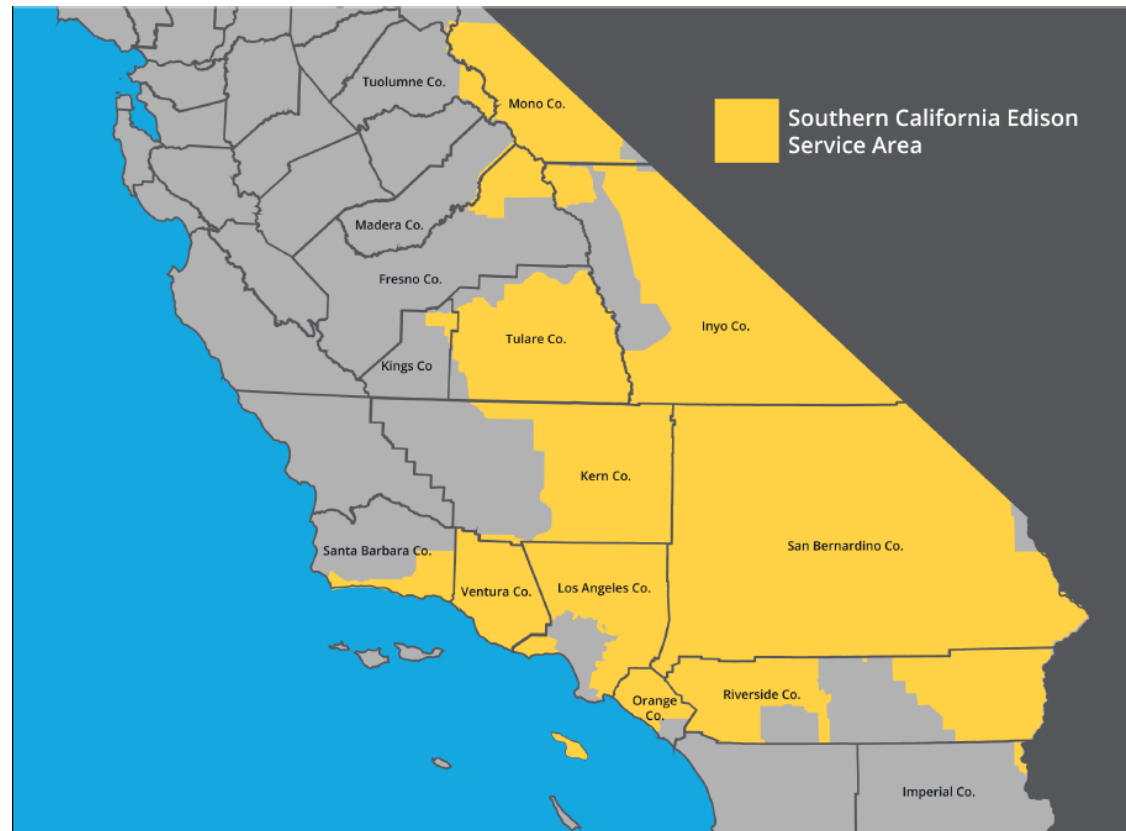# Circuit Reliability Review

Hermosa Beach

2019

Who We Are

- Southern California Edison (SCE) is an Edison International company

- One of the nation's largest electric utilities

- More than 130 years of history

- Regulated by the California Public Utilities Commission (CPUC) and the Federal Energy Regulatory Commission (FERC)

- 50,000 square miles of SCE service area across Central, Coastal, and Southern California

- 15 million residents in service territory

- 5 million customer accounts in 445 cities and communities

Southern California Edison Service Area

Tuolumne Co. | Mono Co. | Madera Co. | Fresno Co. | Inyo Co. | Tulare Co. | Kings Co | Kern Co. | San Bernardino Co. | Santa Barbara Co. | Ventura Co. | Los Angeles Co. | Orange Co. | Riverside Co. | Imperial Co.

Strengthening and Modernizing the Grid

- To deliver power safely, reliably and affordably, we monitor and maintain a vast electricity system.
- We are working on reducing the threat of wildfires and to better integrate clean energy technologies being adopted by customers (including solar and electric vehicles) to meet California's ambitious climate change goals.

50,000 Square Miles

4,600 Circuits

1.5 Million Poles

119,000 Miles of Transmission and Distribution Lines
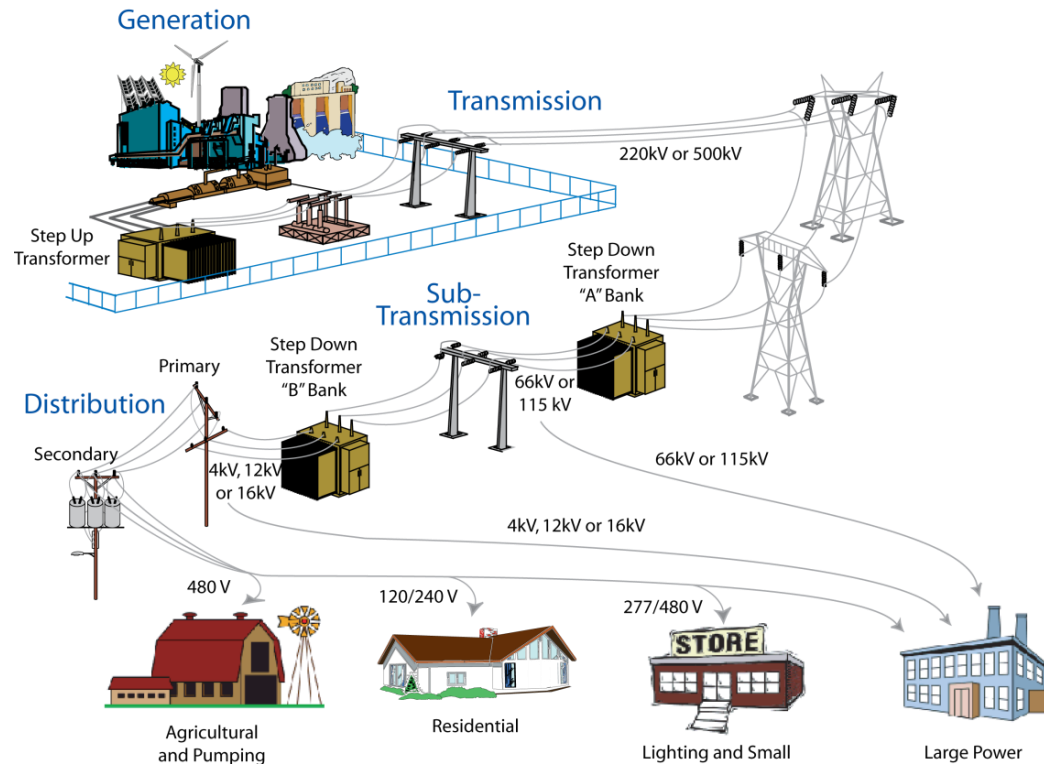
Building the Grid of the Future

SCE spends about $4 billion each year to build infrastructure.

- Infrastructure reliability – updating underground cables, poles, switches, transformers

- Transmission – connecting renewables, installing new substations, updating lines

- Grid readiness – updating the grid for impacts from new technologies

- Future energy policy – energy storage, electric vehicles, renewables

Examples of 2018 Capital Investments

250 miles of underground cable replaced

780 miles of overhead conductor replaced for public safety

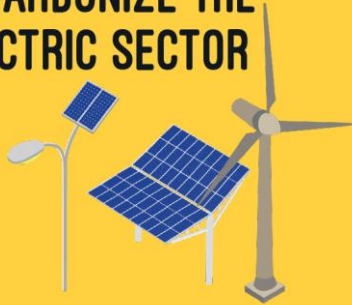18,600 Distribution poles replaced

4,100 Transmission poles replaced

116 Underground structure replacements

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

Clean Energy: SCE's Clean Power and Electrification Pathway

A Three Part, Integrated Solution

DECARBONIZE THE ELECTRIC SECTOR

- By 2030, create an electric generation mix powered by as much as **80% carbon-free resources.**
- More **solar**, **wind**, **hydropower** and other zero-emission sources, along with **energy storage.**
- Currently at about 45%

ELECTRIFY THE TRANSPORTATION SECTOR

- Accelerate electrification of the transportation sector
  - By 2030, **electrify 25% of cars and trucks** – about 7 million in total.
  - 15% of medium-duty vehicles electrified
  - 6% of heavy-duty vehicles electrified

ELECTRIFY BUILDINGS

- Doubling of energy efficiency in existing buildings
- By 2030, electrify about **one-third** of space and water heating in buildings.
- Remove barriers to adoption and empower customers who want cleaner space and water heating options.

"SCE is changing… because our customers demand it," Pedro Pizarro, president and CEO of Edison International, SCE's parent company

Working with customers to build a clean energy future

Clean Energy: Removing Barriers and Empowering Choice

DECARBONIZE THE ELECTRIC SECTOR
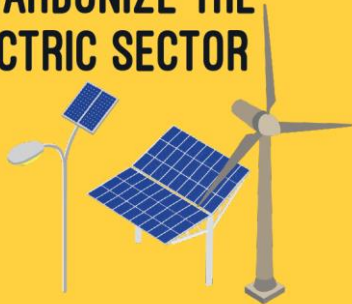
- Information, tools, and resources for customers looking to install solar
- Improved interconnection process for getting solar systems connected sooner
- Self Generation Incentive Program (SGIP) provides rebates for customers who install energy storage
- Green Rate for customers who don't want or can't install solar panels, but want more renewable energy

ELECTRIFY THE TRANSPORTATION SECTOR

- Clean Fuel Rewards offer $1,000 rebate toward purchase or lease of electric vehicle (EV)
- If approved, Charge Ready 2 application will provide incentives for 48,000 public charging stations
- Charge Ready Transport provide incentives for commercial fleets to install charging infrastructure
- EV rates to make it more affordable to charge (both residential and commercial)

ELECTRIFY BUILDINGS
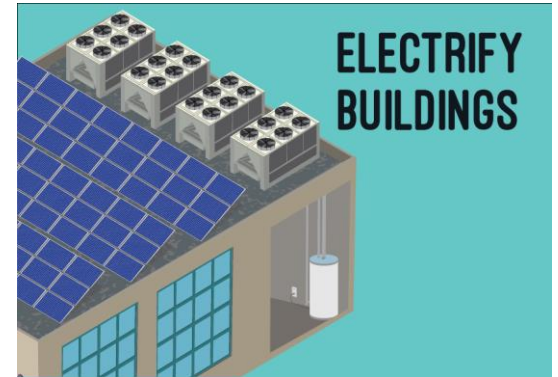
- Portfolio of energy efficiency programs for both residential and commercial
- Pilot with UC and CSU systems to reduce carbon emissions on their campuses
- Partnered with LADWP and SMUD to commission economic study of housing electrification costs and benefits

Empowering customers to make clean energy choices that best fit their needs

Wildfire: SCE's 2019 Wildfire Mitigation Plan (WMP)

Mitigations | Activities

Operational

Inspections
- Enhanced overhead inspections (EOI) on transmission and distribution structures in HFRA
- Various existing inspections (poles, switches, circuits, relays, etc.)
- Infrared, Corona scanning and high definition (HD) imagery

Public Safety Power Shutoff (PSPS)
- Effective communications and engagement with emergency services, customers and communities

Situational Awareness
- Weather stations and HD cameras per SCE's Grid Safety & Resiliency Program (GSRP)

Vegetation Management
- Hazard tree removal per GSRP
- Vegetation removal at poles
- LiDAR surveying for transmission, supplemental inspections in HFRA

Infrastructure

Covered Conductor
- Circuit miles of covered conductor in HFRA

Undergrounding
- Evaluation of targeted undergrounding in HFRA

Other Infrastructure Mitigations
- Various system hardening activities (e.g., composite poles, current limiting fuses (CLFs), remote automatic reclosers (RARs), Fast Curve settings)
- Studies, evaluations and pilots of alternative technologies

Note: Filed with the CPUC on February 6, 2019. HFRA = High Risk Fire Area.

Hardened System

Insulated Wires / Covered conductors

Fast-acting fuses

Fire-resistant poles, crossarms and insulators

Covered Conductor
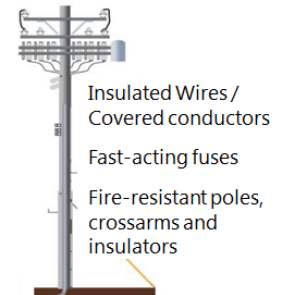
Conductor Shield   Inner Layer   Outer Layer
Conductor
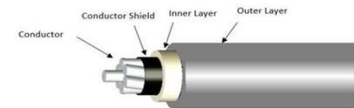
Weather Stations

Fire Monitoring Cameras

The WMP, required by SB 901 (Dodd, 2018), is part of a larger, ongoing effort and incorporates and builds on the $582 million GSRP that SCE submitted to the CPUC

Wildfire: Vegetation Management

- **20+** in-house certified arborists

- **800+** pruning contractors with **60** more crews added June/July 2018

- ≈ **900,000** trees inspected annually

- ≈ **700,000** pruned per year; **400,000** trees in high fire risk areas

2019

➤ Remove dead, dying, diseased trees in HFRA (30,000 forecast for 2019)

➤ Remove additional 7,500 which pose a fall-in or blow-in risk to SCE electrical facilities in HFRA

➤ Expand vegetation clearance distance to 12 feet per CPUC recommendation
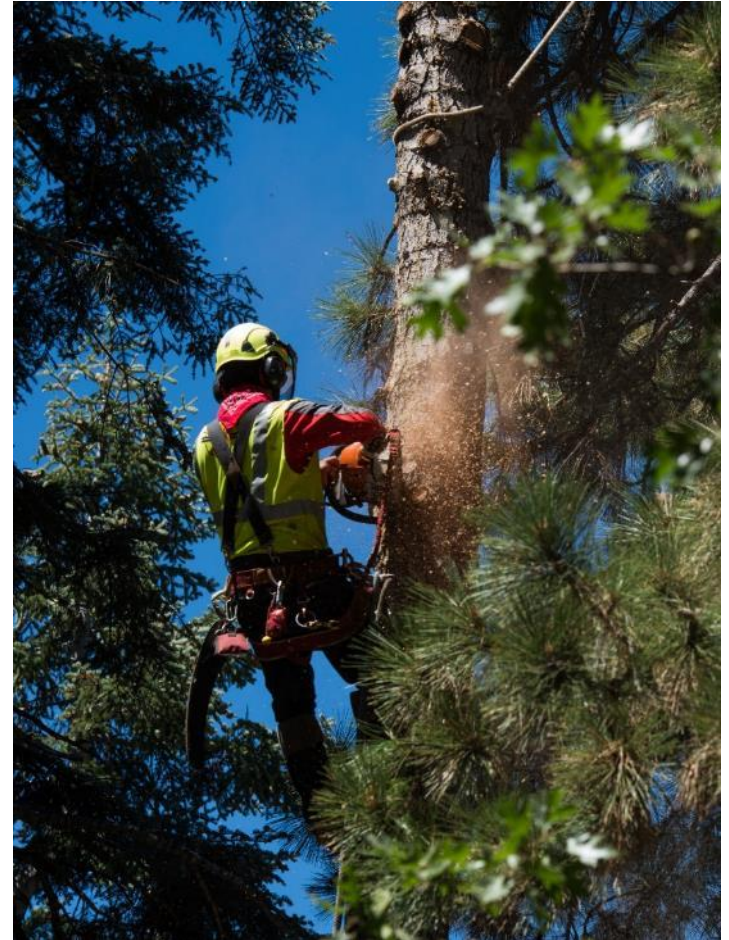
Dead, dying, diseased and certain other trees present a hazard and are removed to protect electrical facilities and reduce risk of fire.

Public Safety Power Shutoff (PSPS) Overview

- De-energization to **<u>prevent</u> ignitions** from powerlines

- Used during **elevated fire conditions**

- Red Flag Warning **does not** mean a PSPS will be called

- Actual frequency of PSPS events will depend on various weather and environmental factors

  - Decision will be made with most accurate assessment of real-time information and situational awareness data

Public Safety Power Shutoff (PSPS) Timeline

Ideal Timeline*

4-7 DAYS AHEAD	3 DAYS AHEAD	2 DAYS AHEAD	1 DAY AHEAD	POWER SHUTOFF	POWER RESTORATION
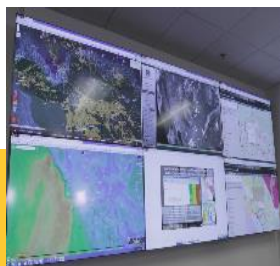
Forecast Weather & Fire Conditions	SCE Incident Management Team on Alert County Operational Areas informed of potential activation	SCE Incident Management Team Activated 1st Notification PSPS Possible sent to agencies and customers	2nd Notification PSPS Possible	3rd Notification Power Shutoff	4th Notification Power Restored After Inspection
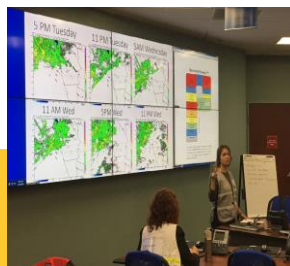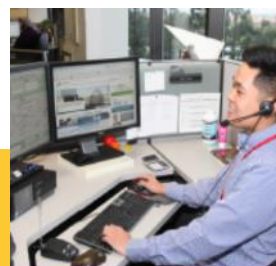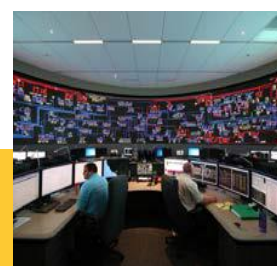
PLANNING AND MONITORING | **OUTAGE**

*Erratic or sudden onset of conditions may impact our ability to provide advanced notice to customers.

Reliability Overview

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).

How Do We Measure Reliability?

SAIDI	SAIFI	MAIFI	CAIDI

SAIDI = Total minutes every SCE customer was without power due to sustained outages (CMI) ÷ Total number of customers

"What's the total time my power service will be unexpectedly interrupted this year?"

System Average Interruption Duration Index

SAIFI = Number of sustained customer outages experienced by all SCE customers (CI) ÷ Total number of customers

"How many times will my power service be unexpectedly interrupted this year?"

System Average Interruption Frequency Duration Index

CAIDI = System Average Interruption Duration Index (SAIDI) ÷ System Average Interruption Frequency Index (SAIFI)

"How long will it take to restore my power after an unexpected interruption?"

Customer Average Interruption Duration Index

Cities in the SOUTH BAY District

ALONDRA PARK

DEL AIRE

EL SEGUNDO

GARDENA

HAWTHORNE

HERMOSA BEACH

INGLEWOOD

LADERA HEIGHTS

LAWNDALE

LENNOX

LOMITA

LOS ANGELES

MANHATTAN BEACH

PALOS VERDES ESTATES

RANCHO PALOS VERDES

REDONDO BEACH

ROLLING HILLS

ROLLING HILLS ESTATES

TORRANCE

VIEW PARK-WINDSOR HILLS

WEST ATHENS

WESTMONT

Reliability by SCE Districts (No Exclusions)

District Name	2014 District SAIDI	2014 SAIDI Ranking	2014 District SAIFI	2014 SAIFI Ranking	2015 District SAIDI	2015 SAIDI Ranking	2015 District SAIFI	2015 SAIFI Ranking	2016 District SAIDI	2016 SAIDI Ranking	2016 District SAIFI	2016 SAIFI Ranking	2017 District SAIDI	2017 SAIDI Ranking	2017 District SAIFI	2017 SAIFI Ranking	2018 District SAIDI	2018 SAIDI Ranking	2018 District SAIFI	2018 SAIFI Ranking
ANTELOPE VALLEY	51.05	35	0.59	34	104.34	22	0.68	30	107.67	24	0.87	29	103.19	23	0.87	27	55.61	33	0.61	31
ARROWHEAD	193.25	5	1.59	5	362.61	4	3.97	1	659.46	3	2.85	5	816.52	2	3.86	3	68.60	29	1.53	5
BARSTOW	201.53	4	1.34	10	187.11	8	1.17	12	134.83	18	1.35	9	357.47	6	2.65	6	116.70	17	1.37	9
BIG CREEK	920.25	1	1.34	11	422.77	2	3.42	2	1062.01	2	4.99	1	4273.52	1	7.95	2	203.43	6	2.48	1
BISHOP	118.79	17	0.59	35	298.11	6	2.22	4	168.59	8	1.22	14	190.51	10	1.93	9	139.70	12	0.54	32
BLYTHE	707.54	2	2.42	2	427.00	1	1.52	7	396.38	5	2.71	6	684.48	3	2.38	7	277.72	3	1.57	4
CATALINA	97.02	24	4.17	1	42.56	35	2.25	3	65.01	35	3.66	3	70.67	34	0.54	35	141.45	11	2.44	2
COVINA	91.60	27	0.87	22	100.08	23	0.81	25	112.13	22	0.97	24	117.18	20	0.93	23	103.18	18	0.83	22
DOMINGUEZ HILLS	82.30	29	0.71	28	130.63	15	0.97	17	146.38	12	1.11	17	123.60	18	0.83	28	93.37	19	0.85	21
FOOTHILL	93.35	25	0.93	21	109.64	20	0.95	20	142.81	14	1.03	21	110.53	21	1.12	13	117.61	16	0.98	17
FULLERTON	82.23	30	0.72	27	76.59	29	0.67	31	92.72	30	0.76	34	89.29	28	0.68	33	69.45	28	0.52	33
HUNTINGTON BEACH	79.61	31	0.78	25	98.32	25	0.95	19	128.02	20	1.26	12	99.07	26	0.98	21	87.72	24	0.76	25
KERNVILLE	178.69	8	1.99	3	286.38	7	0.96	18	2421.32	1	3.67	2	305.53	7	3.29	4	184.41	7	1.14	10
LONG BEACH	66.33	34	0.61	32	164.46	9	0.89	23	135.16	17	0.86	31	77.17	32	0.71	32	51.48	34	0.44	34
MENIFEE	156.68	11	1.32	12	111.46	19	0.98	16	156.75	9	1.31	10	130.47	16	0.96	22	174.06	8	0.90	19
MONROVIA	133.32	14	1.16	16	96.68	26	0.88	24	116.57	21	0.84	32	105.00	22	0.98	20	243.02	5	1.43	8
MONTEBELLO	158.34	10	1.16	15	150.28	12	1.18	11	133.52	19	1.17	15	123.98	17	0.99	19	160.88	10	1.06	13
ONTARIO	97.91	23	1.00	19	94.04	27	0.74	27	105.07	27	0.93	27	100.43	24	1.13	12	80.04	26	0.72	27
PALM SPRINGS	107.04	20	0.71	29	99.54	24	0.80	26	107.58	25	1.07	19	119.10	19	1.02	17	73.95	27	0.79	24
REDLANDS	154.25	12	1.04	18	124.52	17	1.01	14	137.11	16	0.98	23	142.59	14	1.01	18	88.93	22	0.97	18
RIDGECREST	176.84	9	1.57	6	148.90	13	1.01	15	254.31	6	1.05	20	164.28	11	1.09	14	254.59	4	1.10	11
SADDLEBACK	99.07	22	0.74	26	46.03	34	0.39	35	65.99	34	0.65	35	65.35	35	0.58	34	45.80	35	0.38	35
SAN JOAQUIN	138.25	13	1.17	14	127.50	16	1.05	13	108.44	23	1.09	18	191.66	9	1.34	11	56.23	31	0.68	28
SANTA ANA	91.68	26	0.84	23	67.46	32	0.71	29	97.27	29	1.00	22	81.90	31	0.71	31	122.09	15	0.82	23
SANTA BARBARA	183.78	7	1.38	9	152.37	11	1.52	6	156.66	10	1.41	8	408.43	5	9.21	1	172.90	9	1.02	16
SANTA MONICA	110.76	19	0.99	20	75.41	30	0.62	32	91.08	31	0.95	26	71.89	33	0.71	30	80.24	25	1.04	15
SOUTH BAY	125.28	16	1.39	8	164.07	10	1.31	8	183.90	7	1.88	7	99.19	25	0.93	24	90.63	21	1.09	12
TEHACHAPI	130.70	15	1.29	13	298.96	5	1.21	9	97.29	28	1.13	16	86.51	29	1.05	16	55.99	32	0.67	29
THOUSAND OAKS	104.37	21	1.10	17	106.59	21	0.92	21	143.78	13	1.31	11	151.74	12	1.43	10	1167.54	1	1.48	6
VALENCIA	79.23	32	0.61	33	72.27	31	0.61	33	105.09	26	0.97	25	136.62	15	1.08	15	92.41	20	1.06	14
VENTURA	183.79	6	1.65	4	148.85	14	1.19	10	150.41	11	1.24	13	520.90	4	3.12	5	136.04	13	1.44	7
VICTORVILLE	68.85	33	0.63	31	87.03	28	0.91	22	79.35	33	0.92	28	84.07	30	0.89	26	125.92	14	0.86	20
WHITTIER	87.60	28	0.70	30	114.52	18	0.73	28	137.34	15	0.81	33	148.91	13	0.90	25	87.74	23	0.67	30
WILDOMAR	118.49	18	0.81	24	52.70	33	0.60	34	84.01	32	0.87	30	90.15	27	0.80	29	60.77	30	0.75	26
YUCCA VALLEY	304.25	3	1.49	7	389.08	3	1.80	5	463.68	4	3.39	4	300.33	8	1.96	8	353.83	2	1.94	3
SCE SystemWide	**112.10**		**0.97**		**114.83**		**0.92**		**134.48**		**1.10**		**139.73**		**1.19**		**136.82**		**0.87**	

*"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 Hermosa Beach

There are 14 circuits that serve Hermosa Beach

Circuit Type	Customers	Circuit Type	Customers	Circuit Type	Customers	Circuit Type	Customers
ADDIS(16KV)	3,106						
CAMINO REAL(4.16KV)	745						
CARNELIAN(16KV)	4,971						
CLEO(4.16KV)	1,043						
CYLINDER(16KV)	1,392						
EL PASEO(4.16KV)	898						
HERMOSA(4.16KV)	1,203						
HILL(4.16KV)	724						
KEATS(4.16KV)	157						
KING(16KV)	3,766						
MORGAN(4.16KV)	958						
NO BEACH(4.16KV)	782						
OZONE(4.16KV)	600						
SO STRAND(4.16KV)	635						

Grand Total   20,980

Reliability History of Circuits Serving Hermosa Beach (No Exclusions)

SAIDI (average minutes of sustained interruptions)

	2015	2016	2017	2018
Hermosa Beach	196.0	188.5	95.8	61.2
SCE SYSTEMWIDE	114.8	134.5	139.7	136.8

SAIFI (average frequency of sustained interruptions)

	2015	2016	2017	2018
Hermosa Beach	1.5	2.4	0.9	1.0
SCE SYSTEMWIDE	0.9	1.1	1.2	0.9

MAIFI (average frequency of momentary interruptions)

	2015	2016	2017	2018
Hermosa Beach	2.0	1.0	1.6	1.2
SCE SYSTEMWIDE	1.4	1.6	1.8	1.4

Hermosa Beach

SCE SYSTEMWIDE

"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 03/25/2019, data can be slightly different due to outage data validation process

Causes of Repair Outages in Hermosa Beach
2018

- **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
- **3rd Party**
  e.g., balloon, car hit pole, dig-in

Contributions to SAIDI by Outage Cause

- 3rd Party 3.2%
- Weather /Fire /Earthquake 19.1%
- Other 1.5%
- Operation 15.1%
- Equipment Failure 61.2%

Legend:
- 3rd Party
- Equipment Failure
- Operation
- Other
- Vegetation /Animal
- Weather /Fire /Earthquake

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

Causes of Repair Outages in Hermosa Beach
2018

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, PSPS
- **Operations**
  e.g., urgent maintenance w/o 3-day notice
- **3rd Party**
  e.g., balloon, car hit pole, dig-in

Weather /Fire /Earthquake 4.8%
3rd Party 3.9%
Other 3.7%
Operation 38.1%
Equipment Failure 49.5%

Legend:
- 3rd Party
- Equipment Failure
- Operation
- Other
- Vegetation /Animal
- Weather /Fire /Earthquake

SAIFI = the number of times the average customer is interrupted by "sustained" outages each year
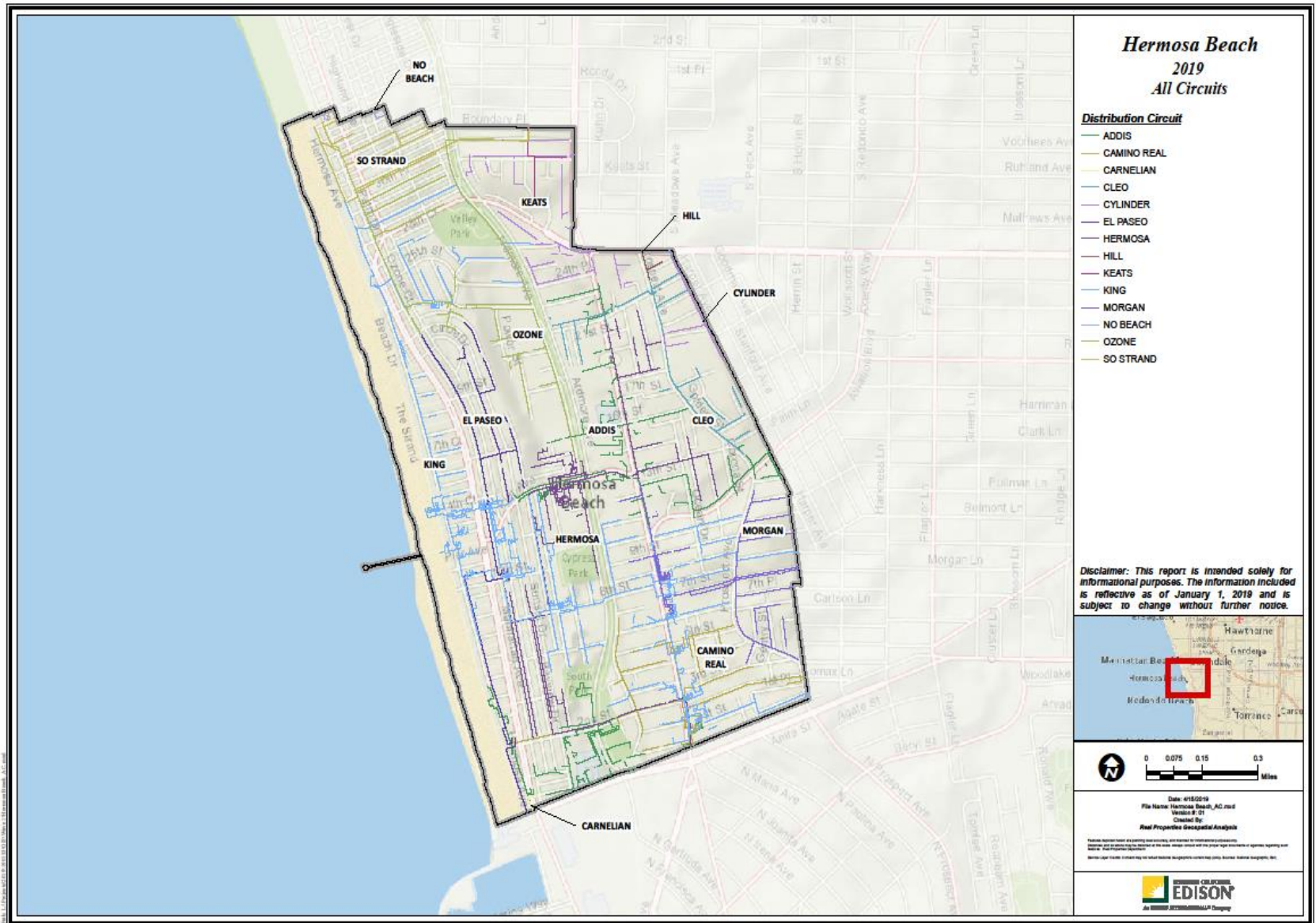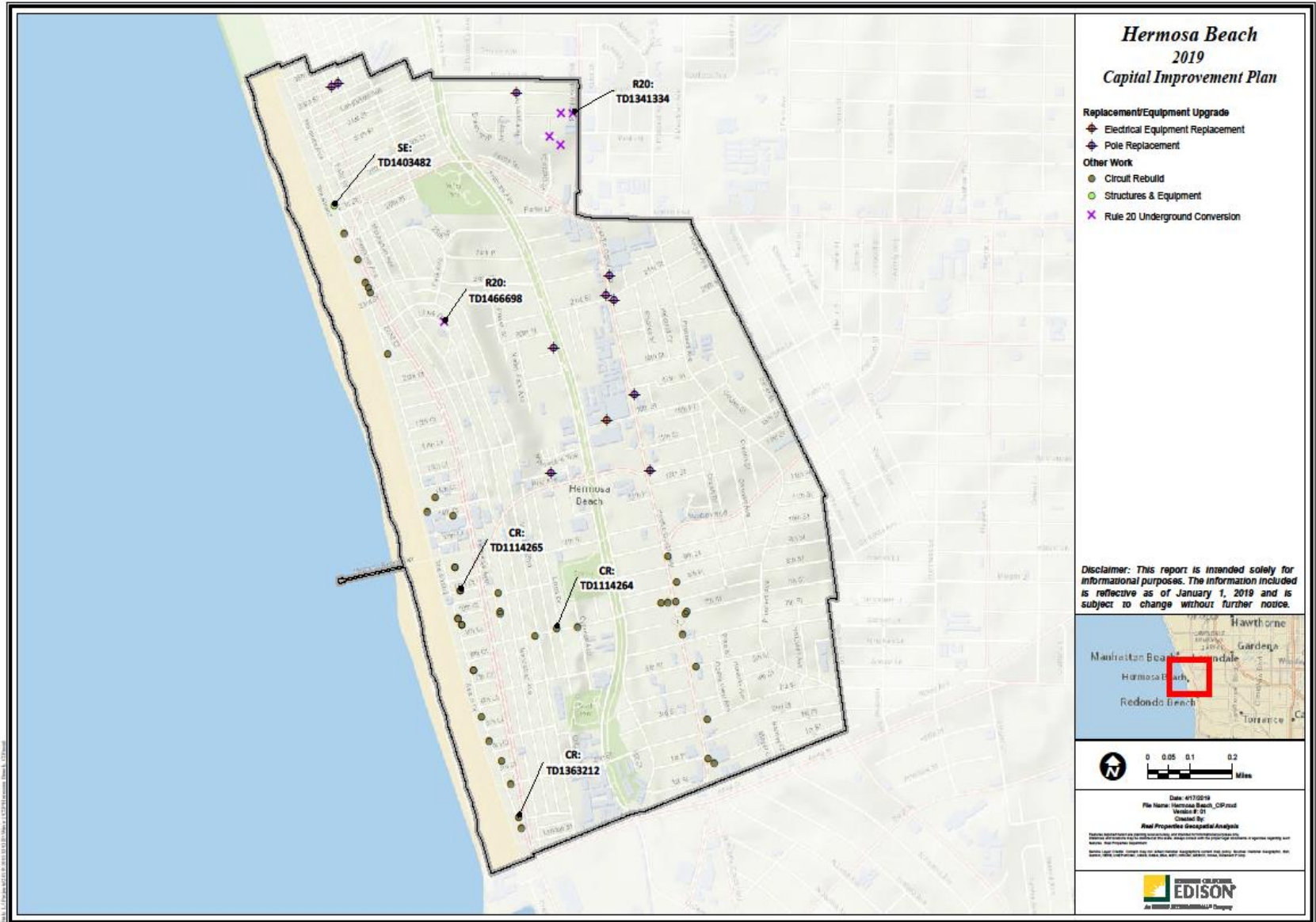
Back-up Slides

Reliability Histories of Circuits Serving Hermosa Beach

Updated through Dec 2018

SOUTHERN CALIFORNIA
EDISON®

Average Reliability of 14 Circuits Serving Hermosa Beach

	2015			2016			2017			1st Qtr 2018			2nd Qtr 2018			3rd Qtr 2018			4th Qtr 2018			2018		
	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI
14 Circuits Serving Hermosa Beach -- Total																								
Customers: 20,980	196.0	1.5	2.0	188.5	2.4	1.0	95.8	0.9	1.6	15.1	0.1	0.2	0.2	0.0	-	34.5	0.5	0.6	11.4	0.3	0.4	61.2	1.0	1.2
3rd Party	11%	16%	36%	6%	5%	6%	20%	3%	40%	13%	43%	39%	-	-	-	-	-	-	-	-	7%	3%	4%	8%
Equipment Failure	52%	56%	9%	47%	33%	49%	74%	82%	49%	10%	3%	15%	83%	73%	-	75%	60%	-	88%	45%	17%	61%	50%	8%
Operation	12%	9%	-	21%	43%	3%	3%	8%	2%	-	-	-	17%	27%	-	23%	34%	-	12%	55%	-	15%	38%	-
Other	25%	19%	53%	14%	7%	32%	1%	1%	4%	-	-	30%	-	-	-	3%	7%	16%	-	-	41%	1%	4%	26%
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	47%	-	-	35%	-	-	36%
Weather/Fire/Earthquake	-	-	2%	12%	11%	10%	3%	5%	5%	77%	54%	15%	-	-	-	0%	0%	37%	-	-	-	19%	5%	22%
SCE SYSTEMWIDE	114.8	0.9	1.4	134.5	1.1	1.6	139.7	1.2	1.8	19.7	0.2	0.3	16.7	0.2	0.4	28.4	0.2	0.3	72.0	0.3	0.4	136.8	0.9	1.4

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

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.

	2015			2016			2017			1st Qtr 2018			2nd Qtr 2018			3rd Qtr 2018			4th Qtr 2018			2018		
	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI
ADDIS(16KV) - Customers: 3,106	136.1	2.4	2.0	151.4	2.0	-	263.1	2.0	1.0	-	-	-	-	-	-	3.5	0.2	-	0.1	0.0	-	3.5	0.2	-
3rd Party	-	-	50%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	100%	99%	-	2%	0%	-	100%	100%	100%	-	-	-	-	-	-	83%	95%	-	-	-	-	81%	91%	-
Operation	0%	1%	-	24%	50%	-	-	-	-	-	-	-	-	-	-	17%	5%	-	100%	100%	-	19%	9%	-
Other	-	-	50%	74%	50%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weather/Fire/Earthquake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CAMINO REAL(4.16KV) - Customers: 745	3.1	0.0	2.0	41.8	1.1	-	-	-	-	-	-	-	-	-	-	74.4	1.0	-	-	-	-	74.4	1.0	-
3rd Party	-	-	50%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	100%	100%	-	4%	1%	-	-	-	-	-	-	-	-	-	-	100%	100%	-	-	-	-	100%	100%	-
Operation	-	-	-	96%	99%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	50%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weather/Fire/Earthquake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CARNELIAN(16KV) - Customers: 4,971	198.7	1.3	2.0	137.7	2.3	2.1	110.3	0.6	2.4	5.4	0.0	-	-	-	-	92.4	1.1	1.0	-	-	-	97.8	1.1	1.0
3rd Party	1%	0%	50%	-	-	-	75%	17%	82%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	99%	99%	-	64%	52%	52%	18%	71%	18%	100%	100%	-	-	-	-	100%	100%	-	-	-	-	100%	100%	-
Operation	0%	1%	-	30%	45%	-	7%	12%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	50%	7%	2%	48%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weather/Fire/Earthquake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%	0%	100%	-	-	-	0%	0%	100%
CLEO(4.16KV) - Customers: 1,043	149.1	0.4	3.0	55.0	2.0	2.0	21.6	0.1	-	-	-	-	-	-	-	-	-	1.0	2.8	0.0	1.0	2.8	0.0	2.0
3rd Party	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	37%	9%	100%	-	-	-	93%	80%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operation	63%	91%	-	58%	51%	-	7%	20%	-	-	-	-	-	-	-	-	-	-	100%	100%	-	100%	100%	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	50%
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	50%
Weather/Fire/Earthquake	-	-	-	42%	49%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	2015			2016			2017			1st Qtr 2018			2nd Qtr 2018			3rd Qtr 2018			4th Qtr 2018			2018		
	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI
CYLINDER(16KV) - Customers: 1,392	**258.5**	**3.0**	**-**	**398.1**	**3.1**	**1.0**	**64.1**	**1.3**	**1.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.0**	**-**	**-**	**1.0**	**-**	**-**	**2.0**
3rd Party	5%	33%	-	39%	33%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	61%	34%	-	22%	32%	97%	97%	98%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operation	35%	34%	-	8%	32%	-	3%	2%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	32%	3%	3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	51%
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	49%
Weather/Fire/Earthquake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EL PASEO(4.16KV) - Customers: 898	**303.4**	**0.7**	**2.0**	**37.2**	**1.0**	**-**	**70.3**	**0.9**	**1.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
3rd Party	-	-	49%	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	100%	100%	-	13%	2%	-	100%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operation	-	-	-	87%	98%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	51%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weather/Fire/Earthquake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HERMOSA(4.16KV) - Customers: 1,203	**6.3**	**0.1**	**2.0**	**87.8**	**2.5**	**1.0**	**110.9**	**1.0**	**2.6**	**-**	**-**	**1.0**	**1.1**	**0.0**	**-**	**-**	**-**	**-**	**2.9**	**0.1**	**-**	**4.0**	**0.1**	**1.0**
3rd Party	-	-	50%	11%	40%	100%	-	-	39%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	100%	100%	-	47%	18%	-	100%	99%	22%	-	-	-	43%	44%	-	-	-	-	100%	100%	-	84%	81%	-
Operation	-	-	-	42%	41%	-	0%	1%	-	-	-	-	57%	56%	-	-	-	-	-	-	-	16%	19%	-
Other	-	-	50%	-	-	-	-	-	39%	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	100%
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weather/Fire/Earthquake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HILL(4.16KV) - Customers: 724	**87.8**	**1.0**	**1.0**	**111.8**	**1.2**	**0.8**	**170.9**	**1.0**	**2.0**	**54.0**	**1.0**	**-**	**-**	**-**	**-**	**25.0**	**1.0**	**1.0**	**1.5**	**0.0**	**1.0**	**80.5**	**2.0**	**1.9**
3rd Party	-	-	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-	-	67%	50%	-
Equipment Failure	100%	100%	-	14%	3%	-	95%	97%	51%	-	-	-	-	-	-	-	-	-	82%	16%	-	2%	0%	-
Operation	-	-	-	86%	97%	100%	5%	3%	49%	-	-	-	-	-	-	-	-	-	18%	84%	-	0%	1%	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	100%	-	-	-	-	31%	48%	-
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	100%	-	-	100%
Weather/Fire/Earthquake	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	2015			2016			2017			1st Qtr 2018			2nd Qtr 2018			3rd Qtr 2018			4th Qtr 2018			2018		
	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI
KEATS(4.16KV) - Customers: 157	18.1	0.1	1.0	75.7	1.1	-	-	-	1.0	-	-	-	-	-	-	-	-	2.0	-	-	1.0	-	-	3.0
3rd Party	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operation	100%	100%	-	100%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50%	-	-	-	-	-	33%
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50%	-	-	100%	-	-	67%
Weather/Fire/Earthquake	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KING(16KV) - Customers: 3,766	349.5	1.8	3.9	270.4	3.7	1.0	34.6	0.5	1.6	-	-	-	0.2	0.0	-	44.8	1.0	-	44.8	1.7	0.4	89.8	2.7	0.4
3rd Party	20%	15%	25%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	4%	2%	-	45%	45%	100%	94%	97%	100%	-	-	-	100%	100%	-	4%	1%	-	84%	39%	100%	44%	25%	100%
Operation	1%	1%	-	14%	28%	-	6%	3%	-	-	-	-	-	-	-	96%	99%	-	16%	61%	-	56%	75%	-
Other	76%	81%	75%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weather/Fire/Earthquake	-	-	-	40%	27%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MORGAN(4.16KV) - Customers: 958	19.5	1.0	1.0	91.0	2.1	-	79.2	2.3	3.8	253.5	1.0	-	-	-	-	-	-	1.0	-	-	1.0	253.5	1.0	2.0
3rd Party	-	-	-	-	-	-	-	-	53%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	100%	100%	100%	55%	38%	-	5%	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operation	-	-	-	45%	62%	-	9%	44%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	18%	11%	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	50%
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	50%
Weather/Fire/Earthquake	-	-	-	-	-	-	68%	44%	47%	100%	100%	-	-	-	-	-	-	-	-	-	-	100%	100%	-
NO BEACH(4.16KV) - Customers: 782	302.3	1.1	-	72.6	2.0	1.0	6.7	0.0	1.0	1.1	0.0	2.0	3.3	0.0	-	10.6	0.0	1.9	-	-	1.0	15.0	0.1	5.0
3rd Party	-	-	-	-	-	-	-	-	-	100%	100%	100%	-	-	-	-	-	-	-	-	-	7%	13%	41%
Equipment Failure	7%	4%	-	-	-	-	57%	9%	100%	-	-	-	100%	100%	-	100%	100%	-	-	-	-	93%	87%	-
Operation	93%	96%	-	43%	50%	-	43%	91%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	50%	-	-	-	-	-	20%
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50%	-	-	100%	-	-	40%
Weather/Fire/Earthquake	-	-	-	57%	50%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	2015			2016			2017			1st Qtr 2018			2nd Qtr 2018			3rd Qtr 2018			4th Qtr 2018			2018		
	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI	SAIDI	SAIFI	MAIFI
OZONE(4.16KV) - Customers: 600	68.8	2.1	1.0	146.6	2.1	1.0	-	-	1.0	-	-	1.0	-	-	-	-	-	2.0	105.6	1.0	2.0	105.6	1.0	5.0
3rd Party	73%	95%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50%	-	-	20%
Equipment Failure	27%	5%	-	77%	51%	-	-	-	100%	-	-	-	-	-	-	-	-	-	100%	100%	-	100%	100%	-
Operation	-	-	-	23%	49%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	50%	-	-	-	-	-	20%
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50%	-	-	50%	-	-	40%
Weather/Fire/Earthquake	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	20%
SO STRAND(4.16KV) - Customers: 635	224.8	2.0	-	1063.8	3.0	1.0	1.7	0.0	1.4	8.5	0.0	1.0	-	-	-	-	-	2.0	-	-	1.0	8.5	0.0	4.0
3rd Party	100%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Equipment Failure	-	-	-	97%	66%	-	-	-	73%	100%	100%	100%	-	-	-	-	-	-	-	-	-	100%	100%	25%
Operation	-	-	-	3%	34%	-	100%	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	100%	-	-	27%	-	-	-	-	-	-	-	-	50%	-	-	-	-	-	25%
Vegetation/Animal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50%	-	-	100%	-	-	50%
Weather/Fire/Earthquake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-