

# Circuit Reliability Review

South Pasadena

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2020

# What is Reliability?

- In simplest terms:

*Having dependable electricity when you need it.*

- Outages:

- Maintenance outages (aka planned outages)
- Repair outages (aka unplanned outages)
  - Sustained Outage = An outage lasting **> 5 minutes**
  - Momentary Outage = An outage lasting **≤ 5 minutes**



**Major Event Day (MED)** : A day in which the daily system SAIDI exceeds a threshold value. For the purposes of calculating daily system SAIDI, any interruption that spans multiple calendar days is accrued to the day on which the interruption began. Statistically, days having a daily system SAIDI greater than a threshold value are days on which the energy delivery system experienced stresses beyond that normally expected (such as severe weather).

**Public Safety Power Shutoff (PSPS)** : An operational protocol that SCE implements under extreme weather conditions in order to minimize the threat of wildfires and keep communities safe from potentially dangerous situations. These types of sustained outages are temporary and usually involve situations where high fire areas are experiencing adverse weather or public safety is at risk.

# How Do We Measure Reliability?

SAIDI	SAIFI	MAIFI	CAIDI
<b>SAIDI</b> System Average Interruption Duration Index	<b>Total minutes every SCE customer was without power due to sustained outages (CMI)</b>	<b>Total number of customers</b>	“What’s the total time my power service will be unexpectedly interrupted this year?”
<b>SAIFI</b> System Average Interruption Frequency Duration Index	<b>Number of sustained customer outages experienced by all SCE customers (CI)</b>	<b>Total number of customers</b>	“How many times will my power service be unexpectedly interrupted this year?”
<b>CAIDI</b> Customer Average Interruption Duration Index	<b>System Average Interruption Duration Index (SAIDI)</b>	<b>System Average Interruption Frequency Index (SAIFI)</b>	“How long will it take to restore my power after an unexpected interruption?”

# Communities in the MONROVIA District

ALTADENA  
ARCADIA  
AZUSA  
BALDWIN PARK  
BRADBURY  
DUARTE  
EAST PASADENA  
EAST SAN GABRIEL  
GLENDALE  
IRWINDALE  
LA CANADA FLINTRIDGE  
LA CRESCENTA MONTROSE  
LOS ANGELES  
MAYFLOWER VILLAGE  
MONROVIA  
PASADENA  
SAN GABRIEL  
SAN MARINO  
SIERRA MADRE  
**SOUTH PASADENA**  
TEMPLE CITY  
VINCENT  
WEST PUENTE VALLEY

# Reliability by SCE Districts (No Exclusions)

District Name	2015				2016				2017				2018				2019			
	District SAIDI	SAIDI Ranking	District SAIFI	SAIFI Ranking	District SAIDI	SAIDI Ranking	District SAIFI	SAIFI Ranking	District SAIDI	SAIDI Ranking	District SAIFI	SAIFI Ranking	District SAIDI	SAIDI Ranking	District SAIFI	SAIFI Ranking	District SAIDI	SAIDI Ranking	District SAIFI	SAIFI Ranking
ANTELOPE VALLEY	104.34	22	0.68	30	107.67	24	0.87	29	103.19	23	0.87	27	55.61	33	0.61	31	194.75	15	0.67	33
ARROWHEAD	362.61	4	3.97	1	659.46	3	2.85	5	816.52	2	3.86	3	68.60	29	1.53	5	3630.64	1	9.59	1
BARSTOW	187.11	8	1.17	12	134.83	18	1.35	9	357.47	6	2.65	6	116.70	17	1.37	9	114.49	19	0.83	26
BIG CREEK	422.77	2	3.42	2	1062.01	2	4.99	1	4273.52	1	7.95	2	203.43	6	2.48	1	1559.97	3	5.58	2
BISHOP	298.11	6	2.22	4	168.59	8	1.22	14	190.51	10	1.93	9	139.70	12	0.54	32	1445.73	4	2.91	4
BLYTHE	427.00	1	1.52	7	396.38	5	2.71	6	684.48	3	2.38	7	277.72	3	1.57	4	379.85	8	1.69	8
CATALINA	42.56	35	2.25	3	65.01	35	3.66	3	70.67	34	0.54	35	141.45	11	2.44	2	46.63	35	1.56	11
COVINA	100.08	23	0.81	25	112.13	22	0.97	24	117.18	20	0.93	23	103.18	18	0.83	22	84.30	28	0.86	24
DOMINGUEZ HILLS	130.63	15	0.97	17	146.38	12	1.11	17	123.60	18	0.83	28	93.37	19	0.85	21	98.66	22	0.87	23
FOOTHILL	109.64	20	0.95	20	142.81	14	1.03	21	110.53	21	1.12	13	117.61	16	0.98	17	273.47	12	1.05	18
FULLERTON	76.59	29	0.67	31	92.72	30	0.76	34	89.29	28	0.68	33	69.45	28	0.52	33	82.34	30	0.78	28
HUNTINGTON BEACH	98.32	25	0.95	19	128.02	20	1.26	12	99.07	26	0.98	21	87.72	24	0.76	25	97.70	23	1.01	20
KERNVILLE	286.38	7	0.96	18	2421.32	1	3.67	2	305.53	7	3.29	4	184.41	7	1.14	10	320.17	10	1.67	9
LONG BEACH	164.46	9	0.89	23	135.16	17	0.86	31	77.17	32	0.71	32	51.48	34	0.44	34	78.18	32	0.64	34
MENIFEE	111.46	19	0.98	16	156.75	9	1.31	10	130.47	16	0.96	22	174.06	8	0.90	19	99.48	21	0.86	25
MONROVIA	96.68	26	0.88	24	116.57	21	0.84	32	105.00	22	0.98	20	243.02	5	1.43	8	86.10	26	0.82	27
MONTEBELLO	150.28	12	1.18	11	133.52	19	1.17	15	123.98	17	0.99	19	160.88	10	1.06	13	127.52	18	1.18	16
ONTARIO	94.04	27	0.74	27	105.07	27	0.93	27	100.43	24	1.13	12	80.04	26	0.72	27	90.16	25	0.94	21
PALM SPRINGS	99.54	24	0.80	26	107.58	25	1.07	19	119.10	19	1.02	17	73.95	27	0.79	24	133.77	17	1.23	14
REDLANDS	124.52	17	1.01	14	137.11	16	0.98	23	142.59	14	1.01	18	88.93	22	0.97	18	215.23	13	1.27	13
RIDGECREST	148.90	13	1.01	15	254.31	6	1.05	20	164.28	11	1.09	14	254.59	4	1.10	11	299.99	11	2.09	6
SADDLEBACK	46.03	34	0.39	35	65.99	34	0.65	35	65.35	35	0.58	34	45.80	35	0.38	35	134.87	16	0.67	32
SAN JOAQUIN	127.50	16	1.05	13	108.44	23	1.09	18	191.66	9	1.34	11	56.23	31	0.68	28	72.67	33	0.75	30
SANTA ANA	67.46	32	0.71	29	97.27	29	1.00	22	81.90	31	0.71	31	122.09	15	0.82	23	62.79	34	0.56	35
SANTA BARBARA	152.37	11	1.52	6	156.66	10	1.41	8	408.43	5	9.21	1	172.90	9	1.02	16	201.25	14	1.50	12
SANTA MONICA	75.41	30	0.62	32	91.08	31	0.95	26	71.89	33	0.71	30	80.24	25	1.04	15	104.74	20	0.90	22
SOUTH BAY	164.07	10	1.31	8	183.90	7	1.88	7	99.19	25	0.93	24	90.63	21	1.09	12	79.31	31	1.01	19
TEHACHAPI	298.96	5	1.21	9	97.29	28	1.13	16	86.51	29	1.05	16	55.99	32	0.67	29	2983.88	2	4.61	3
THOUSAND OAKS	106.59	21	0.92	21	143.78	13	1.31	11	151.74	12	1.43	10	1167.54	1	1.48	6	517.05	5	1.72	7
VALENCIA	72.27	31	0.61	33	105.09	26	0.97	25	136.62	15	1.08	15	92.41	20	1.06	14	457.47	6	1.22	15
VENTURA	148.85	14	1.19	10	150.41	11	1.24	13	520.90	4	3.12	5	136.04	13	1.44	7	334.96	9	1.65	10
VICTORVILLE	87.03	28	0.91	22	79.35	33	0.92	28	84.07	30	0.89	26	125.92	14	0.86	20	82.42	29	1.10	17
WHITTIER	114.52	18	0.73	28	137.34	15	0.81	33	148.91	13	0.90	25	87.74	23	0.67	30	84.86	27	0.73	31
WILDOMAR	52.70	33	0.60	34	84.01	32	0.87	30	90.15	27	0.80	29	60.77	30	0.75	26	94.47	24	0.77	29
YUCCA VALLEY	389.08	3	1.80	5	463.68	4	3.39	4	300.33	8	1.96	8	353.83	2	1.94	3	451.75	7	2.34	5
<b>SCE SystemWide</b>	<b>114.83</b>		<b>0.92</b>		<b>134.48</b>		<b>1.10</b>		<b>139.73</b>		<b>1.19</b>		<b>136.82</b>		<b>0.87</b>		<b>177.97</b>		<b>1.04</b>	

\*\*Exclusions\*\* are days which utilities are allowed to remove from their metrics because the outages on those days were caused by a severe acts of nature.

\*\*In the columns showing "Rank," lower numbers indicate poorer performance.

# Overview of South Pasadena

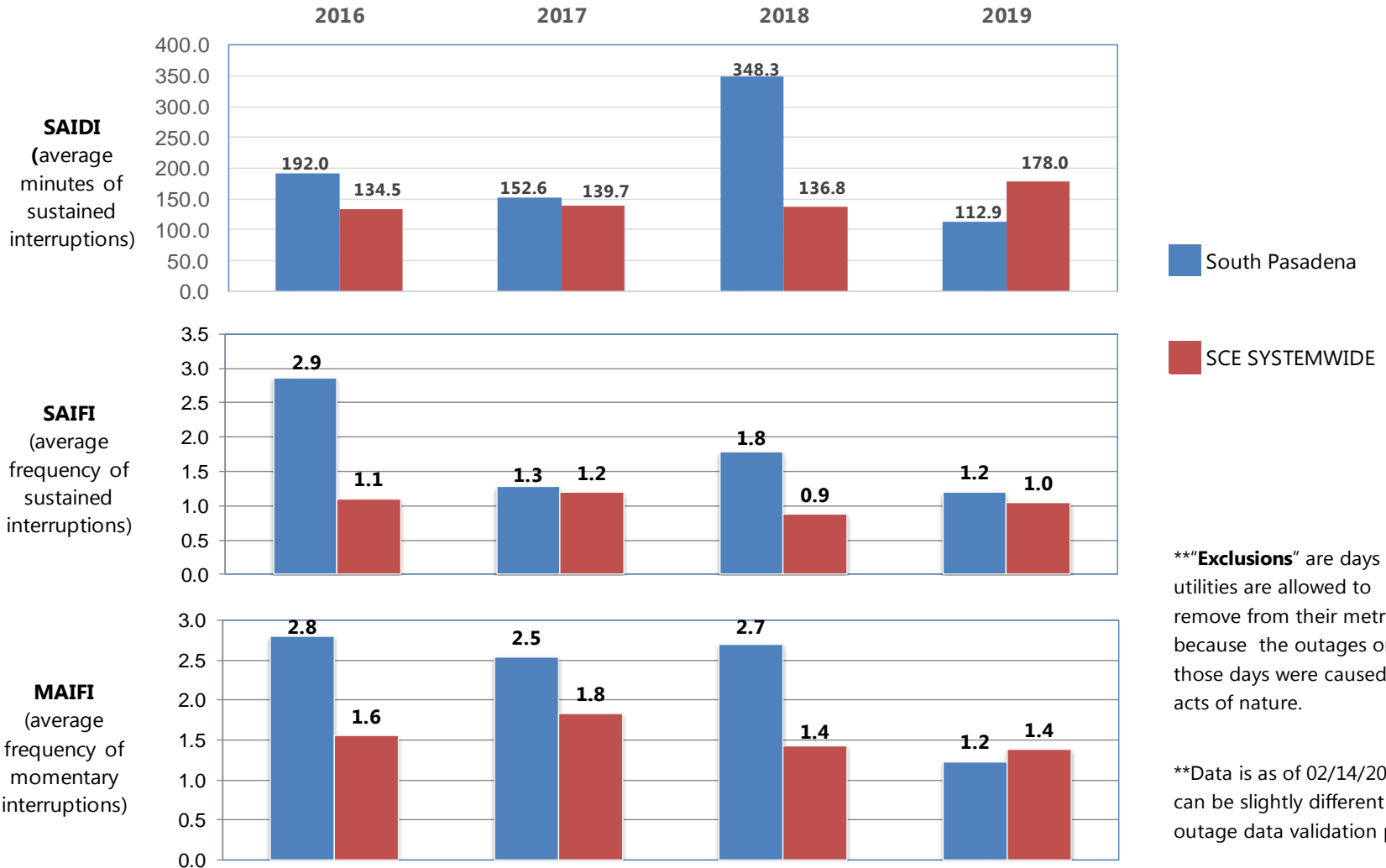
There are 13 circuits that serve South Pasadena

1

Circuit Type	Customers	Circuit Type	Customers	Circuit Type	Customers	Circuit Type	Customers
ASTEROID(16KV)	4,505						
BRAUN(16KV)	1,365						
BRENT(4.16KV)	801						
EL CENTRO(4.16KV)	372						
FREMONT(4.16KV)	441						
GRAVES(4.16KV)	316						
GREVELIA(4.16KV)	383						
HOOVER(4.16KV)	261						
MARENGO(4.16KV)	187						
OXLEY(4.16KV)	385						
ST. CHARLES(16KV)	1,280						
TEST(16KV)	4,125						
TRI CITY(16KV)	2,831						

**Grand Total** 17,252

# Reliability History of Circuits Serving South Pasadena (No Exclusions)



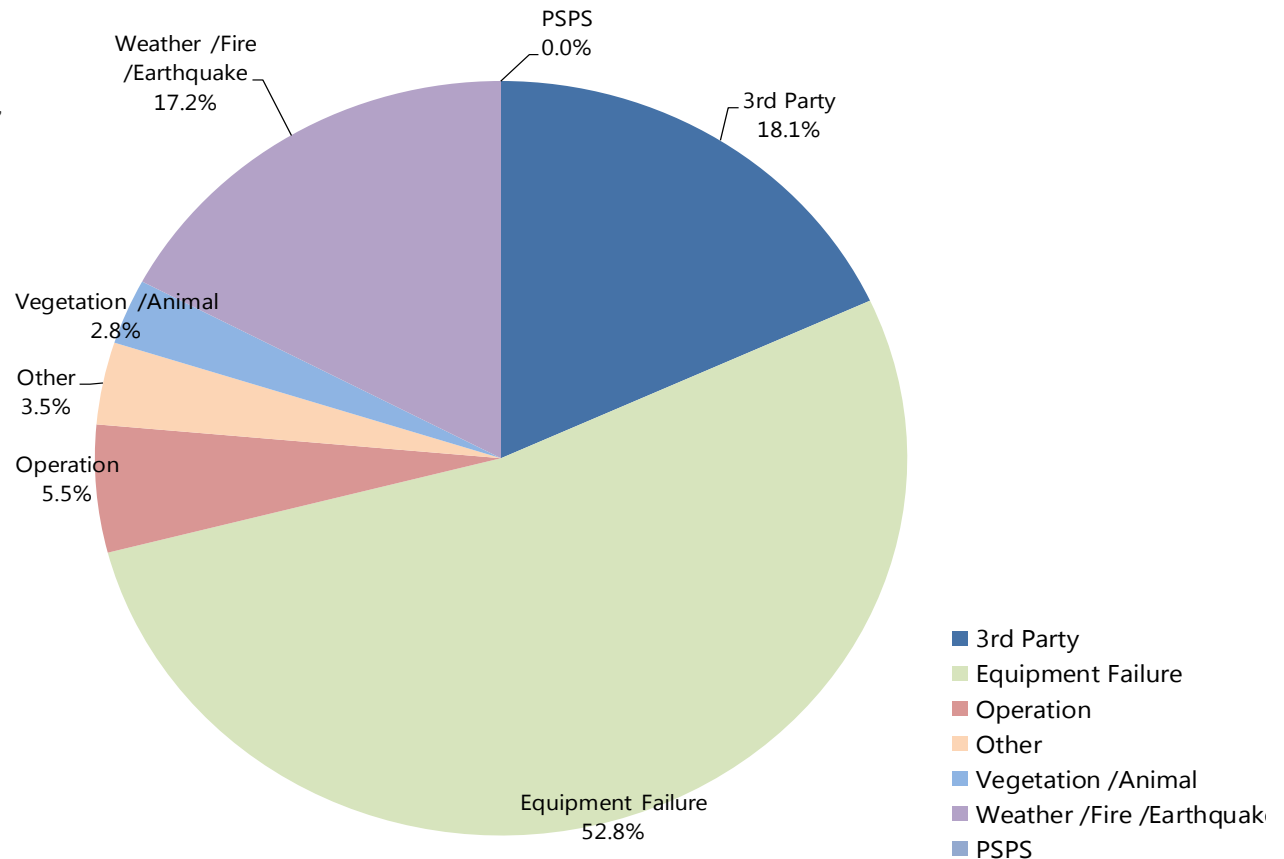
\*\*"Exclusions" are days which utilities are allowed to remove from their metrics because the outages on those days were caused by acts of nature.

\*\*Data is as of 02/14/2020, data can be slightly different due to outage data validation process

## Causes of Repair Outages in South Pasadena 2019

### Contributions to SAIDI by Outage Cause

- **Equipment Failure**  
e.g., in-service failure of transformer, switch, or conductors
- **Vegetation/Animal**  
e.g., tree branch, rodent, or bird causing a short circuit between conductors
- **Other**  
e.g., patrolled but no cause found, PSPS
- **Operations**  
e.g., urgent maintenance w/o 3-day notice
- **3<sup>rd</sup> Party**  
e.g., balloon, car hit pole, dig-in
- **PSPS**  
e.g., Public Safety Power Shutoff



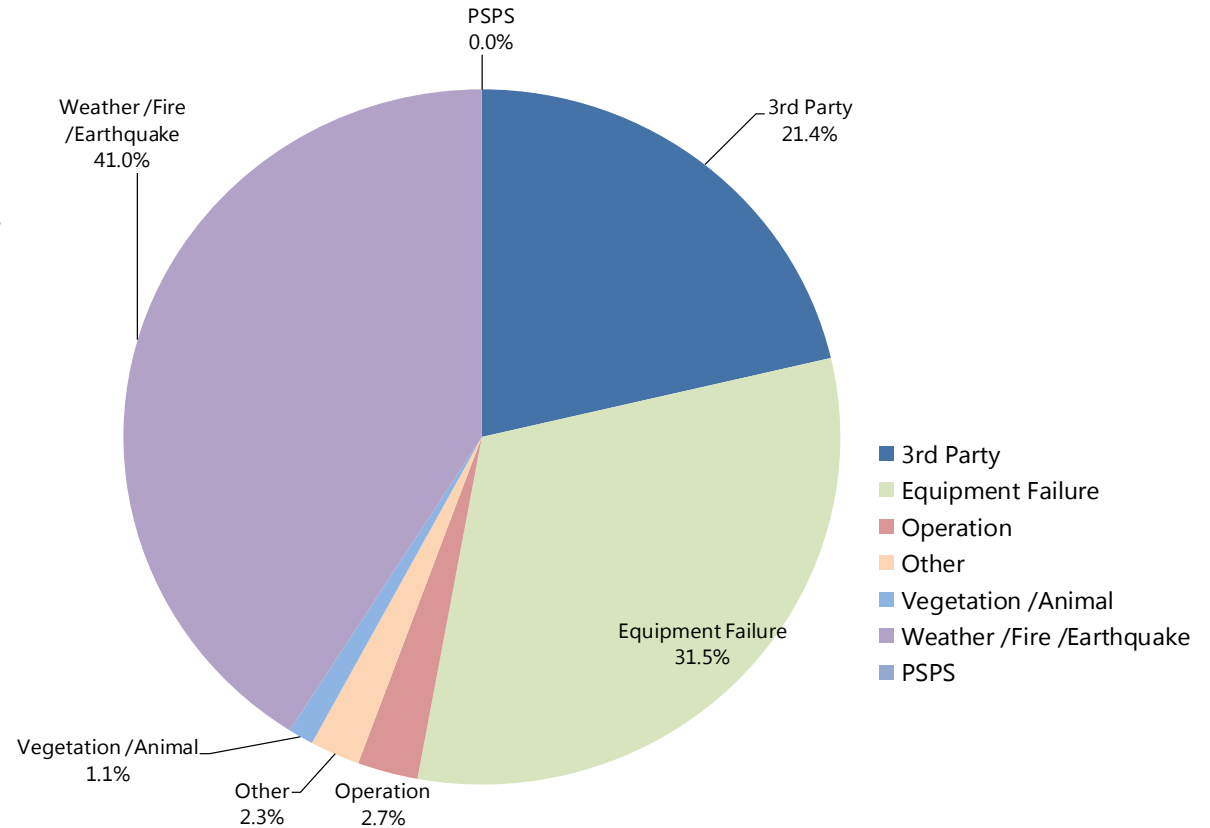
**SAIDI** = the cumulative amount of time the average customer is interrupted by “sustained” outages each year.



# Causes of Repair Outages in South Pasadena 2019

## Contributions to SAIFI by Outage Cause

- **Equipment Failure**  
e.g., in-service failure of transformer, switch, or conductors
- **Vegetation/Animal**  
e.g., tree branch, rodent, or bird causing a short circuit between conductors
- **Other**  
e.g., patrolled but no cause found
- **Operations**  
e.g., urgent maintenance w/o 3-day notice
- **3<sup>rd</sup> Party**  
e.g., balloon, car hit pole, dig-in
- **PSPS**  
e.g., Public Safety Power Shutoff



**SAIFI** = the number of times the average customer is interrupted by “sustained” outages each year

## South Pasadena 2020 All Distribution Circuits

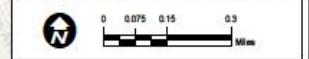
**PSPS Circuit**

- BRAUN
- TEST
- TRI CITY

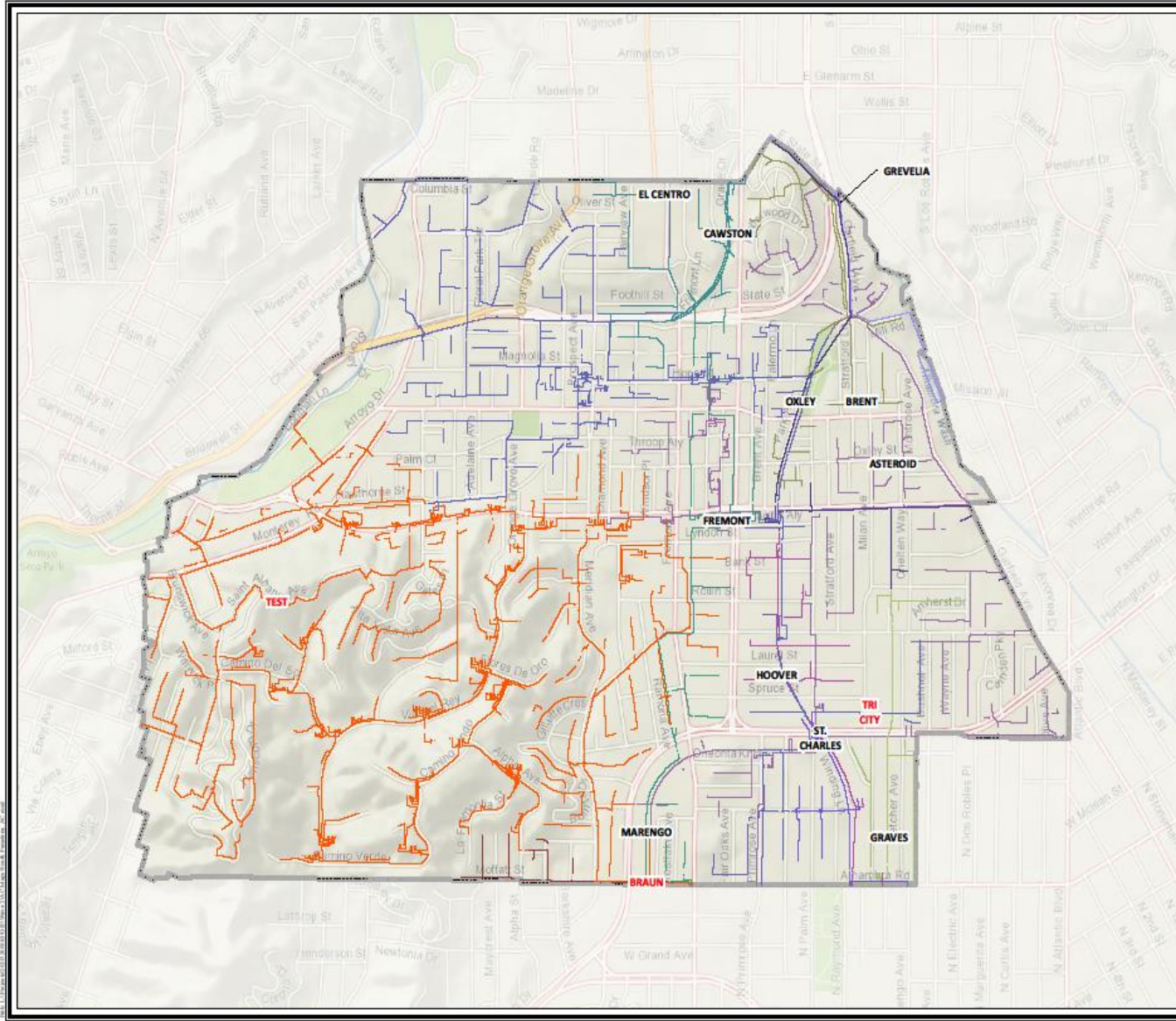
**Circuit**

- ASTEROID
- BRENT
- CAWSTON
- EL CENTRO
- FREMONT
- GRAVES
- GREVELIA
- HOOVER
- MARENGO
- OXLEY
- ST. CHARLES

**Disclaimer:** This report is intended solely for informational purposes. The information included is reflective as of January 1, 2020 and is subject to change without further notice.



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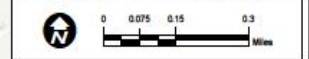


## South Pasadena 2020 Capital Improvement Plan

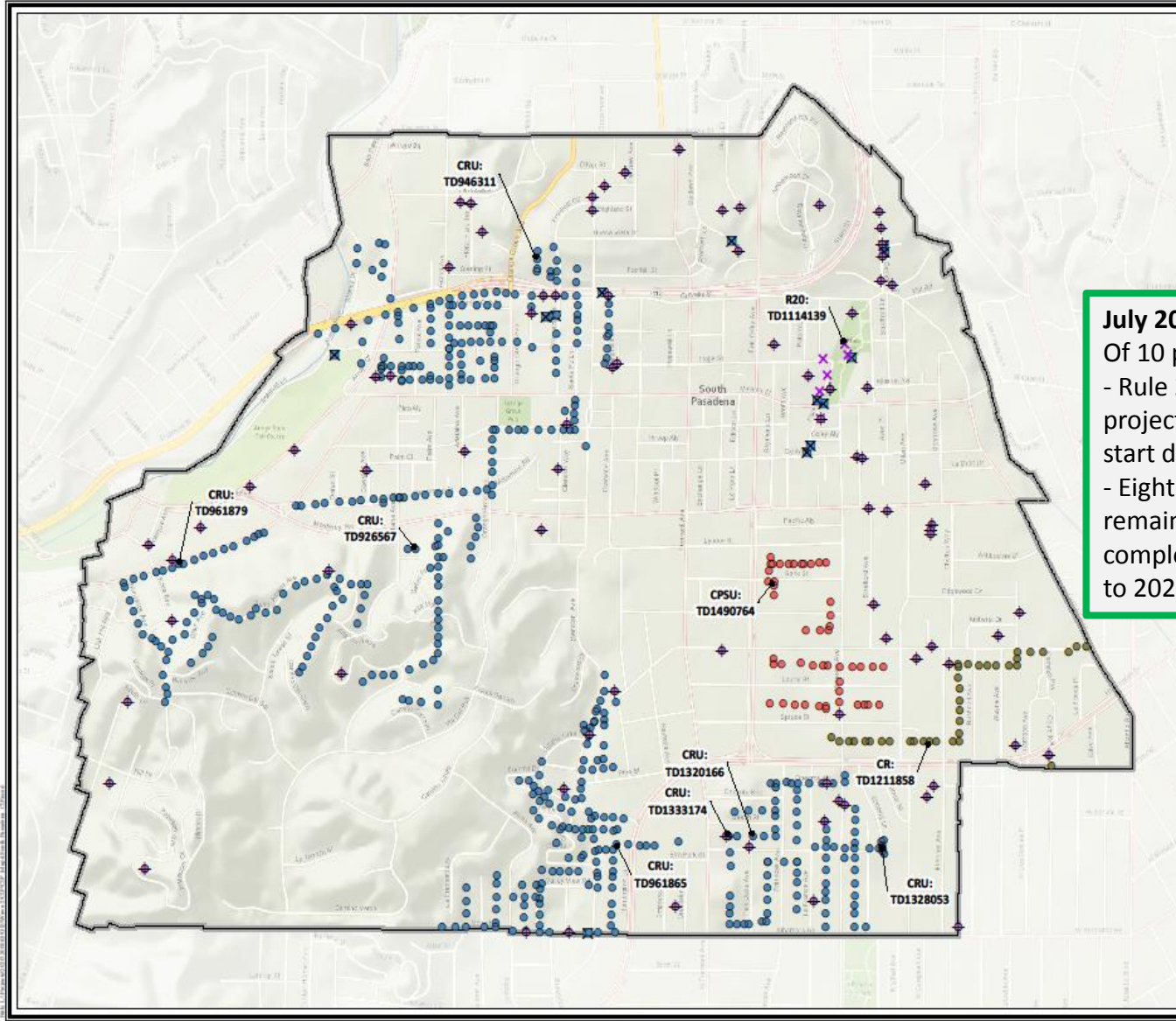
- Replacement/Equipment Upgrade**
- ◆ Pole Replacement
- Other Work**
- Circuit Public Safety Upgrade
  - Circuit Rebuild
  - Circuit Reliability Upgrade
  - ✕ Rule 20 Underground Conversion
  - ◆ Replacement/Equipment Upgrade (Transmission)
  - ✕ Pole Replacement

**July 2020 Update**  
 Of 10 projects listed:  
 - Rule 20 undergrounding project does not have start date currently  
 - Eight out of nine remaining projects already completed or rescheduled to 2021

*Disclaimer: This report is intended solely for informational purposes. The information included is reflective as of December 1, 2020 and is subject to change without further notice.*



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# Strengthening and Modernizing the Grid

**SCE plans to spend more than \$5B each year to maintain, improve, and harden its infrastructure.**

- **Infrastructure reliability** – updating underground cables, poles, switches, and transformers
- **Wildfire mitigation** – hardening infrastructure, bolstering situational awareness capabilities, and enhancing operational practices
- **Transmission** – connecting renewables, installing new substations, and updating lines
- **Grid readiness** – updating the grid for impacts from new technologies
- **Long-term energy policy** – supporting energy storage, electric vehicles, and renewables

## 2019 Capital Investments

179 miles of underground cable replaced

502 miles of overhead conductor replaced for public safety

16.4k distribution poles replaced

4.3k transmission poles replaced

71 underground structure replacements

SCE's investments support safe, reliable, affordable, and clean energy for our customers

# Addressing Wildfire Risk

## WILDFIRE CAMERAS

161

CAMERAS INSTALLED THOROUGHLY  
COVERING HIGH FIRE RISK AREAS

## COVERED CONDUCTOR

500+ MILES

INSTALLED

AT LEAST 700 MILES

ADDITIONALLY INSTALLED BY THE END OF 2020

## WEATHER STATIONS

482

WEATHER STATIONS INSTALLED

MORE THAN 850

INSTALLED BY THE END OF 2020

## INCIDENT MANAGEMENT TEAM

500+

QUALIFIED RESPONSE TEAM MEMBERS,  
WHO ARE ON CALL FOR DUTY 24/7

## ENHANCED INSPECTIONS

CONTINUE ADVANCING INSPECTIONS  
TO ADDRESS WILDFIRE RISKS IN 2020

## PROTECTIVE DEVICES

12,000+

FUSES AND REMOTE CONTROLLED  
SECTIONALIZING DEVICES APPLIED TO  
INTERRUPT ELECTRICAL CURRENT MORE  
QUICKLY & BOOST RELIABILITY BY SEGMENTING  
CIRCUITS TO ISOLATE PROBLEMS

- SCE filed its second Wildfire Mitigation Plan in February 2020
- It builds on the progress made in 2019 to reduce the risk of fire ignitions caused by utility infrastructure
- SCE crews will continue to work to install hi-tech wildfire mitigation tools and technologies to make communities safer, more resilient, and to help reduce the number of Public Safety Power Shutoffs (possible de-energizing of power lines to prevent ignitions in High Fire Risk Areas)

# Back-up Slides

**Reliability Histories of Circuits Serving South Pasadena**

**Updated through Dec 2019**

# Average Reliability of 13 Circuits Serving South Pasadena

	2016			2017			2018			1st Qtr 2019			2nd Qtr 2019			3rd Qtr 2019			4th Qtr 2019			2019		
	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI
<b>13 Circuits Serving South Pasadena -- Total</b>																								
<b>Customers: 17,252</b>	<b>192.0</b>	<b>2.9</b>	<b>2.8</b>	<b>152.6</b>	<b>1.3</b>	<b>2.5</b>	<b>348.3</b>	<b>1.8</b>	<b>2.7</b>	<b>27.2</b>	<b>0.6</b>	<b>0.3</b>	<b>3.5</b>	<b>0.0</b>	<b>0.1</b>	<b>6.3</b>	<b>0.0</b>	<b>0.3</b>	<b>75.9</b>	<b>0.6</b>	<b>0.6</b>	<b>112.9</b>	<b>1.2</b>	<b>1.2</b>
3rd Party	38%	28%	-	1%	1%	3%	4%	15%	2%	-	-	-	-	-	100%	35%	31%	-	24%	44%	-	18%	21%	7%
Equipment Failure	27%	41%	30%	54%	47%	9%	79%	48%	26%	33%	18%	2%	11%	26%	-	22%	11%	-	64%	48%	96%	53%	32%	45%
Operation	12%	15%	-	6%	10%	2%	4%	2%	1%	2%	2%	-	24%	18%	-	7%	11%	-	6%	2%	4%	5%	3%	2%
Other	7%	5%	26%	3%	1%	36%	7%	10%	26%	2%	0%	-	-	-	-	8%	11%	-	4%	4%	-	4%	2%	-
Vegetation/Animal	8%	8%	26%	1%	0%	38%	0%	0%	30%	-	-	-	65%	55%	-	9%	3%	-	0%	1%	-	3%	1%	-
Weather/Fire/Earthquake	8%	3%	17%	36%	41%	13%	6%	25%	15%	62%	80%	98%	-	-	-	20%	32%	100%	2%	1%	-	17%	41%	46%
PSPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>SCE SYSTEMWIDE</b>	<b>134.5</b>	<b>1.1</b>	<b>1.6</b>	<b>139.7</b>	<b>1.2</b>	<b>1.8</b>	<b>136.8</b>	<b>0.9</b>	<b>1.4</b>	<b>28.1</b>	<b>0.3</b>	<b>0.4</b>	<b>18.9</b>	<b>0.2</b>	<b>0.4</b>	<b>31.8</b>	<b>0.2</b>	<b>0.3</b>	<b>99.3</b>	<b>0.3</b>	<b>0.3</b>	<b>178.0</b>	<b>1.0</b>	<b>1.4</b>

**Notes:**

No outages are excluded from the metrics.

**Outage Causes:**

- Other: e.g., patrolled but no cause could be found
- Operations: e.g., urgent maintenance w/o 3-day notice to customers
- 3rd Party: e.g., balloons, car hit pole, dig-in
- Vegetation/Animal: e.g., tree branch, rodent, or bird causing short circuit across conductors
- PSPS: e.g., Public Safety Power Shutoff

SAIDI (minutes) = the cumulative amount of time the average customer is interrupted by “sustained” (longer than 5 minutes) outages.

SAIFI (interruptions) = the number of times the average customer is interrupted by “sustained” outages.

MAIFI (interruptions) = the number of times the average customer is interrupted by “momentary ” (lasting 5 minutes or less) outages.

# Reliability Histories for Individual Circuits Serving South Pasadena - 1 of 4

	2016			2017			2018			1st Qtr 2019			2nd Qtr 2019			3rd Qtr 2019			4th Qtr 2019			2019		
	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI
<b>ASTEROID(16KV) - Customers: 4,505</b>	<b>300.0</b>	<b>5.0</b>	<b>4.0</b>	<b>108.3</b>	<b>2.1</b>	<b>5.0</b>	<b>991.0</b>	<b>4.4</b>	<b>6.0</b>	<b>10.9</b>	<b>0.0</b>	<b>1.0</b>	-	-	-	<b>8.4</b>	<b>0.0</b>	<b>1.0</b>	<b>197.7</b>	<b>1.1</b>	<b>1.6</b>	<b>217.0</b>	<b>1.2</b>	<b>3.6</b>
3rd Party	49%	40%	-	-	-	-	5%	23%	-	-	-	-	-	-	-	100%	99%	-	2%	1%	-	5%	4%	-
Equipment Failure	27%	40%	25%	90%	51%	-	92%	55%	33%	7%	4%	2%	-	-	-	-	-	-	93%	90%	100%	85%	85%	46%
Operation	18%	20%	-	3%	1%	-	0%	0%	-	-	-	-	-	-	-	0%	1%	-	0%	0%	-	0%	0%	-
Other	-	-	25%	-	-	40%	-	-	33%	-	-	-	-	-	-	-	-	-	4%	6%	-	3%	5%	-
Vegetation/Animal	0%	0%	25%	0%	0%	40%	-	-	17%	-	-	-	-	-	-	-	-	-	1%	2%	-	1%	2%	-
Weather/Fire/Earthquake	6%	0%	25%	7%	48%	20%	4%	23%	16%	93%	96%	98%	-	-	-	-	-	100%	0%	1%	-	5%	3%	54%
PSPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>BRAUN(16KV) - Customers: 1,365</b>	<b>213.5</b>	<b>3.0</b>	<b>2.0</b>	<b>537.5</b>	<b>0.6</b>	<b>2.8</b>	<b>0.4</b>	<b>0.0</b>	-	<b>101.4</b>	<b>1.1</b>	-	<b>0.4</b>	<b>0.0</b>	<b>1.0</b>	-	-	-	<b>9.5</b>	<b>0.0</b>	-	<b>111.3</b>	<b>1.1</b>	<b>1.0</b>
3rd Party	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	100%
Equipment Failure	15%	36%	50%	16%	18%	64%	-	-	-	100%	100%	-	100%	100%	-	-	-	-	-	-	-	91%	98%	-
Operation	-	-	-	6%	30%	-	100%	100%	-	-	-	-	-	-	-	-	-	-	100%	100%	-	9%	2%	-
Other	85%	64%	50%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vegetation/Animal	-	-	-	0%	1%	36%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weather/Fire/Earthquake	-	-	-	78%	52%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PSPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>BRENT(4.16KV) - Customers: 801</b>	<b>222.3</b>	<b>2.0</b>	-	<b>144.9</b>	<b>1.0</b>	-	<b>82.5</b>	<b>1.0</b>	-	-	-	<b>1.0</b>	-	-	-	-	-	-	-	-	<b>1.0</b>	-	-	<b>2.0</b>
3rd Party	35%	50%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	50%
Operation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weather/Fire/Earthquake	65%	50%	-	-	-	-	100%	100%	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	50%
PSPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>EL CENTRO(4.16KV) - Customers: 372</b>	-	-	-	<b>188.0</b>	<b>1.0</b>	<b>1.0</b>	<b>9.8</b>	<b>1.0</b>	-	-	-	-	-	-	-	-	-	-	-	-	<b>0.9</b>	-	-	<b>0.9</b>
3rd Party	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	-	-	-	72%	94%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	100%
Operation	-	-	-	28%	6%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weather/Fire/Earthquake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PSPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



# Reliability Histories for Individual Circuits Serving South Pasadena - 2 of 4

	2016			2017			2018			1st Qtr 2019			2nd Qtr 2019			3rd Qtr 2019			4th Qtr 2019			2019		
	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI
<b>FREMONT(4.16KV) - Customers: 441</b>	-	-	4.0	138.9	1.0	1.0	0.8	0.0	1.0	2.0	0.2	-	-	-	-	-	-	-	-	-	1.0	2.0	0.2	1.0
3rd Party	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	100%
Operation	-	-	-	-	-	-	100%	100%	-	100%	100%	-	-	-	-	-	-	-	-	-	-	100%	100%	-
Other	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weather/Fire/Earthquake	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PSPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>GRAVES(4.16KV) - Customers: 316</b>	20.0	1.0	1.0	13.4	0.0	1.0	314.8	3.9	-	-	-	-	-	-	-	74.6	0.2	-	-	-	-	74.6	0.2	-
3rd Party	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	100%	100%	-	100%	100%	-	64%	69%	-	-	-	-	-	-	-	100%	100%	-	-	-	-	100%	100%	-
Operation	-	-	-	-	-	-	28%	6%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	100%	-	-	-	9%	25%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weather/Fire/Earthquake	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PSPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>GREVELIA(4.16KV) - Customers: 383</b>	124.9	1.0	1.0	168.0	1.1	-	138.8	1.0	-	-	-	-	-	-	-	-	-	-	1.0	0.0	1.0	1.0	0.0	1.0
3rd Party	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	31%	3%	-	82%	92%	-	0%	2%	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	100%
Operation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	100%	18%	8%	-	100%	98%	-	-	-	-	-	-	-	-	-	-	100%	100%	-	100%	100%	-
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weather/Fire/Earthquake	69%	97%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PSPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>HOOVER(4.16KV) - Customers: 261</b>	104.5	1.2	0.8	21.8	0.0	1.0	725.6	3.4	-	-	-	-	-	-	-	0.4	0.0	-	-	-	-	0.4	0.0	-
3rd Party	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	19%	86%	-	87%	75%	-	-	-	-	-	-	-	-	-	-	100%	100%	-	-	-	-	100%	100%	-
Operation	-	-	-	13%	25%	100%	1%	21%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	99%	79%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vegetation/Animal	81%	14%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weather/Fire/Earthquake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PSPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

# Reliability Histories for Individual Circuits Serving South Pasadena - 3 of 4

	2016			2017			2018			1st Qtr 2019			2nd Qtr 2019			3rd Qtr 2019			4th Qtr 2019			2019		
	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI
<b>MARENGO(4.16KV) - Customers: 187</b>	<b>133.7</b>	<b>0.2</b>	<b>1.0</b>	<b>0.8</b>	<b>0.0</b>	<b>5.0</b>	<b>1.5</b>	<b>0.0</b>	<b>1.8</b>	<b>3.0</b>	<b>0.0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>3.0</b>	<b>0.0</b>	<b>-</b>	
3rd Party	-	-	-	-	-	20%	100%	100%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Equipment Failure	77%	70%	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-	100%	100%	-	
Operation	5%	20%	-	100%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Other	-	-	-	-	-	60%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Weather/Fire/Earthquake	18%	10%	100%	-	-	20%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
PSPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>OXLEY(4.16KV) - Customers: 385</b>	<b>-</b>	<b>-</b>	<b>2.0</b>	<b>139.0</b>	<b>1.0</b>	<b>-</b>	<b>412.6</b>	<b>0.4</b>	<b>1.0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1.4</b>	
3rd Party	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Equipment Failure	-	-	-	100%	100%	-	100%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27%	
Operation	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	73%	
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Weather/Fire/Earthquake	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
PSPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>ST. CHARLES(16KV) - Customers: 1,280</b>	<b>94.2</b>	<b>2.2</b>	<b>4.0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>155.1</b>	<b>1.0</b>	<b>-</b>	<b>1.6</b>	<b>0.1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2.5</b>	<b>0.0</b>	<b>-</b>	<b>0.3</b>	<b>0.0</b>	<b>-</b>	<b>4.3</b>	<b>0.2</b>	
3rd Party	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Equipment Failure	21%	47%	50%	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-	-	37%	87%	
Operation	60%	7%	-	-	-	-	-	-	-	-	-	-	-	-	100%	100%	-	100%	100%	-	63%	13%	-	
Other	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Vegetation/Animal	19%	46%	50%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Weather/Fire/Earthquake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
PSPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>TEST(16KV) - Customers: 4,125</b>	<b>179.7</b>	<b>1.7</b>	<b>3.5</b>	<b>270.7</b>	<b>2.4</b>	<b>2.4</b>	<b>49.5</b>	<b>0.5</b>	<b>1.4</b>	<b>66.6</b>	<b>2.0</b>	<b>-</b>	<b>5.0</b>	<b>0.0</b>	<b>-</b>	<b>6.2</b>	<b>0.1</b>	<b>-</b>	<b>93.5</b>	<b>1.1</b>	<b>-</b>	<b>171.3</b>	<b>3.2</b>	
3rd Party	83%	60%	-	3%	2%	-	-	-	-	-	-	-	-	-	-	-	-	-	78%	95%	-	42%	32%	
Equipment Failure	12%	38%	28%	49%	30%	17%	46%	5%	-	3%	1%	-	30%	54%	-	-	-	-	1%	0%	-	3%	1%	
Operation	5%	3%	-	7%	24%	-	-	-	-	3%	2%	-	70%	46%	-	16%	21%	-	14%	3%	-	12%	3%	
Other	-	-	28%	6%	0%	41%	-	-	-	4%	0%	-	-	-	-	-	-	-	3%	1%	-	3%	0%	
Vegetation/Animal	-	-	44%	2%	1%	41%	2%	1%	75%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Weather/Fire/Earthquake	-	-	-	33%	44%	-	51%	94%	25%	89%	97%	-	-	-	-	84%	79%	-	5%	1%	-	40%	63%	
PSPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

# Reliability Histories for Individual Circuits Serving South Pasadena - 4 of 4

	2016			2017			2018			1st Qtr 2019			2nd Qtr 2019			3rd Qtr 2019			4th Qtr 2019			2019		
	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI
<b>TRI CITY(16KV) - Customers: 2,831</b>	<b>202.2</b>	<b>4.0</b>	<b>2.0</b>	<b>31.2</b>	<b>0.2</b>	<b>1.4</b>	<b>183.1</b>	<b>1.4</b>	<b>4.6</b>	<b>0.1</b>	<b>0.0</b>	<b>-</b>	<b>14.3</b>	<b>0.0</b>	<b>-</b>	<b>6.6</b>	<b>0.0</b>	<b>-</b>	<b>3.1</b>	<b>0.0</b>	<b>-</b>	<b>24.1</b>	<b>0.1</b>	<b>-</b>
3rd Party	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	53%	51%	50%	23%	3%	-	52%	74%	23%	59%	82%	-	-	-	-	-	-	-	-	-	0%	3%	-	
Operation	4%	24%	-	0%	0%	-	40%	12%	2%	-	-	-	-	-	-	-	-	47%	41%	-	6%	9%	-	
Other	-	-	50%	6%	11%	26%	-	-	21%	-	-	-	-	-	-	47%	77%	-	53%	59%	-	19%	38%	-
Vegetation/Animal	43%	25%	-	-	-	74%	-	-	43%	-	-	-	100%	100%	-	53%	23%	-	-	-	-	74%	49%	-
Weather/Fire/Earthquake	-	-	-	70%	85%	-	8%	14%	11%	41%	18%	-	-	-	-	-	-	-	-	-	-	0%	1%	-
PSPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

# Public Safety Power Shutoffs (PSPS)

- De-energizing power lines to prevent ignitions
- Used during elevated fire conditions
- Primarily impacts circuits in high fire risk areas
- Use of multiple methods to notify people in affected areas before, during and after a de-energization event



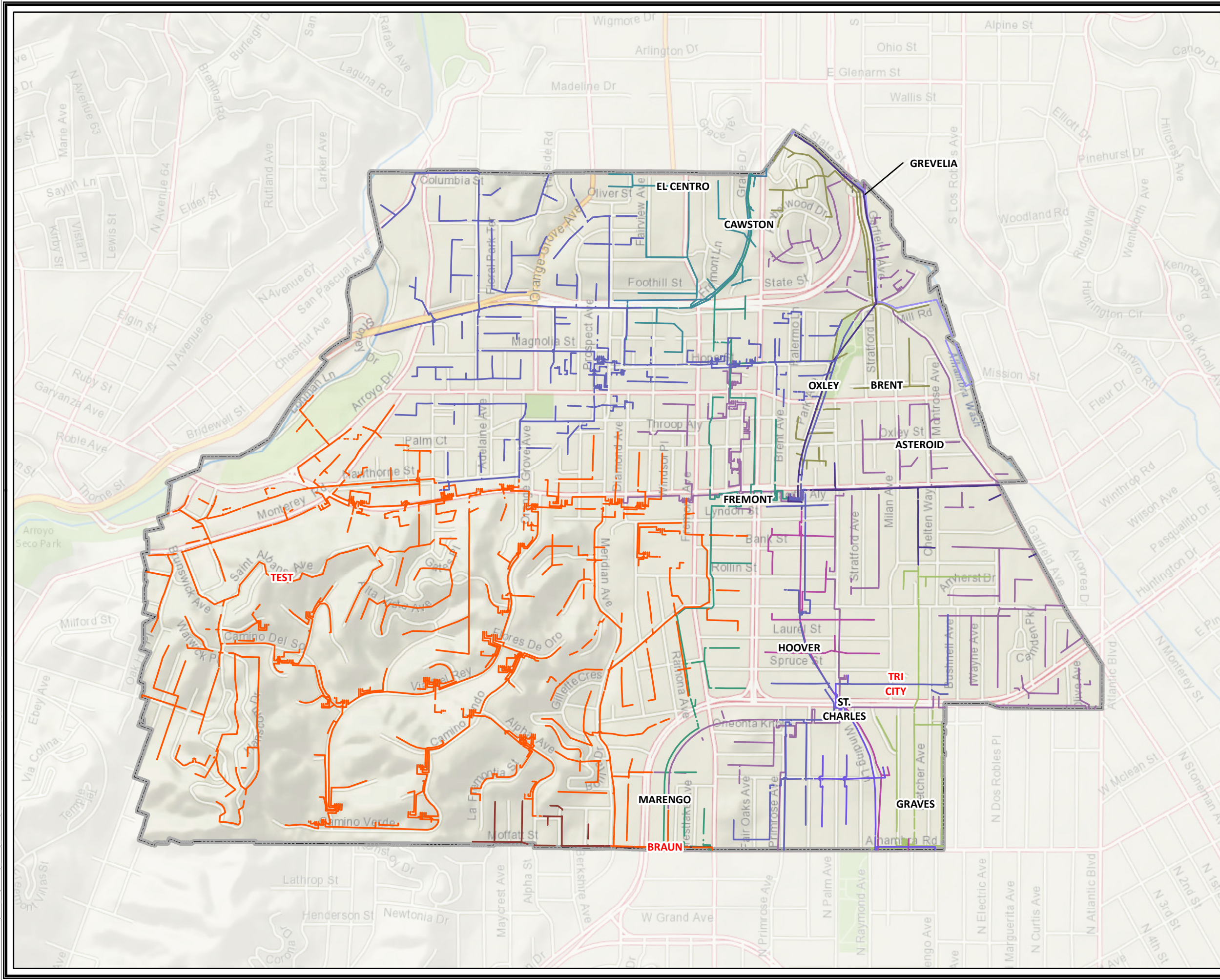
# South Pasadena 2020 All Distribution Circuits

## PSPS Circuit

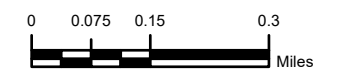
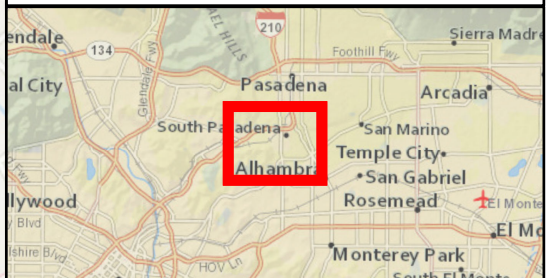
- BRAUN
- TEST
- TRI CITY

## Circuit

- ASTEROID
- BRENT
- CAWSTON
- EL CENTRO
- FREMONT
- GRAVES
- GREVELIA
- HOOVER
- MARENGO
- OXLEY
- ST. CHARLES



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**Geospatial Analysis  
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