An Inside Look at Electric Reliability
2015 Electric Reliability Report

Bakersfield, California
November 3, 2016
• Overview of our electric system
• Power outages and interruptions
• System-wide and local reliability statistics
• What we’re doing in your community to improve reliability
• Questions
Energizing California for over 150 years

Provides electric service to 16 million people

Spans our diverse 70,000 square-mile service territory

20,000+ employees

Regulated by the California Public Utilities Commission

Together, Building a Better California
Supporting our community

We serve more than 840,000 customers in the western half of Kern County and part of San Luis Obispo and Santa Barbara Counties.

- Employ more than 600 residents in the area.
- Property taxes - $12.6 million (fiscal year 2015-2016).
- Franchise Fees - $6.59 million (combined city and county totals for 2015).

In 2015, PG&E gave more than $667,000 to Kern County through charitable giving.

- Kern employees gave more than 1,400 hours of their time to local non-profits.
- Provides more than $684,000 in grants annually to local organizations.

PG&E’s Jason Payne helps a student inside the bucket of his truck. Scholarship winner Jineava To, with her mother Jin To and PG&E’s Denise Newton. Students from the first PowerPathway class in Kern County gather for a post graduation photo.
Public safety

Our highest priority is public safety and we engage our customers with a robust communication process.

Personal notifications include:

• In person conversations
• Door hangers
• Letters
• Phone calls
Delivering safe and reliable electric service

Steven Calvert P.E.
Senior Manager, Electric System Reliability
Our electric system

We are committed to delivering safe, reliable, affordable and clean energy.

- Operates and maintains 141,215 miles of distribution lines
- Operates and maintains 18,616 miles of interconnected transmission lines focused on clean energy
Our electric system

**Generation**
- Power Generated at 13–25 kV

**Transmission**
- Transmission Line 60, 115, 230 or 500 kV

**Distribution/Customers**
- Distribution Line 4, 12, 17 or 21 kV
- Home or Business 120–480 Volts
Why are there outages and interruptions?

- Weather
- **Vegetation** (trees contacting power lines)
- Animals
- Equipment failure
- Vehicle accidents
- Digging into underground electric lines
Outage Classifications

The company classifies outages according to industry definitions, in the Institute of Electrical and Electronic Engineers (IEEE) standards.

**Momentary Outage**
An outage less than or equal to 5 minutes in duration.

**Sustained Outage**
An outage greater than 5 minutes in duration.

**Planned Outage**
Outages which are customer or public official-requested or where the company has provided notice to the customer.

**Major Event**
A set of outages which occurred during a specific time and location and which combined, exceeds historically expected outage duration (SAIDI) for at least one day (as defined in IEEE 1366-2012)
### Reliability

<table>
<thead>
<tr>
<th>What we use to measure reliability:</th>
<th>How we track outages:</th>
<th>What we do with the data:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SmartMeter data</td>
<td>Outages are logged in PG&amp;E’s outage databases</td>
<td>Data is grouped into the metrics—SAIDI, SAIFI, CAIDI, MAIFI—so we can learn more about our reliability and how we can improve</td>
</tr>
<tr>
<td>Information from customer calls</td>
<td>Some data is stored automatically</td>
<td></td>
</tr>
<tr>
<td>Information from PG&amp;E’s automated systems</td>
<td>Detailed data is gathered by PG&amp;E’s first responders and field crews</td>
<td></td>
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</table>
How We Manage Reliability

**Immediate Response**
Restoration crews make repairs and improvements to the electric system due to an outage

**Daily Reviews**
Previous day outages are reviewed and near-term system improvement projects are identified

**Weekly and Monthly Reviews**
Trends in electric reliability are reviewed and action items are developed for both near- and long-term system improvement projects

**Annual Reviews**
Long-term (one year or greater) system improvement projects are identified and planned
Reliability is consistently delivering power to our customers

How we define and measure this

**SAIDI** = \[\frac{\text{Total minutes every customer was without power due to sustained outages}}{\text{Total number of customers}}\]

System average cumulative minutes of sustained power interruptions during the year

**SAIFI** = \[\frac{\text{Number of sustained customer outages experienced by all PG&E customers}}{\text{Total number of customers}}\]

System average number of sustained power interruptions during the year

**CAIDI** = \[\frac{\text{System Average Interruption Duration Index (SAIDI)}}{\text{System Average Interruption Frequency Index (SAIFI)}}\]

Average duration of each sustained power interruptions during the year

**MAIFI** = \[\frac{\text{Number of customers who experience Momentary Outages}}{\text{Total number of customers}}\]

Average number of momentary power interruptions during the year

*AIDI*—Average cumulative minutes of sustained power interruptions during the year on a specific circuit.

*AIFI*—Average number of sustained power interruptions during the year on a specific circuit.
What is PG&E’s system-wide reliability story?

- **Seven consecutive years** of record reliability.
- **39% reduction** in customer outage duration since 2010.
- **27% reduction** in the frequency of outages customers have experienced since 2010.

How will PG&E’s reliability improve?

- Infrastructure investments
- New technology
- Special programs targeting poorly-performing areas
- Improved emergency response
Kern Division Reliability Statistics

The following Kern Division statistics excluding planned outages and Major Event Days

<table>
<thead>
<tr>
<th>YEAR</th>
<th>AIDI</th>
<th>AIFI</th>
<th>MAIFI</th>
<th>CAIDI</th>
</tr>
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<tr>
<td>2006</td>
<td>173.1</td>
<td>1.470</td>
<td>1.842</td>
<td>118.3</td>
</tr>
<tr>
<td>2007</td>
<td>123.9</td>
<td>1.131</td>
<td>1.580</td>
<td>109.5</td>
</tr>
<tr>
<td>2008</td>
<td>139.7</td>
<td>1.181</td>
<td>1.101</td>
<td>118.3</td>
</tr>
<tr>
<td>2009</td>
<td>100.2</td>
<td>1.085</td>
<td>1.439</td>
<td>92.4</td>
</tr>
<tr>
<td>2010</td>
<td>120.4</td>
<td>1.076</td>
<td>1.408</td>
<td>111.9</td>
</tr>
<tr>
<td>2011</td>
<td>112.5</td>
<td>0.979</td>
<td>1.340</td>
<td>114.8</td>
</tr>
<tr>
<td>2012</td>
<td>88.1</td>
<td>0.981</td>
<td>1.218</td>
<td>89.8</td>
</tr>
<tr>
<td>2013</td>
<td>87.5</td>
<td>1.027</td>
<td>1.133</td>
<td>85.2</td>
</tr>
<tr>
<td>2014</td>
<td>81.0</td>
<td>0.936</td>
<td>1.635</td>
<td>86.5</td>
</tr>
<tr>
<td>2015</td>
<td>80.3</td>
<td>0.862</td>
<td>1.850</td>
<td>93.2</td>
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T&D RELIABILITY INDICES (2006-2015), (Excluding 2.5b ME Days, ISO, & Planned Outages)
PG&E’s poorly performing electric circuits in 2015, by the amount of time the average PG&E customer experienced a sustained outage (an outage that lasts more than five minutes).

<table>
<thead>
<tr>
<th>#</th>
<th>Division</th>
<th>Substation</th>
<th>Circuit Name</th>
<th>Total Customers</th>
<th>Circuit Miles</th>
<th>% OH</th>
<th>% UG</th>
<th>3 Yr Ave Mainline Outages</th>
<th>3 Yr Avg AIDI</th>
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<tbody>
<tr>
<td>1</td>
<td>CENTRAL COAST</td>
<td>OTTER</td>
<td>OTTER 1102</td>
<td>532</td>
<td>87</td>
<td>87%</td>
<td>13%</td>
<td>4.0</td>
<td>853.19</td>
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<td>2</td>
<td>NORTH VALLEY</td>
<td>RISING RIVER</td>
<td>RISING RIVER 1101*</td>
<td>727</td>
<td>82</td>
<td>98%</td>
<td>2%</td>
<td>4.0</td>
<td>821.51</td>
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<tr>
<td>3</td>
<td>NORTH VALLEY</td>
<td>CHALLENGE</td>
<td>CHALLENGE 1101*</td>
<td>698</td>
<td>71</td>
<td>99%</td>
<td>1%</td>
<td>3.0</td>
<td>791.00</td>
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<td>4</td>
<td>HUMBOLDT</td>
<td>FRUITLAND</td>
<td>FRUITLAND 1141*</td>
<td>373</td>
<td>41</td>
<td>100%</td>
<td>0%</td>
<td>2.7</td>
<td>760.02</td>
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<td>5</td>
<td>HUMBOLDT</td>
<td>HOOPA</td>
<td>HOOPA 1101*</td>
<td>2,008</td>
<td>199</td>
<td>94%</td>
<td>6%</td>
<td>5.7</td>
<td>758.57</td>
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<td>WILKINS SLOUGH</td>
<td>WILKINS SLOUGH 1101*</td>
<td>169</td>
<td>85</td>
<td>100%</td>
<td>0%</td>
<td>4.0</td>
<td>740.28</td>
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<td>7</td>
<td>HUMBOLDT</td>
<td>WILLOW CREEK</td>
<td>WILLOW CREEK 1103*</td>
<td>1,527</td>
<td>126</td>
<td>99%</td>
<td>1%</td>
<td>4.0</td>
<td>628.13</td>
</tr>
<tr>
<td>8</td>
<td>STOCKTON</td>
<td>ALPINE</td>
<td>ALPINE 1102*</td>
<td>309</td>
<td>3</td>
<td>0%</td>
<td>100%</td>
<td>2.7</td>
<td>618.70</td>
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<td>ALLEGHANY</td>
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<td>114</td>
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<td>2%</td>
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<td>10</td>
<td>KERN</td>
<td>POSO MOUNTAIN</td>
<td>POSO MOUNTAIN 2101</td>
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<td>100%</td>
<td>0%</td>
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<td>590.28</td>
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<td>TULARE LAKE 2108</td>
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<td>1%</td>
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<tr>
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<td>YOSEMITE</td>
<td>INDIAN FLAT</td>
<td>INDIAN FLAT 1104*</td>
<td>599</td>
<td>44</td>
<td>55%</td>
<td>45%</td>
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<td>556.32</td>
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<td>GARBERVILLE</td>
<td>GARBERVILLE 1102*</td>
<td>1,783</td>
<td>215</td>
<td>95%</td>
<td>5%</td>
<td>11.0</td>
<td>546.46</td>
</tr>
<tr>
<td>14</td>
<td>SIERRA</td>
<td>PIKE CITY</td>
<td>PIKE CITY 1101*</td>
<td>412</td>
<td>52</td>
<td>97%</td>
<td>3%</td>
<td>2.3</td>
<td>527.93</td>
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<tr>
<td>15</td>
<td>FRESNO</td>
<td>DUNLAP</td>
<td>DUNLAP 1102*</td>
<td>718</td>
<td>115</td>
<td>69%</td>
<td>31%</td>
<td>6.3</td>
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<td>6%</td>
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<td>502.81</td>
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<td>FRESNO</td>
<td>ANGIOLA</td>
<td>ANGIOLA 1102</td>
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<td>50</td>
<td>99%</td>
<td>1%</td>
<td>2.7</td>
<td>500.57</td>
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<td>DUNLAP</td>
<td>DUNLAP 1103*</td>
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<td>6%</td>
<td>3.3</td>
<td>485.15</td>
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<td>KERN</td>
<td>KERN OIL</td>
<td>KERN OIL 1106</td>
<td>668</td>
<td>78</td>
<td>92%</td>
<td>8%</td>
<td>3.0</td>
<td>440.86</td>
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</table>
PG&E’s poorly performing electric circuits in 2015, by the number of times the average PG&E customer experienced a sustained outage (an outage that lasts more than five minutes).

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<th>3 Yr Avg AIFI</th>
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<td>1</td>
<td>YOSEMITE</td>
<td>BORDEN</td>
<td>BORDEN 1103</td>
<td>703</td>
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<td>1%</td>
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<td>3.51</td>
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<td>SIERRA</td>
<td>EL DORADO PH</td>
<td>EL DORADO PH 2101</td>
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<td>1%</td>
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<td>WILKINS SLOUGH</td>
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<td>100%</td>
<td>0%</td>
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<td>3.17</td>
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<td>4</td>
<td>DIABLO</td>
<td>ROSSMOOR</td>
<td>ROSSMOOR 1108</td>
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<td>SIERRA</td>
<td>BRUNSWICK</td>
<td>BRUNSWICK 1103*</td>
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<td>101</td>
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<td>12%</td>
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<td>2.78</td>
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<td>ALPINE 1102</td>
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<td>0%</td>
<td>100%</td>
<td>2.7</td>
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<td>HUMBOLDT</td>
<td>GARBERVILLE</td>
<td>GARBERVILLE 1102*</td>
<td>1,783</td>
<td>215</td>
<td>95%</td>
<td>5%</td>
<td>11.0</td>
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<td>TULARE LAKE</td>
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<td>1%</td>
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<td>58</td>
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<td>17%</td>
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<td>238</td>
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<td>1%</td>
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<td>SALT SPRINGS 2102*</td>
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<td>5%</td>
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<td>2.27</td>
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<td>15</td>
<td>CENTRAL COA</td>
<td>OTTER</td>
<td>OTTER 1102</td>
<td>532</td>
<td>87</td>
<td>87%</td>
<td>13%</td>
<td>4.0</td>
<td>2.27</td>
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<td>CHALLENGE</td>
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<td>1%</td>
<td>3.0</td>
<td>2.25</td>
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<td>1%</td>
<td>4.3</td>
<td>2.22</td>
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<td>SACRAMENTO</td>
<td>MERIDIAN</td>
<td>MERIDIAN 1101</td>
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<td>86</td>
<td>100%</td>
<td>0%</td>
<td>2.3</td>
<td>2.17</td>
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<td>19</td>
<td>FRESNO</td>
<td>KEARNEY</td>
<td>KEARNEY 1104</td>
<td>1,457</td>
<td>102</td>
<td>99%</td>
<td>1%</td>
<td>4.3</td>
<td>2.11</td>
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Poorly Performing Circuits

System Map

Kern Area Map
Improving Kern’s Poor Performing Circuits

**Poso Mountain 2101 (146 customers)**
- The Poso Mountain Substation is located on Woody Road 15 miles east of Famoso and 14 miles north of Bakersfield. This is a rural area, and the circuit primarily serves oil fields.
- Outages on this circuit are due to animals and lightning strikes.
- PG&E completed a $1.1 million Reliability Targeted Project on this circuit in 2014.

**Kern Oil 1106 (668 customers)**
- The Kern Oil Substation is on North Chester Avenue and Jesse D Road. It serves a rural area north of Bakersfield to the east to Round Mountain and Choctaw Valley.
- Outages on this circuit are due to equipment failure.
- PG&E completed several projects on this circuit in 2015 to install sectionalizing equipment to reduce customers impacted when outages occurred.

**Lamont 1104 (358 customers)**
- The Lamont Substation is located at White Wolf Road and Malaga Road, nine miles southeast Bakersfield. It serves north to Edison Highway and east to Rankin Ranch.
- Outages on this circuit are due to third-party vehicle accidents.
- PG&E has projects planned for completion in 2018 to install sectionalizing equipment to reduce customers impacted when outage occur.
Key PG&E facilities and office buildings within Kern

1. Bakersfield Customer Service Office
   1918 H Street, Bakersfield

2. Bakersfield Service Center
   4101 Wible Road, Bakersfield

3. Ridgecrest Service Center
   530 South China Lake Blvd, Ridgecrest

4. Wasco Service Center
   1101 Twelfth Street, Wasco

5. Taft Service Center
   550 Gardner Field Road, Taft

In addition, we have 62 substations, one natural gas compressor station, and three switching stations in Kern.

PG&E’s total capital investment in Kern Division electric distribution and transmission infrastructure:

$133.8 million in 2015 and is forecasted to be $184.6 million in 2016
$199.2 million in 2017
$207.6 million in 2018
Customers in Kern Division have consistently experienced **improved reliability** with the average customer experiencing **80.3 minutes** of sustained power interruptions in 2015 compared to **173.9 minutes** in 2006.

That’s **over a 50% reduction** (53 percent) compared to 10 years ago.

Similarly, the average customer in Kern experienced **0.862** sustained power interruptions in 2015 compared to **1.47** in 2006.

That’s less than one interruption per customer per year, and represents a **41.3% reduction** compared to 10 years ago.
Rio Bravo 1101: Completed 2015

After three sustained outages were reported within the last three years in a section of the mainline overhead conductor, a preliminary field investigation discovered deteriorated cable and splices. More than a mile (about 5,800 feet) of new wire was installed.

Number of customers on the circuit: 369

McFarland 1101: Completed 2016

Four sustained outages were reported on 12 miles of mainline. This project was part of the Kern Division Reliability Targeted Circuit Program that addresses all aspects of the mainline. The work is expected to reduce the annual number of customer interruptions by about 74 percent and the customer outage minutes by about 64 percent.

Number of customers on the circuit: 2,339
Old River: Planned for 2017

As a result of 15 sustained outages and three wire-downs on the 8.5 miles of mainline, this project was added to the Kern Division Reliability Targeted Circuit Program that addresses all aspects of the mainline. It is expected to reduce the annual number of customer interruptions by 37% and the customer-minutes of outage by 29%.

Number of customers on the circuit: 846

Wasco 1102: Planned for 2017

Three sustained outages were reported within the last three years in a section of mainline overhead conductor. Preliminary field investigation discovered deteriorated cable and several splices. This project will installed more than a mile (about 6,700 feet) of new wire.

Number of Customers on the Circuit: 1,366
Thank you

Annual report and a recording of this presentation
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Contact us
800-743-5000

Questions?