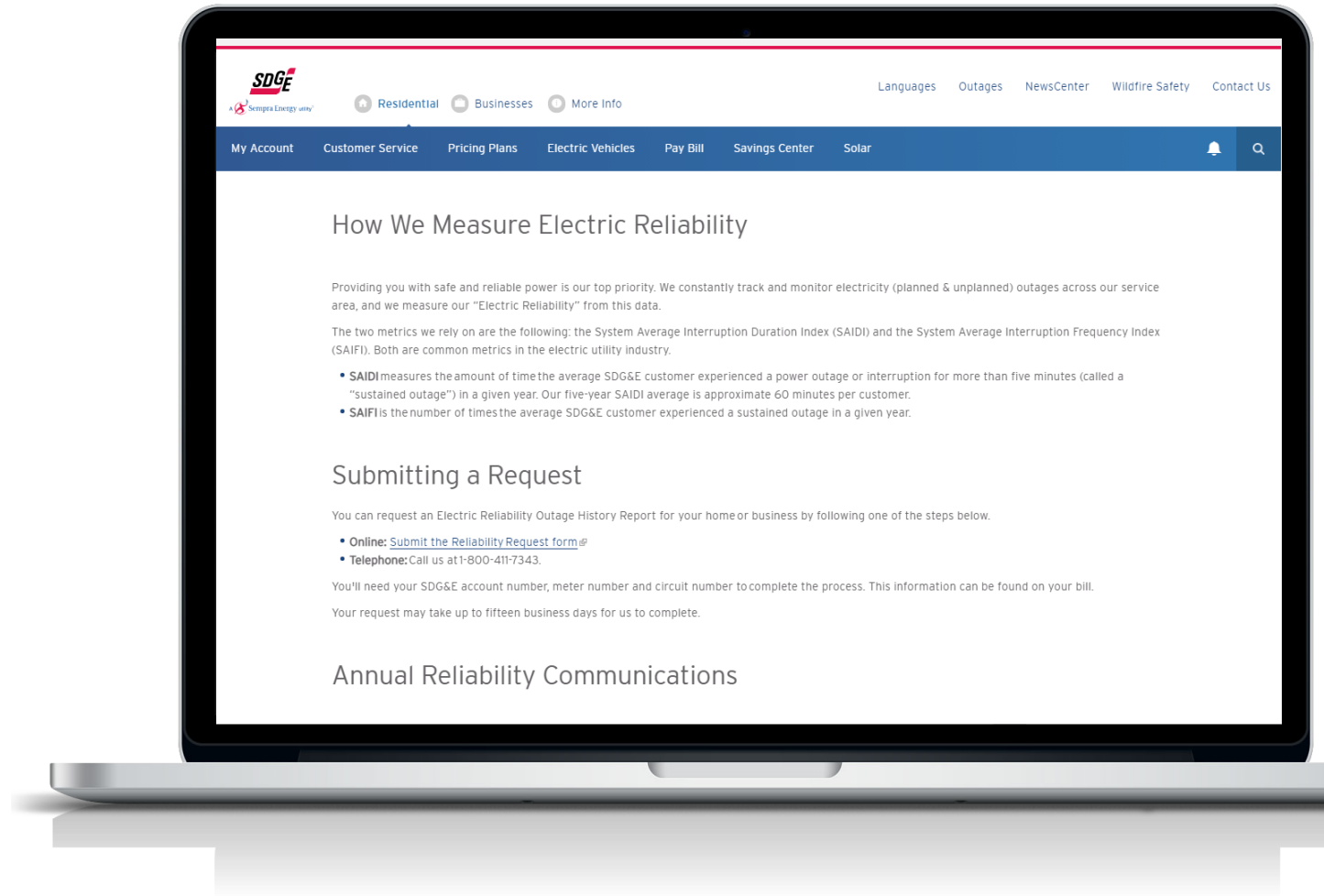
Historical 10 Largest Unplanned Outage Events				
Rank	Date	SAIDI	SAIFI	Description
1	11/24/2021	5.96	0.004	High Winds / RFW
2	10/4/2021	2.29	0.018	Severe Weather / Lightning
3	12/13/2021	2.18	0.022	Cap Bank Bus Disconnect
4	12/14/2021	2.11	0.017	Severe Weather / High Winds
5	1/19/2021	1.56	0.003	Severe Weather / High Winds
6	1/25/2021	1.21	0.011	Severe Weather / High Winds
7	12/14/2021	1.04	0.004	Fuse Cutout
8	8/12/2021	0.86	0.004	Tee Connector
9	8/31/2021	0.85	0.009	Severe Weather / Lightning
10	2/10/2021	0.77	0.002	Tee Connector

Section 9 – Website – Outage Inquiries



Find information or submit a request:

sdge.com/system-reliability



Social Media

Connect with us on our social media channels



[Twitter.com/sdge](https://twitter.com/sdge)



[Facebook.com/SanDiegoGasandElectric](https://facebook.com/SanDiegoGasandElectric)



[Instagram.com/sdge](https://instagram.com/sdge)

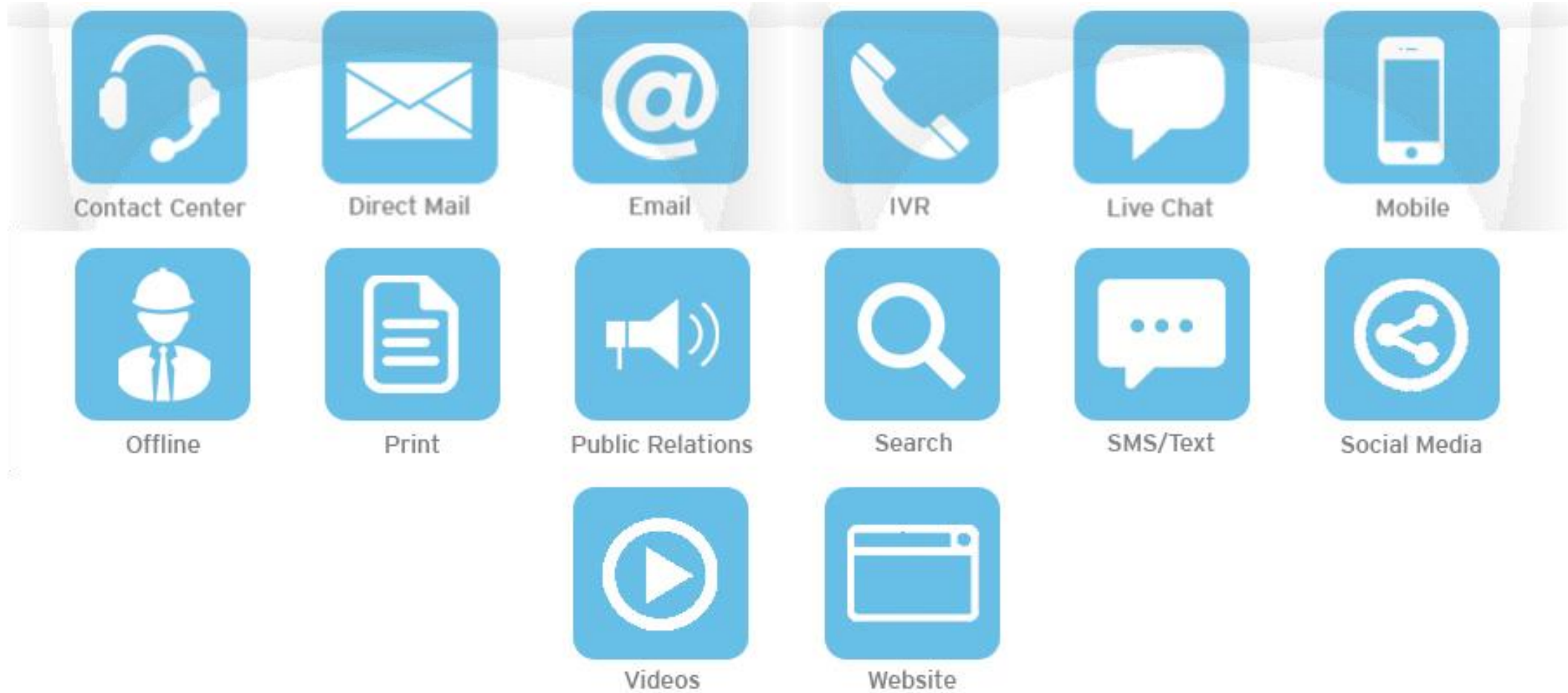


YouTube.com/SDGEWebmaster



LinkedIn.com/company/san-diego-gas-&-electric

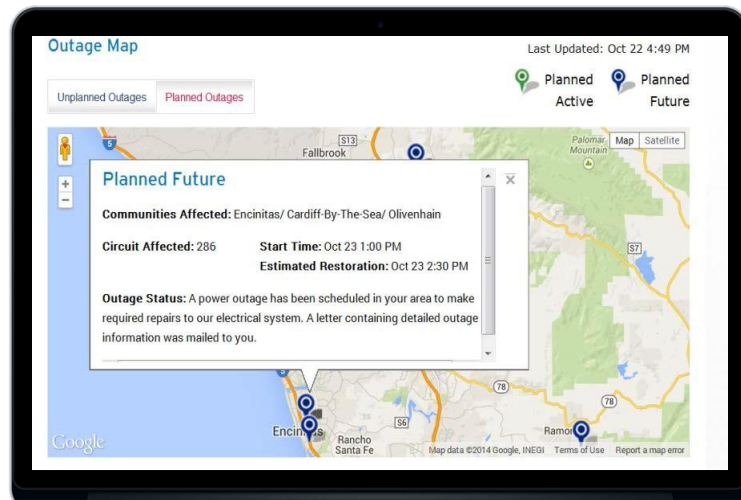
Customer Engagement Channels



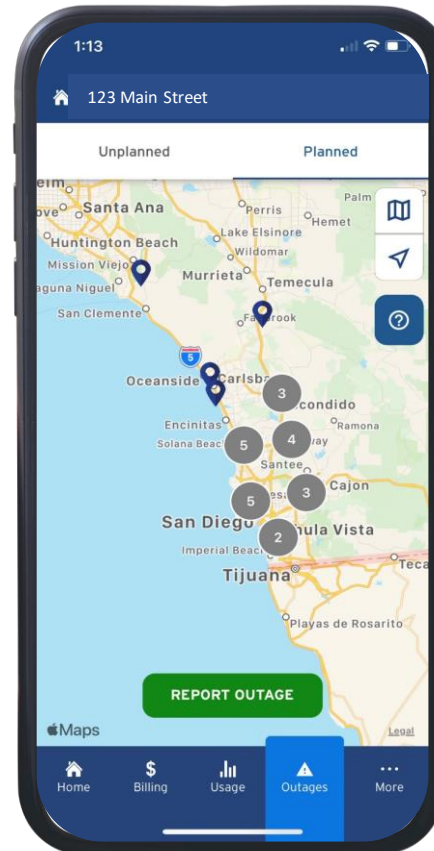
Customer Outage Tools



Outage Map



Mobile App



Outage Video



Summary At A Glance



- Classification of Assets & Reliability
 - SAIDI
 - SAIFI
 - CAIDI
 - MAIFI
 - MED
- SDG&E Reliability Efforts
 - ESH
 - Vegetation Management
 - Data Gathering/Circuit Analysis
 - Business Services Project Coordination
 - Meteorology
 - Others
- Comparison of 3 Largest IOUs in California



Summary At A Glance



- SDG&E 2021 Annual Report available on
 - cpuc.ca.gov
 - sdge.com/system-reliability
- Social Media
- Customer Service
- Customer Engagement Channels
- Customer Outage Tools



Thank you