



| ID | Overloaded Facility | Worst Contingency | Category | Category Description | Loading (%) | | | | | | | Potential Mitigation Solutions |
|--------------|--|---|----------|----------------------|------------------|------------------|--------------------------|------------------|----------------------|------------------------|----------------------|---|
| | | | | | 2017 Summer Peak | 2020 Summer Peak | 2025 Summer Partial Peak | 2025 Summer Peak | 2017 Spring Off-Peak | 2020 Spring Light Load | 2025 Spring Off-Peak | |
| PGE Blk-T-1 | Chico Jct-Anita 60 kV | normal conditions | P0 | normal | 135.7% | 137.0% | 113.6% | 141.3% | <95% | <95% | <95% | radial line, section of Glenn-Anita line, mitigation in area studies |
| PGE Blk-T-2 | Glenn-Capay Jct - Headgate 60 kV | normal conditions | P0 | normal | 121.0% | 121.7% | 100.6% | 124.7% | <95% | <95% | <95% | radial line, section of Glenn-Anita line, mitigation in area studies |
| PGE Blk-T-3 | Taft-TX_BV_Hills 70 kV | normal conditions | P0 | normal | 116.7% | 116.7% | 110.8% | 117.5% | <95% | <95% | <95% | radial line, section of Taft-Elk Hills 70 kV, mitigation in area studies |
| PGE Blk-T-4 | Highlands Jct-Low Lake Jct 115 kV | normal conditions | P0 | normal | 109.6% | 104.1% | <95% | 99.6% | <95% | <95% | <95% | section of Eagle Rk-Red Bud 115 kV line, wrong rating |
| PGE Blk-T-5 | Vaca Dix- Winters-Plain Fld 60 kV | normal conditions | P0 | normal | 107.7% | 110.0% | <95% | <95% | <95% | <95% | <95% | radial line, low voltage (0.886), moved to 115 kV in 2025, mitigation in area studies |
| PGE Blk-T-6 | Chowchilla-Chowchilla gen Jct 115 kV | normal conditions | P0 | normal | 99.1% | 101.1% | <95% | 102.5% | 100.1% | <95% | <95% | reduce output from Chowch co-gen (bus 34301) |
| PGE Blk-T-7 | E. Nicolaus-Plumas 60 kV | normal conditions | P0 | normal | <95% | 100.5% | 108.6% | 129.4% | <95% | <95% | <95% | radial line, mitigation in area studies |
| PGE Blk-T-8 | Merced-Mc Farland 70 kV | normal conditions | P0 | normal | <95% | 100.1% | <95% | <95% | <95% | <95% | <95% | radial line, mitigation in area studies |
| PGE Blk-T-9 | Midway-SM1T013041 (Semitropic) 115 kV | normal conditions | P0 | normal | <95% | <95% | 122.4% | 116.7% | <95% | <95% | <95% | change Midway-Semitropic 115 kV line configuration |
| PGE Blk-T-10 | Wyandette-Wyandette Jct (Palermo) 115 kV | normal conditions | P0 | normal | <95% | <95% | <95% | 101.2% | <95% | <95% | <95% | radial line, mitigation in area studies |
| PGE Blk-T-11 | Avenal T - Kettleman T 70 kV | normal conditions | P0 | normal | <95% | <95% | <95% | <95% | 99.9% | <95% | 100.4% | reduce output from Sun City |
| PGE Blk-T-13 | Delevan-Cortina 230 kV | Olinda-Tracy 500 kV | P1 | L-1 | <95% | 100.8% | <95% | 100.7% | <95% | <95% | <95% | reduce Colusa generation or upgrade/rerate the line |
| PGE Blk-T-13 | Delevan-Cortina 230 kV | Table Mtn-Vaca Dix 500 kV | P1 | L-1 | <95% | 101.0% | <95% | 100.5% | <95% | <95% | <95% | reduce Colusa generation or upgrade/rerate the line |
| PGE Blk-T-14 | Eight Mile - Lodi 230 kV | Table Mtn 500/230 kV x-former | P1 | T-1 | <95% | <95% | <95% | <95% | 98.1% | <95% | <95% | not a violation, reduce Lodi generation if overload |
| PGE Blk-T-14 | Eight Mile - Lodi 230 kV | Table Mtn 500/230 kV x-former & Diablo # 1 unit | P3 | T-1/G-1 | <95% | <95% | <95% | <95% | 99.7% | <95% | <95% | not a violation, reduce Lodi generation if overload |
| PGE Blk-T-15 | MOSSLND2 - LASAGUIL 230 kV #2 | Moss Landing 500/230 kV x-former | P1 | T-1 | <95% | <95% | <95% | <95% | <95% | <95% | 96.6% | not a violation |

Thermal Overloads

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| | | | | | 2017 Summer Peak | 2020 Summer Peak | 2025 Summer Partial Peak | 2025 Summer Peak | 2017 Spring Off-Peak | 2020 Spring Light Load | 2025 Spring Off-Peak | |
| PGE Blk-T-12 | Rnd Mtn -Table Mtn #1 or #2 500 kV | Rnd Mtn -Table Mtn #2 or #1 500 kV | P1 | L-1 | 101.1% | 102.1% | <95% | 102.8% | <95% | <95% | <95% | bypass ser caps on the remaining Round Mtn-Table Mtn 500 kV line or Tbl Mtn-Vaca Dix or reduce COI flow according to seasonal nomogram |
| PGE Blk-T-16 | Round Mtn 500/230 kV x-former | Capt Jack-Olinda 500 kV | P1 | L-1 | <95% | <95% | <95% | <95% | <95% | <95% | 98.6% | not a violation, turning off shunt cap at Malin will reduce flow |
| PGE Blk-T-13 | Delevan-Cortina 230 kV | Vaca Dix 500 kV stuck brk | P4 | BRK | <95% | 103.1% | <95% | 101.5% | <95% | <95% | <95% | upgrade/rerate the line or reduce Colusa generation, Colusa dispatch is lower in 2017 |
| PGE Blk-T-15 | MOSSLND2-LASAGUIL 230.0 #2 | Los Banos stuck Brk 500 kV | P4 | BRK | <95% | <95% | <95% | <95% | <95% | <95% | 98.1% | not a violation |
| PGE Blk-T-15 | MOSSLND2 - LASAGUIL 230 kV #2 | Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV | P6 | L-1/L-1 | <95% | 189.0% | 112.3% | 167.2% | 117.8% | <95% | 166.0% | Dispatch generation in San Jose. Sectionalize San Jose system. Other mitigation measures are being evaluated. |
| PGE Blk-T-15 | MOSSLND2 - LASAGUIL 230 kV #2 | Moss Landing-Metcalf 500 kV & Moss Landing-Los Banos 500 kV | P6 | L-1/L-1 | <95% | 103.0% | <95% | 96.6% | <95% | <95% | 115.6% | Open Mosslanding-Lasaguilass 230 kV line |
| PGE Blk-T-26 | LASAGUILASS - PANOCHE 230 1 & 2 | Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV | P6 | L-1/L-1 | <95% | 108.6% | <95% | 99.4% | <95% | <95% | <95% | Dispatch generation in San Jose. Sectionalize San Jose system. Other mitigation measures are being evaluated. |
| PGE Blk-T-27 | LONETREE-USWP-JRW 230 kV | Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV | P6 | L-1/L-1 | <95% | 100.9% | <95% | <95% | <95% | <95% | <95% | Dispatch generation in San Jose. Sectionalize San Jose system. Other mitigation measures are being evaluated. |
| PGE Blk-T-28 | LS ESTEROS - NWK DIST 230 kV | Tesla-Metcalf 500 kV & Moss Landing-Metcalf 500 kV | P6 | L-1/L-1 | <95% | 106.0% | <95% | <95% | <95% | <95% | <95% | dispatch Ls Esteros peakers after 1st contingency |
| PGE Blk-T-28 | LS ESTEROS - NWK DIST 230 kV | Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV | P6 | L-1/L-1 | <95% | 145.4% | <95% | 120.1% | 100.4% | <95% | <95% | Dispatch generation in San Jose. Sectionalize San Jose system. Other mitigation measures are being evaluated. |



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| PGE BIK-T-29 | METCALF 500/230 kV x-former #13 | Metcalf 500/230 kV Tranformers #11 and #12 | P6 | T-1/T-1 | <95% | 117.0% | <95% | 105.8% | <95% | <95% | <95% | dispatch Ls Esteros peakers after 1st contingency, trip load in San Jose if overload persists |
| PGE BIK-T-30 | N.DUBLIN-CAYETANO 230 kV | Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV | P6 | L-1/L-1 | <95% | 102.1% | <95% | <95% | <95% | <95% | <95% | Dispatch generation in San Jose. Sectionalize San Jose system. Other mitigation measures are being evaluated. |
| PGE BIK-T-31 | NEWARK 230/115 # 11 | Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV | P6 | L-1/L-1 | <95% | 103.4% | <95% | <95% | <95% | <95% | <95% | Dispatch generation in San Jose. Sectionalize San Jose system. Other mitigation measures are being evaluated. |
| PGE BIK-T-32 | NEWARK E - NWK DIST 230 kV | Tesla-Metcalf 500 kV & Moss Landing-Metcalf 500 kV | P6 | L-1/L-1 | <95% | 109.1% | <95% | <95% | <95% | <95% | <95% | dispatch Ls Esteros peakers after 1st contingency |
| PGE BIK-T-32 | NEWARK E - NWK DIST 230 kV | Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV | P6 | L-1/L-1 | <95% | 145.7% | 96.3% | 122.5% | 97.9% | <95% | <95% | Dispatch generation in San Jose. Sectionalize San Jose system. Other mitigation measures are being evaluated. |
| PGE BIK-T-33 | NEWARK F - LCKHD J1 115 kV | Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV | P6 | L-1/L-1 | <95% | 136.4% | 103.5% | 125.6% | 97.9% | <95% | <95% | Dispatch generation in San Jose. Sectionalize San Jose system. Other mitigation measures are being evaluated. |
| PGE BIK-T-34 | NEWARK F -DIXON LD 115 kV | Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV | P6 | L-1/L-1 | <95% | 109.8% | <95% | 96.4% | <95% | <95% | <95% | Dispatch generation in San Jose. Sectionalize San Jose system. Other mitigation measures are being evaluated. |
| PGE BIK-T-21 | OLINDA 500 / 230 kV transformer | Malin-Round Mountain #1 and Olinda-Tracy 500 kV | P6 | L-1/L-1 | <95% | <95% | <95% | <95% | <95% | <95% | 107.7% | use Colusa SPS for off-peak overload |
| PGE BIK-T-12 | ROUND MT -TABLE MT 500 kV #2 (or #1) | Round Mountain-Table Mountain #1 (or # 2) and Olinda-Tracy 500 kV | P6 | L-1/L-1 | <95% | <95% | 97.5% | 106.0% | <95% | <95% | <95% | Reduce flow after first contingency. Bypass series caps on remaining Round Mtn-Table Mtn line if overload |
| PGE BIK-T-12 | ROUND MT -TABLE MT 500 kV #2 (or #1) | Round Mountain-Table Mountain #1 (or # 2) and Capt Jack-Olinda 500 kV | P6 | L-1/L-1 | <95% | <95% | <95% | 101.9% | <95% | <95% | <95% | Reduce flow after first contingency. Bypass series caps on remaining Round Mtn-Table Mtn line if overload |

Thermal Overloads

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| PGE Blk-T-35 | TRACY 500 /230 kV x-former #1 | Tesla-Tracy 500 kV Line and Tracy 500/230 kV x-former # 2 | P6 | L-1/T-1 | <95% | 108.1% | <95% | 105.3% | <95% | <95% | <95% | open Tracy-Tesla 230 kV lines if overload |
| PGE Blk-T-36 | TRIMBLE-SJB DG 115 kV | Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV | P6 | L-1/L-1 | <95% | 129.8% | 116.9% | 136.4% | 103.9% | <95% | <95% | Dispatch generation in San Jose. Sectionalize San Jose system. Other mitigation measures are being evaluated. |
| PGE Blk-T-37 | USWP-JRW-CAYETANO 230 kV | Tesla-Metcalf 500 kV & Moss Landing-Los Banos 500 kV | P6 | L-1/L-1 | <95% | 108.2% | 97.0% | 99.5% | <95% | <95% | <95% | Dispatch generation in San Jose. Sectionalize San Jose system. Other mitigation measures are being evaluated. |
| PGE Blk-T-17 | Captain Jack-Olinda 500 kV | Malin- Round Mtn #1 and #2 500 kV | P7 | L-2 | 103.2% | 104.9% | 99.5% | 104.5% | <95% | <95% | 96.5% | operate within COI nomogram |
| PGE Blk-T-17 | Captain Jack-Olinda 500 kV | Round Mtn-Table Mtn # 1 and # 2 500 kV | P7 | L-2 | 104.1% | 106.2% | 99.3% | 105.6% | <95% | <95% | <95% | operate within COI nomogram |
| PGE Blk-T-19 | Cottonwd E-Round Mtn 230kV #3 | Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV | P7 | L-2 | 101.9% | 105.0% | <95% | 105.6% | <95% | <95% | <95% | upgrade the line, or limit COI import within nomogram |
| PGE Blk-T-20 | Cottonwood-Round Mtn # 2 230 kV | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | <95% | 95.7% | <95% | 96.4% | <95% | <95% | <95% | upgrade the line, or limit COI import within nomogram |
| PGE Blk-T-13 | Delevan-Cortina 230 kV | Round Mtn-Table Mtn # 1 and # 2 500 kV | P7 | L-2 | 96.5% | 110.8% | <95% | 109.6% | <95% | <95% | <95% | upgrade/erate the line, or modify RAS to trip Colusa generation |
| PGE Blk-T-13 | Delevan-Cortina 230 kV | Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV | P7 | L-2 | 98.0% | 112.5% | <95% | 111.1% | <95% | <95% | <95% | upgrade/erate the line, or modify RAS to trip Colusa generation |
| PGE Blk-T-22 | Gregg-Ashlan 230 kV | Gregg-Herndon 230 kV # 1 and 2 | P7 | L-2 | 152.5% | <95% | <95% | <95% | <95% | <95% | <95% | Ashlan upgrade project, SPS prior to upgrade |
| PGE Blk-T-23 | Midway-Kern #1 230 kV | Midway-Kern 230 kV # 2 and 3 | P7 | L-2 | 125.5% | <95% | <95% | <95% | <95% | <95% | <95% | trip Bakersfield and Stockdale load prior to upgrade |
| PGE Blk-T-9 | Midway-SM1T0130 115 kV | Midway-Kern PP 230 kV # 2 and 3 | P7 | L-2 | <95% | <95% | 123.1% | 118.2% | <95% | <95% | <95% | change Midway-Semitropic 115 kV line configuration in 2025 |
| PGE Blk-T-21 | Olinda500/230 kV x-former | Malin-Round Mtn # 1 and # 2 500 kV | P7 | L-2 | <95% | <95% | <95% | <95% | <95% | <95% | 109.5% | use Colusa SPS |
| PGE Blk-T-24 | Rio Oso-Gleaf Tp 115 kV | Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV | P7 | L-2 | 99.2% | <95% | <95% | <95% | <95% | <95% | <95% | South of Palermo Project. Prior to the project: limit COI import within nomogram |
| PGE Blk-T-16 | Round Mtn 500/230 kV x-former | Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV | P7 | L-2 | <95% | <95% | <95% | <95% | <95% | <95% | 97.3% | open Round Mtn bank |
| PGE Blk-T-16 | Round Mtn 500/230 kV x-former | Round Mtn-Table Mtn # 1 and # 2 500 kV | P7 | L-2 | <95% | <95% | <95% | <95% | <95% | <95% | 108.6% | open Round Mtn bank |
| PGE Blk-T-25 | Table Mtn-Rio Oso 230 kV | Tbl Mtn-Tesla and Tbl Mtn-Vaca Dix 500 kV | P7 | L-2 | 108.1% | 113.4% | <95% | 114.2% | <95% | <95% | <95% | Upgrade terminal equipment on this line. |



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| PGE Blk-T-18 | Captain Jack-Ponderosa B 500 kV | PDCI bi-pole | P7 | DC bipole | 102.6% | 100.2% | <95% | 101.0% | N/A | <95% | N/A | don't insert Fort Rock series caps or operate within COI nomogram, contact BPA to discuss |
| PGE Blk-T-23 | Ponderosa-Summer Lake 500 kV | PDCI bi-pole | P7 | DC bipole | 111.3% | <95% | <95% | <95% | N/A | <95% | N/A | contact BPA to discuss |



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| | | | | | 2017 Summer Peak | 2020 Summer Peak | 2025 Summer Partial Peak | 2025 Summer Peak | 2017 Spring Off-Peak | 2020 Spring Light Load | 2025 Spring Off-Peak | |
| PGE Blk-VD-1 | HOLLISTR 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.2% | <5% | 5.4% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-2 | NTVD SW2 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.1% | <5% | 5.3% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-3 | NTVD SW1 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.1% | <5% | 5.3% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-4 | Green Vly # 1 and 2 115 kV | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.2% | <5% | 5.3% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-5 | Camp Evers 115 kV | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.4% | <5% | 5.5% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-6 | Rob Roy 115 kV | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.3% | <5% | 5.4% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-7 | Paul Sweet 115 kV | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.4% | <5% | 5.5% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-8 | PRUNEDLE 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 5.9% | <5% | 5.1% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-9 | SOLEDAD 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.4% | <5% | 5.6% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-10 | SALINAS 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.1% | <5% | 5.2% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-11 | Moss Landing E and D 115 kV | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 5.7% | <5% | <5% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-12 | CSTRVLE 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 5.7% | <5% | <5% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-13 | Dolan Rd 115 kV | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 5.7% | <5% | <5% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-14 | DEL MNTE 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.0% | <5% | 5.1% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-15 | HOLST D 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.2% | <5% | 5.4% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-16 | SNBENITO 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.2% | <5% | 5.3% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-17 | WTSNVLE 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.2% | <5% | 5.3% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-18 | GRANT RK 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.2% | <5% | 5.3% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-19 | BRIGTANO 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.1% | <5% | 5.3% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-20 | LGNTS J1 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.4% | <5% | 5.5% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-21 | GABILAN 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.2% | <5% | 5.5% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-22 | SALINAS2 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.2% | <5% | 5.3% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-23 | SALINAS1 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.2% | <5% | 5.3% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-24 | BORONDA 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.2% | <5% | 5.3% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-25 | FORT ORD 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.1% | <5% | 5.2% | <5% | <5% | <5% | adjust svds and transformer taps |



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| PGE Blk-VD-26 | DEL MNTE 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.0% | <5% | 5.2% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-27 | MONTEREY 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.0% | <5% | 5.2% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-28 | NAVY SCHL 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.0% | <5% | 5.2% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-29 | VIEJO 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.1% | <5% | 5.2% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-30 | HATTON 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.1% | <5% | 5.2% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-31 | NAVY LAB 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.0% | <5% | 5.2% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-32 | RSVTN RD 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.4% | <5% | 5.5% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-33 | LAURELES 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.6% | 5.0% | 5.7% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-34 | OTTER 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.7% | 5.1% | 5.8% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-35 | FRSHXPRS 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.3% | <5% | 5.5% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-36 | BNA VSTA 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.3% | <5% | 5.5% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-37 | FIRESTNE 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.4% | <5% | 5.5% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-38 | SPENCE 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.4% | <5% | 5.5% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-39 | SNBRN JT 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.2% | <5% | 5.3% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-40 | IND.ACRE 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.2% | <5% | 5.3% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-41 | 9 ST JCT 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.7% | 5.1% | 5.8% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-42 | CMPHR J2 and J1 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.6% | 5.0% | 5.6% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-43 | GONZALES 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.7% | 5.1% | 5.8% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-44 | CAMPORA 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.5% | 5.0% | 5.6% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-45 | SOLEDAD 60.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.5% | <5% | 5.6% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-46 | SLD ENRG 12.5 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.5% | <5% | 5.6% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-47 | CRZY_HRS 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.0% | <5% | 5.2% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-48 | NATIVDAD 115.0 | Moss Landing 500/230 kV x-former | P1 | T-1 | <5% | 6.1% | <5% | 5.2% | <5% | <5% | <5% | adjust svds and transformer taps |
| PGE Blk-VD-49 | buses in NW 115 kV and below | PDCI mono-pole outage | P1 | PDCI | <5% | <5% | <5% | up to 5.2% | N/A | | N/A | adjust svds and transformer taps |



| ID | Substation | Worst Contingency | Category | Category Description | Post Cont. Voltage Deviation % | | | | | | | Potential Mitigation Solutions |
|--------------|----------------------------|-----------------------|----------|----------------------|--------------------------------|------------------|--------------------------|------------------|----------------------|----------------------------|----------------------|--------------------------------|
| | | | | | 2017 Summer Peak | 2020 Summer Peak | 2025 Summer Partial Peak | 2025 Summer Peak | 2017 Spring Off-Peak | 2020 Spring Light Load | 2025 Spring Off-Peak | |
| PGE Bk-VD-50 | Sylmar 230 kV (SCE and LA) | PDCI mono-pole outage | P1 | PDCI | <5% | <5% | <5% | <5% | N/A | up to -5.7% (deviation up) | N/A | turn off shunt caps at Sylmar |



| ID | Substation | Worst Contingency | Category | Category Description | Voltage (PU) | | | | | | | Potential Mitigation Solutions |
|--------------|----------------------------------|---|----------|----------------------|------------------|------------------|--------------------------|------------------|----------------------|------------------------|----------------------|---|
| | | | | | 2017 Summer Peak | 2020 Summer Peak | 2025 Summer Partial Peak | 2025 Summer Peak | 2017 Spring Off-Peak | 2020 Spring Light Load | 2025 Spring Off-Peak | |
| PGE Blk-V-1 | 500 kV in NW, Round Mt, Table Mt | normal conditions and all contingencies | P0 | normal | <550 kV | <550 kV | <550 kV | <550 kV | up to 553 kV | up to 559 kV | up to 554 kV | consider installing additional reactors |
| PGE Blk-V-2 | BIG EDDY 500.0 | Malin-Round Mtn 500 kV # 1 and 2 | P7 | L-2 | 553 | <550 kV | <550 kV | 551 | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-3 | HANFORD 500.0 | Malin-Round Mtn 500 kV # 1 and 2 | P7 | L-2 | 552 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-4 | JOHN DAY 500.0 | Malin-Round Mtn 500 kV # 1 and 2 | P7 | L-2 | 553 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-5 | LANE 500.0 | Malin-Round Mtn 500 kV # 1 and 2 | P7 | L-2 | 553 | <550 kV | 554 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-6 | MARION 500.0 | Malin-Round Mtn 500 kV # 1 and 2 | P7 | L-2 | 551 | <550 kV | 552 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-7 | SLATT 500.0 | Malin-Round Mtn 500 kV # 1 and 2 | P7 | L-2 | 553 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-8 | TROUTDAL 500.0 | Malin-Round Mtn 500 kV # 1 and 2 | P7 | L-2 | 551 | <550 kV | <550 kV | 551 | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-9 | WAUTOMA 500.0 | Malin-Round Mtn 500 kV # 1 and 2 | P7 | L-2 | 551 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-10 | CELILO1 500.0 | Malin-Round Mtn 500 kV # 1 and 2 | P7 | L-2 | 553 | <550 kV | <550 kV | 551 | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-11 | CELILO2 500.0 | Malin-Round Mtn 500 kV # 1 and 2 | P7 | L-2 | 553 | <550 kV | <550 kV | 551 | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-12 | ROCK CK 500.0 | Malin-Round Mtn 500 kV # 1 and 2 | P7 | L-2 | 551 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-13 | KNIGHT 500.0 | Malin-Round Mtn 500 kV # 1 and 2 | P7 | L-2 | 551 | <550 kV | <550 kV | 550 | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-14 | ALVEY 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 555 | <550 kV | 552 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-15 | ALVEY 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 557 | <550 kV | 552 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-16 | ASHE 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 540 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-17 | ASHE 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 551 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-18 | BIG EDDY 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 555 | <550 kV | 552 | 551 | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-19 | BIG EDDY 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 556 | <550 kV | 552 | 552 | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-20 | BUCKLEY 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 555 | <550 kV | 555 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-21 | BUCKLEY 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 556 | <550 kV | 555 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-22 | GRIZZLY 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 552 | <550 kV | 555 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-23 | GRIZZLY 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 554 | <550 kV | 555 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-24 | HANFORD 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 553 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-25 | HANFORD 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 554 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |



| ID | Substation | Worst Contingency | Category | Category Description | Voltage (PU) | | | | | | | Potential Mitigation Solutions | |
|--------------|----------------|---|----------|----------------------|------------------|------------------|--------------------------|------------------|----------------------|------------------------|----------------------|--------------------------------|---|
| | | | | | 2017 Summer Peak | 2020 Summer Peak | 2025 Summer Partial Peak | 2025 Summer Peak | 2017 Spring Off-Peak | 2020 Spring Light Load | 2025 Spring Off-Peak | | |
| PGE Blk-V-26 | JOHN DAY 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 556 | <550 kV | 553 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-27 | JOHN DAY 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 557 | <550 kV | 553 | 551 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-28 | LANE 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 558 | <550 kV | 559 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-29 | LANE 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 560 | <550 kV | 559 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-30 | MALIN 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 553 | <550 kV | 551 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-31 | MALIN 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 557 | 552 | 551 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-32 | MARION 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 555 | <550 kV | 557 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | activate SVD to absorbs VARs |
| PGE Blk-V-33 | MARION 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 557 | <550 kV | 558 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-34 | OSTRNDER 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 552 | <550 kV | 557 | 552 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-35 | OSTRNDER 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 553 | <550 kV | 557 | 553 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-36 | PEARL 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | <550 kV | <550 kV | 552 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-37 | PEARL 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | <550 kV | <550 kV | 552 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-38 | PONDROSB 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 555 | <550 kV | 554 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-39 | PONDROSB 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 558 | 553 | 555 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-40 | PONDROSA 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 552 | 550 | 557 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-41 | PONDROSA 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 555 | 554 | 558 | 552 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-42 | SANTIAM 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 554 | <550 kV | 557 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-43 | SANTIAM 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 556 | <550 kV | 557 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-44 | SLATT 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 556 | <550 kV | 551 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-45 | SLATT 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 557 | <550 kV | 551 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-46 | SUMMER L 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 552 | <550 kV | 556 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-47 | SUMMER L 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 555 | 553 | 556 | 551 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-48 | TROUTDAL 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 554 | <550 kV | 553 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-49 | TROUTDAL 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 555 | <550 kV | 554 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-50 | VANTAGE 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 550 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |



| ID | Substation | Worst Contingency | Category | Category Description | Voltage (PU) | | | | | | | Potential Mitigation Solutions | |
|---------------|----------------|---|----------|----------------------|------------------|------------------|--------------------------|------------------|----------------------|------------------------|----------------------|--------------------------------|---|
| | | | | | 2017 Summer Peak | 2020 Summer Peak | 2025 Summer Partial Peak | 2025 Summer Peak | 2017 Spring Off-Peak | 2020 Spring Light Load | 2025 Spring Off-Peak | | |
| PGE Blk-V-51 | VANTAGE 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 551 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-52 | WAUTOMA 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 552 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-53 | WAUTOMA 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 553 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-54 | CELILO1 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 555 | <550 kV | 551 | 551 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-55 | CELILO1 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 556 | <550 kV | 552 | 553 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-56 | CELILO2 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 555 | <550 kV | 551 | 551 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-57 | CELILO2 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 556 | <550 kV | 552 | 553 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-580 | ROCK CK 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 555 | <550 kV | 552 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-59 | ROCK CK 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 556 | <550 kV | 553 | 550 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-60 | KNIGHT 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 554 | <550 kV | 553 | 550 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-61 | KNIGHT 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 555 | <550 kV | 553 | 552 | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-62 | BOARD F 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 552 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-63 | BOARD F 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 553 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-40 | COYOTE 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 552 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-65 | COYOTE 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 553 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-66 | LONGHORN 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 551 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-67 | LONGHORN 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 552 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-68 | ROUND BU 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | <550 kV | <550 kV | 552 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-69 | ROUND BU 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 552 | <550 kV | 552 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-70 | CAPTJACK 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 552 | <550 kV | 550 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-71 | CAPTJACK 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 556 | 553 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-72 | DIXONVLE 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 557 | <550 kV | 550 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-73 | DIXONVLE 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 560 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-40 | MERIDINP 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 557 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-75 | MERIDINP 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 560 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |

| ID | Substation | Worst Contingency | Category | Category Description | Voltage (PU) | | | | | | | Potential Mitigation Solutions | |
|--------------|----------------|---|----------|----------------------|------------------|------------------|--------------------------|------------------|----------------------|------------------------|----------------------|--------------------------------|---|
| | | | | | 2017 Summer Peak | 2020 Summer Peak | 2025 Summer Partial Peak | 2025 Summer Peak | 2017 Spring Off-Peak | 2020 Spring Light Load | 2025 Spring Off-Peak | | |
| PGE Blk-V-76 | KFALLS 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 555 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V70 | KFALLS 500.0 | Table Mtn-Tesla and Tesla-Vaca Dix 500 kV | P7 | L-2 | 559 | 552 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off shunt capacitors at high voltage |
| PGE Blk-V-78 | TABLE MT 500.0 | Table Mtn-Tesla and Table Mtn-Vaca Dix 500 kV | P7 | L-2 | 552 | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | <550 kV | turn off 227 MVA of shunt capacitors |
| PGE Blk-V-79 | WHEELER 230 | Midway-Vincent # 1 and # 2 500kV w/RAS | P7 | L-2 | 206 | >207 kV | >207 kV | >207 kV | >207 kV | >207 kV | >207 kV | >207 kV | install shunt capacitors (approved project) |
| PGE Blk-V-80 | 500 kV in NW | Diablo # 1 and #2 units | D | G-2 | <550 kV | <550 kV | <550 kV | <550 kV | up to 578 kV | up to 571 kV | up to 586 kV | | don't turn on FACRI |
| PGE Blk-V-81 | 500 kV in NW | Palo Verde # 1 and #2 units | D | G-2 | <550 kV | <550 kV | <550 kV | <550 kV | up to 569 kV | up to 565 kV | up to 579 kV | | don't turn on FACRI |

| ID | Generator/Load | Contingency | Category | Category Description | Transient Stability Performance | | | | | | Potential Mitigation Solutions | |
|--------------|---|---|----------|----------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|-----------------------------------|------------------------------------|-----------------------------------|--|
| | | | | | 2017 Summer Peak | 2020 Summer Peak | 2025 Summer Partial Peak | 2025 Summer Peak | 2017 Spring Off-Peak | 2020 Spring Light Load | | 2025 Summer Partial Peak |
| PGE BIK-TS-1 | wind generators at High Winds # 3 (bus 32171) | 3 Ph fault Contra Costa-La Positas 230 KV | P1 | L-1 | tripped for undervoltage (10.5 MW) | tripped for undervoltage (10.5 MW) | tripped for undervoltage (12.5 MW) | tripped for undervoltage (10.5 MW) | tripped for undervoltage (38 MW) | tripped for undervoltage (6.4 MW) | tripped for undervoltage (38 MW) | these are old induction generator units that don't have LVRT, they may trip with faults close to these units |
| | | 3 Ph fault Tesla-Newark 230 KV | P1 | L-1 | none | none | none | none | none | tripped for undervoltage | tripped for undervoltage | |
| | | 3 Ph fault Newark-Ravenswood 230 kV | P1 | L-1 | none | none | none | none | none | tripped for undervoltage | none | |
| | | 3Ph fault C.-Costa-Brentwood and C.Costa-Delta 230 kV | P7 | L-2 | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | |
| | | 3 Ph fault Contra Costa-La Positas and C.Costa-Lone Tree 230 KV | P7 | L-2 | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | |
| | | Tesla 500 kV stuck breaker | P4 | BRK | none | none | none | none | tripped for undervoltage | none | tripped for undervoltage | |
| PGE BIK-TS-2 | wind generators at Shilo # 2 (bus 32177) | 3Ph fault Contra-Costa-Brentwood and Contra Costa-Delta 230 kV | P7 | L-2 | tripped for undervoltage (46 MW) | tripped for undervoltage (46 MW) | tripped for undervoltage (49.5 MW) | tripped for undervoltage (46 MW) | tripped for undervoltage (150 MW) | tripped for undervoltage (42.6 MW) | tripped for undervoltage (150 MW) | |
| | | Tesla 500 kV stuck breaker | P4 | BRK | none | none | none | none | none | none | tripped for undervoltage | |
| | | 3 Ph fault C. Costa-La Positas 230 KV | P1 | L-1 | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | |
| | | 3 Ph fault Tesla-Newark 230 KV | P1 | L-1 | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | |
| | | 3 Ph fault Newark 230 KV, Newark-Ravenswood | P1 | L-1 | none | none | none | none | none | tripped for undervoltage | tripped for undervoltage | |
| | | 3 Ph fault Contra Costa-La Positas and C.Costa-Lone Tree 230 KV | P7 | L-2 | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | tripped for undervoltage | |
| | | 3 Ph fault Contra Costa-La Positas 230 KV | P1 | L-1 | none | vlt dip 27% | | vlt dip 38% | | | | |
| | | 3Ph fault on Gates 230 kV, Gates-Midway 230 kV | P1 | L-1 | vlt dip 32% | vlt dip 27% | | vlt dip 61%, freq oscill. | | | | |
| | | 3Ph fault on Midway 230 kV, Gates-Midway 230 kV | P1 | L-1 | tripped for out-of-step | vlt dip 43% | | vlt dip 61%, freq oscill. | | | | |
| | | 3Ph fault on Gates 500 kV, Gates-Diablo 500 kV | P1 | L-1 | vlt dip 61%, freq oscill. | vlt dip 37% | | vlt dip 62%, freq oscill. | | | | |
| | | 3Ph fault on Gates 500 kV, Gates-Midway 500 kV | P1 | L-1 | vlt dip 61%, freq oscill. | vlt dip 38% | | vlt dip 61%, freq oscill. | | | | |
| | | 3Ph fault on Midway 500 kV, Gates-Midway 500 kV | P1 | L-1 | vlt dip 41%, freq oscill. | vlt dip 62%, freq oscill. | | vlt dip 63%, freq oscill. | | | | |
| | | 3Ph fault on Midway 500 kV, Midway-Diablo 500 kV | P1 | L-1 | vlt dip 36.5% | vlt dip 62% | | none | | | | |
| | | 3ph fault on Los Banos, Los Banos-Gates # 1 or # 3 500 kV | P1 | L-1 | vlt dip 56-60%, freq oscill. | vlt dip 34% | | vlt dip 40% | | | | |
| | | 3ph fault on Los Banos, Los Banos-Midway 500 kV | P1 | L-1 | vlt dip 53%, freq oscill. | vlt dip 30% | | vlt dip 35% | | | | |
| | | 3ph fault on Midway, Los Banos-Midway 500 kV | P1 | L-1 | vlt dip 34% | vlt dip 62% , freq oscill. | | vlt dip <25%, 20% for 22 Cyc | | | | |

| ID | Generator/Load | Contingency | Category | Category Description | Transient Stability Performance | | | | | | Potential Mitigation Solutions | |
|---|--|--|-------------|----------------------|---------------------------------|----------------------------|---------------------------------------|----------------------------|----------------------|------------------------|--------------------------------|---|
| | | | | | 2017 Summer Peak | 2020 Summer Peak | 2025 Summer Partial Peak | 2025 Summer Peak | 2017 Spring Off-Peak | 2020 Spring Light Load | | 2025 Summer Partial Peak |
| PGE Blk-TS-3 | STAR GT # 1 and 2 (Calpeak Panoche, buses 34328 and 34329), 56.3 MW output each in Heavy Summer cases, 56.3 + 44.4 MW in Partial peak case, off in off-peak and minimum load cases | 3ph fault on Midway, Midway-Vincent # 1 or 2 500 kV | P1 | L-1 | vlt dip 38% | vlt dip 62% , freq oscill. | none, lower output than in peak cases | none | off in the case | off in the case | off in the case | possible modeling error of exciters, EXAC8B. No issues when Voltage Regulator gains Kvi (Integral Gain) and Kvd (Derivative Gain) were reduced. Need to contact generator's owners and request results of exciter testing. |
| | | 3ph fault on Midway, Midway-Vincent # 3 500 kV | P1 | L-1 | vlt dip 35% | vlt dip 62% , freq oscill. | | none | | | | |
| | | 3ph fault on Mosslanding, Mosslanding-Los Banos 500 kV | P1 | L-1 | vlt dip 59%, freq oscill. | vlt dip 35% | | vlt dip 41% | | | | |
| | | 3ph fault on Round Mtn, Round Mtn-Table Mtn # 1 500 kV | P1 | L-1 | none | vlt dip 39% | | vlt dip 66%, freq oscill | | | | |
| | | 3ph fault on Round Mtn, Round Mtn-Table Mtn # 2 500 kV | P1 | L-1 | none | vlt dip 62% , freq oscill. | | none | | | | |
| | | 3ph fault on Table Mtn, Table MTn-Tesla 500 kV | P1 | L-1 | none | vlt dip 40% | | tripped for out of step | | | | |
| | | 3ph fault on Table Mtn, Table MTn-Vaca Dix 500 kV | P1 | L-1 | none | vlt dip 41% | | vlt dip 67%, freq oscill. | | | | |
| | | 3ph fault on Vaca Dix, Vaca Dix-Tesla 500 kV | P1 | L-1 | none | vlt dip 61% , freq oscill. | | tripped for out of step | | | | |
| | | 3ph fault on Tesla, Tesla-Metcalf 500 kV (with DEC off) | P1 | G-1/L-1 | none | vlt dip 36%-(44%) | | vlt dip 61% (63%) | | | | |
| | | 3ph fault on Tesla, Tesla-Tracy 500 kV | P1 | L-1 | none | tripped for out-of-step | | vlt dip 62%, freq oscill. | | | | |
| | | 3ph fault on Tesla 500 kV, Tesla -Los Banos 500 kV | P1 | L-1 | none | vlt dip 32% | | vlt dip 62% | | | | |
| | | 3ph fault on Tracy 500 kV, Tracy -Los Banos 500 kV | P1 | L-1 | none | vlt dip 44% out of step | | vlt dip 63%, freq oscill. | | | | |
| | | 3ph on Newark 230 kV, Newark-Ravenswood 230 kV | P1 | L-1 | vlt dip 61%, freq oscill. | vlt dip 27% | | vlt dip 30% | | | | |
| | | 3ph on Tesla 230 kV, Tesla- Newark 230 kV | P1 | L-1 | vlt dip 42% | vlt dip 27% | | vlt dip 36% | | | | |
| | | 3Ph fault on Table Mtn 500 kV, Table Mtn 500/230 kV x-former (tripped) | P1 | T-1 | none | vlt dip 40% | | tripped for out-of-step | | | | |
| | | 3Ph fault on Los Banos 500 kV, Los Banos 500/230 kV x-former | P1 | T-1 | vlt dip 55%, freq oscill. | vlt dip 39% | | vlt dip 46% | | | | |
| | | 3Ph fault on Metcalf 500 kV, Metcalf 500/230 kV x-former | P1 | T-1 | none | vlt dip 62% , freq oscill. | | vlt dip <25%, >20% 22 cyc | | | | |
| | | 3Ph fault on Midway 500 kV, Midway 500/230 kV # 12 x-former | P1 | T-1 | vlt dip 33% | vlt dip 62% | | tripped for out-of step | | | | |
| | | 3Ph fault on Tesla 500 kV, Tesla 500/230 kV x-former | P1 | T-1 | none | vlt dip 31% out of step | | vlt dip 62% | | | | |
| | | 3Ph fault on Tracy 500 kV, Tracy 500/230 kV x-former | P1 | T-1 | none | vlt dip 41% | | vlt dip 62% , freq oscill. | | | | |
| 3Ph fault on Gates 500 kV, Gates 500/230 kV x-former | P1 | T-1 | vlt dip 53% | vlt dip 33% | vlt dip 47% | | | | | | | |
| 3Ph fault on Round Mtn 500 kV, Round Mtn 500/230 kV x-former | P1 | T-1 | none | out of step, tripped | none | | | | | | | |
| 3Ph fault on Vaca Dix 500 kV, Vaca Dix 500/230 kV x-former | P1 | T-1 | none | out of step, tripped | vlt dip 64%, freq oscill. | | | | | | | |
| 3Ph fault Contra-Costa-Brentwood and Contra Costa-Delta 230 kV | P7 | L-2 | none | vlt dip 27% | vlt dip 38% | | | | | | | |
| 3Ph fault on Gates 230 kV, Gates-Gregg, Gates-Mc Call 230 kV | P7 | L-2 | vlt dip 31% | vlt dip 27% | vlt dip 33% | | | | | | | |
| 3 Ph fault Contra Costa-La Positas and C.Costa-Lone Tree 230 KV | P7 | L-2 | none | vlt dip 28% | vlt dip 40% | | | | | | | |

| ID | Generator/Load | Contingency | Category | Category Description | Transient Stability Performance | | | | | | Potential Mitigation Solutions | |
|--|---|---|----------|----------------------|---------------------------------|----------------------------|--------------------------|---------------------------|----------------------|--------------------------|---|--------------------------|
| | | | | | 2017 Summer Peak | 2020 Summer Peak | 2025 Summer Partial Peak | 2025 Summer Peak | 2017 Spring Off-Peak | 2020 Spring Light Load | | 2025 Summer Partial Peak |
| | | 3Ph Fault on Gates 230 kV Gates-Arco, Gates-Midway 230 kV | P7 | L-2 | vlt dip 32% | vlt dip 27% | | vlt dip 33% | | | | |
| | | 3ph fault on Los Banos, 500 kV DLO North of Los Banos | P7 | L-2 | vlt dip 57%, freq oscill. | vlt dip 31% | | vlt dip 37% | | | | |
| | | 3ph fault on Los Banos, 500 kV DLO South of Los Banos | P7 | L-2 | vlt dip 30% | vlt dip 41% | | vlt dip 46% | | | | |
| | | 3ph fault on Table Mtn, 500 kV DLO South of Table Mtn | P7 | L-2 | none | vlt dip 62% | | none | | | | |
| | | 3ph fault on Tracy, 500 kV DLO South of Tracy | P7 | L-2 | none | vlt dip 46% , freq oscill. | | vlt dip 63% | | | | |
| | | 3ph fault on Tesla, 500 kV DLO North of Tesla | P7 | L-2 | none | vlt dip 39% | | vlt dip 62% | | | | |
| | | 3ph fault on Midway 500 kV, Midway-Diablo # 1 and 2 500 kV | P7 | L-2 | vlt dip 32% | vlt dip 61% , freq oscill. | | vlt dip 63% | | | | |
| | | 3ph fault on Midway 500 kV, DLO North of Midway 500 kV | P7 | L-2 | vlt dip 62%, freq oscill. | vlt dip 63%, freq oscill. | | vlt dip 63% | | | | |
| | | 3ph fault on Gregg, Gregg-Herndon 230 kV # 1 and 2 | P7 | L-2 | none | none | | vlt dip 30% | | | | |
| | | 3ph fault on Pittsburg 230 kV, Pittsburg-Tesla 230 kV # 1 and 2 | P7 | L-2 | none | none | | tripped for out of step | | | | |
| | | 3Ph fault on Midway 230 kV, Midway-Kern # 2 and 3 230 kV | P7 | L-2 | tripped for out-of-step | vlt dip 45% | | vlt dip 62%, freq oscill. | | | | |
| PGE BIK-TS-4 | Solar PV on bus 33102 , 19 MW 2017 and 2025 off-peak, 4.8 MW in all Peak cases, off in 2020 Minimum load and 2025 Part peak | 3ph fault on C.Costa 230kV, C.Cos-Ls Positas 230 kV | P1 | L-1 | none | none | off in the case | none | off in the case | tripped for high voltage | modeled with old solar PV model (wt4g, wt4e), protection trips at 1.1 pu in 1 sec, no issues if shunt capacitor on the collector system is turned off, or generator can absorb reactive power in power flow | |
| | | 3ph fault Newark 230 kV, Newark-Ravenswood | P1 | L-1 | none | none | | none | | | | none |
| | | 3ph fault Tesla 500 kV, Tesla-Metcalf 500 kV | P1 | L-1 | none | none | | none | | | | none |
| | | 3ph fault Tesla 230 kV, Tesla-Newark 230 kV | P1 | L-1 | none | none | | none | | | | none |
| | | 3ph fault Tesla 500 kV, Tesla-Tracy 500 kV | P1 | L-1 | none | none | | none | | | | none |
| | | 3ph fault Tesla 500 kV, Tesla-Los Banos 500 kV | P1 | L-1 | none | none | | none | | | | none |
| | | 3ph fault Tesla 500 kV, Tesla 500/230 kV x-former | P1 | T-1 | none | none | | none | | | | none |
| | | 3ph fault Tracy 500 kV, Tracy 500/230 kV x-former | P1 | T-1 | none | none | | none | | | | none |
| | | Vaca Dix 500 kV stuck brk | P4 | BRK | none | none | | none | | | | none |
| | | 3ph fault Pittsburg 230 kV, Pittsb-Tesla # 1 and 2 | P7 | L-2 | none | none | | none | | | | none |
| | | 3Ph fault C. Costa-Ls Positas and C. Costa-Lonetree 230 kV | P7 | L-2 | none | none | | none | | | | none |
| 3Ph fault C.-Costa-Brentwood and C. Costa-Delta 230 kV | P7 | L-2 | none | none | none | none | | | | | | |
| | | Diablo-g1 | P1 | G-1 | | none | | none | | | | |
| | | 3ph fault Gates 500 kV, Gates-Diablo 500 kV | P1 | L-1 | | none | | none | | | | |
| | | 3ph fault Gates 230 kV, Gates-Midway 230 kV | P1 | L-1 | | none | | none | | | | |
| | | 3ph fault Los Banos 500 kV LosBanos-Gates#1 or # 2 | P1 | L-1 | | none | | none | | | | |

| ID | Generator/Load | Contingency | Category | Category Description | Transient Stability Performance | | | | | | | Potential Mitigation Solutions | |
|--------------|--|---|----------|----------------------|---------------------------------|-------------------------|--------------------------|-------------------------|----------------------|------------------------|------------------------------------|---|------|
| | | | | | 2017 Summer Peak | 2020 Summer Peak | 2025 Summer Partial Peak | 2025 Summer Peak | 2017 Spring Off-Peak | 2020 Spring Light Load | 2025 Summer Partial Peak | | |
| PGE BIK-TS-5 | Solar PV on bus 34461 units # 1 and # 2, off in 2017 Peak, 2017 off-peak, 2025 Partial Peak, 2020 Min load, total 5 MW in 2020 and 2025 Peak, total 20 MW in 2025 off-peak | 3ph fault Midway 500 kV, Midway-Vincent# 1, 2 or 3 | P1 | L-1 | off in the case | none | off in the case | none | off in the case | off in the case | tripped for high voltage | modeled as two small solar PV units, no plant control, typical data, unity power factor, tripped when voltage was higher than 1.1 p.u for more than 1 sec. Voltage close to 1.1 in the base case. Need to maintain lower voltages in the base case, can reduce voltage by changing x-former taps | |
| | | 3ph fault MossIndg 500 kV, MossInd-Los Banos 500 kV | P1 | L-1 | | | | | | | | | none |
| | | 3ph fault Gates 500 kV Gates 500/230 kV x-former | P1 | T-1 | | | | | | | | | none |
| | | 3ph fault Los Banos 500 kV Ls Banos 500/230 kV x-former | P1 | T-1 | | | | | | | | | none |
| | | 3ph fault Midway 500 kV Midway 500/230 kV x-former # 11, 12 or 13 | P1 | T-1 | | | | | | | | | none |
| | | 3ph fault Midway 500 kV DLO North of Midway | P7 | L-2 | | | | | | | | | none |
| | | 3ph fault Midway 500 kV Midway-Diablo # 1 and 2 500 kV | P7 | L-2 | | | | | | | | | none |
| | | 3ph fault Los Banos 500 kV DLO North of Los Banos | P7 | L-2 | | | | | | | | | none |
| | | 3ph fault Los Banos 500 kV DLO South of Los Banos | P7 | L-2 | | | | | | | | | none |
| | | 3 ph fault Gregg 230 kV, Gregg - Herndon # 1 and 2 | P7 | L-2 | | | | | | | | | none |
| | | 3ph fault Gates 230 kV Gates-Arco and Gates-Midway 230 kV | P7 | L-2 | | | | | | | | | none |
| | | 3 ph Gates 230 kV, Gates-Greg and Gates- MCal | P7 | L-2 | | | | | | | | | none |
| | | 3 ph fault Diablo 500 kV, Diablo-Midway # 1 and 2 | P7 | L-2 | | | | | | | | | none |
| | | Diablo-g2 | Extreme | G-2 | | | | | | | | | none |
| PGE BIK-TS-6 | Solar PV on bus 35019, 16,9 MW in all peak cases, off in 2025 partial peak, 2017 off-peak and 2020 min load, 65 MW in 2025 off-peak | 3ph fault Midway 500 kV, Midway-Gates 500 kV | P1 | L-1 | none | none | off in the case | none | off in the case | off in the case | tripped for high freq with fault | Old wt4g, wt4e models, possible modeling error. Over-frequency protection is set to trip the plant in 0.02 seconds at frequency 60.5 Hz. Wasn't tripped with RE models with typical data because freq with fault was lower. Need to discuss protection settings and the plant model parameters with the generation owner. | |
| | | 3ph fault Midway 500 kV, Midway-Los Banos 500 kV | P1 | L-1 | none | none | | none | | | | | |
| | | 3ph fault Midway 500 kV, Midway-Vincent 500 kV # 1, 2 or 3 | P1 | L-1 | none | none | | none | | | | | |
| | | 3 ph fault Midway500 kV, Diablo-Midway # 1 or 2 | P1 | L-1 | none | none | | none | | | | | |
| | | 3 ph fault Midway500 kV, Midway500/230 kV x-former | P1 | T-1 | none | none | | none | | | | | |
| | | 3ph fault Midway 500 kV, Midway-Vincent 500 kV # 1 and 2 | P7 | L-2 | none | none | | none | | | | | |
| | | 3 ph fault Midway500 kV, Diablo-Midway # 1 and 2 | P7 | L-2 | none | none | | none | | | | | |
| PGE BIK-TS-7 | Solar PV on bus 34694, 5 MW in all peak cases, off in 2025 partial peak, 2017 off-peak and 2020 min load, 19 MW in 2025 off-peak | 3ph fault Gates 230 kV, Gates-Midway 230 kV | P1 | L-1 | none | none | off in the case | none | off in the case | off in the case | tripped for low voltage with fault | Old wt4g, wt4e models. Under-voltage protection trips in 0.02 sec with vlt 0.5 p.u. Need to discuss protection settings and the plant model parameters with the generation owner. | |
| | | 3ph fault Gates 230 kV Gates-Arco and Gates-Midway 230 kV | P7 | L-2 | none | none | | none | | | | | |
| | | 3 ph Gates 230 kV, Gates-Greg and Gates- MCal | P7 | L-2 | none | none | | none | | | | | |
| | | 3Ph fault on Gates 230 kV, Gates-Midway 230 kV | P1 | L-1 | UFLS reduced load to 6% | UFLS reduced load to 6% | UFLS reduced load to 6% | UFLS reduced load to 6% | none | none | none | slow frequency recovery. load tripped | |

| ID | Generator/Load | Contingency | Category | Category Description | Transient Stability Performance | | | | | | | Potential Mitigation Solutions |
|---------------|---|---|----------|----------------------|------------------------------------|------------------------------------|--------------------------|------------------------------------|----------------------|------------------------|------------------------------------|---|
| | | | | | 2017 Summer Peak | 2020 Summer Peak | 2025 Summer Partial Peak | 2025 Summer Peak | 2017 Spring Off-Peak | 2020 Spring Light Load | 2025 Summer Partial Peak | |
| PGE BIK-TS-8 | Load on Gates 115 kV | 3Ph fault on Gates 230 kV, Gates-Gregg, Gates-Mc Call 230 kV | P7 | L-2 | UFLS reduced load to 6% | UFLS reduced load to 6% | UFLS reduced load to 6% | UFLS reduced load to 6% | none | none | none | with fault, modeling issue because of low impedance between the fault and load. Low load in off-peak cases |
| | | 3Ph Fault Gates-Arco, Gates-Midway 230 kV | P7 | L-2 | UFLS reduced load to 6% | UFLS reduced load to 6% | UFLS reduced load to 6% | UFLS reduced load to 6% | none | none | none | |
| PGE BIK-TS-9 | Load on Gates-distr 12.5 kV | 3Ph fault on Gates 230 kV, Gates-Midway 230 kV | P1 | L-1 | UFLS reduced load to 33% | UFLS reduced load to 33% | UFLS reduced load to 33% | UFLS reduced load to 33% | UFLS reduced to 33% | UFLS reduced to 33% | UFLS reduced to 33% | slow frequency recovery, load tripped with fault, modeling issue because of low impedance between the fault and load |
| | | 3Ph fault on Gates 230 kV, Gates-Gregg, Gates-Mc Call 230 kV | P7 | L-2 | UFLS reduced load to 33% | UFLS reduced load to 33% | UFLS reduced load to 33% | UFLS reduced load to 33% | UFLS reduced to 33% | UFLS reduced to 33% | UFLS reduced to 33% | |
| | | 3Ph Fault Gates-Arco, Gates-Midway 230 kV | P7 | L-2 | UFLS reduced load to 33% | UFLS reduced load to 33% | UFLS reduced load to 33% | UFLS reduced load to 33% | UFLS reduced to 33% | UFLS reduced to 33% | UFLS reduced to 33% | |
| PGE BIK-TS-10 | Solar PV on bus 35021, 5 MW all peak cases, 18 MW in 2025 Off-peak | 3Ph fault on Midway 230 kV, Gates-Midway 230 kV | P1 | L-1 | tripped for low voltage with fault | tripped for low voltage with fault | off in the case | tripped for low voltage with fault | off in the case | off in the case | tripped for low voltage with fault | Old wt4g, wt4e models. Under-voltage protection trips in 0.02 sec with vlt 0.5 p.u. Need to discuss protection settings and the plant model parameters with the generation owner. |
| | | 3Ph fault Midway230 kV, Midway-Kern # 1 and 2 230 kV | P7 | L-2 | tripped for low voltage with fault | tripped for low voltage with fault | off in the case | tripped for low voltage with fault | off in the case | off in the case | tripped for low voltage with fault | |
| PGE BIK-TS-11 | Solar PV on bus 35082, 5 MW in all peak cases, 19 MW 2025 off-peak | 3Ph fault on Midway 230 kV, Gates-Midway 230 kV | P1 | L-1 | tripped for low voltage with fault | tripped for low voltage with fault | off in the case | tripped for low voltage with fault | off in the case | off in the case | tripped for low voltage with fault | Old wt4g, wt4e models. Under-voltage protection trips in 0.02 sec with vlt 0.5 p.u. Over-frequency trips for 60.5 Hz in 0.02 sec. Need to discuss protection settings and the plant model parameters with the generation owner. |
| | | 3Ph fault on Midway 500 kV, Gates-Midway 500 kV | P1 | L-1 | none | none | | none | | | tripped for high freq | |
| | | 3Ph fault on Midway 500 kV, Los Banos-Midway 500 kV | P1 | L-1 | none | none | | none | | | tripped for high freq | |
| | | 3Ph fault on Midway 500 kV, Diablo-Midway 500 kV | P1 | L-1 | none | none | | none | | | tripped for high freq | |
| | | 3Ph fault on Midway 500 kV, Midway-Vincent # 1, 2 or 3 500 kV | P1 | L-1 | none | none | | none | | | tripped for high freq | |
| | | 3Ph fault on Midway 500 kV, Midway 500/230 kV x-former kV | P1 | T-1 | none | none | | none | | | tripped for high freq | |
| | | 3Ph fault Midway500 kV, DLO North of Midway 500 kV | P7 | L-2 | none | none | | none | | | tripped for high freq | |
| | | 3Ph fault Midway500 kV, Midway-VIncent # 1 and 2 500 kV | P7 | L-2 | none | none | | none | | | tripped for high freq | |
| | | 3Ph fault on Midway 230 kV, Midway-Kern PP# 2 and 3 230 kV | P7 | L-2 | tripped for low voltage with fault | tripped for low voltage with fault | | tripped for low voltage with fault | | | tripped for low voltage with fault | |
| | | 3Ph fault Midway 500 kV, Midway-Diablo # 1 and 2 500 kV | P7 | L-2 | none | none | | none | | | tripped for high freq | |
| PGE BIK-TS-12 | Solar PV on bus 39184, 5 MW in all peak cases, 20 MW in 2025 off-peak | 3Ph fault on Midway 230 kV, Gates-Midway 230 kV | P1 | L-1 | none | none | off in the case | none | off in the case | off in the case | tripped for high freq/ w fault | Frequency protection trips the unit at 60.5 Hz or 59.3 Hz in 0.02 sec. Need to check the models with the generation owner. Inverter control model wasn't provided. Same refers to the Pumpjack plant (bus 39176) |
| | | 3Ph fault on Midway 230 kV, Midway - Kern PP# 2 and 3 230 kV | P7 | L-2 | tripped for low freq w/ fault | tripped for low freq w/ fault | | none | | | none | |

| ID | Generator/Load | Contingency | Category | Category Description | Transient Stability Performance | | | | | | | Potential Mitigation Solutions |
|---------------|--|--|----------|----------------------|--|----------------------------------|--------------------------------|---|--------------------------------|------------------------|--------------------------|---|
| | | | | | 2017 Summer Peak | 2020 Summer Peak | 2025 Summer Partial Peak | 2025 Summer Peak | 2017 Spring Off-Peak | 2020 Spring Light Load | 2025 Summer Partial Peak | |
| PGE BIK-TS-13 | Generator Fritolay (35048) | 3Ph fault on Midway 230 kV, Gates-Midway 230 kV | P1 | L-1 | tripped for out of step | none | none | none | none | none | none | small unit, 6 MW,lost synchronism with fault. Possible numerical issue because of not clean convergence |
| | | 3Ph fault on Midway 230 kV, Midway - Kern PP# 2 and 3 230 kV | P7 | L-2 | tripped for out of step | none | none | none | none | none | none | |
| PGE BIK-TS-14 | Generator Borden D (34253) | 3Ph fault on Gregg 230 kV, Gregg-Herndon # 1 and 2 230 kV | P7 | L-2 | none | tripped for out of step (1.4 MW) | none | none | none | none | none | small unit close to the fault |
| PGE BIK-TS-15 | Solar PV on bus 35015, 5 MW in all peak cases, 19.8 MW in the 2025 off-peak case | 3Ph fault on Midway 230 kV, Gates-Midway 230 kV | P1 | L-1 | tripped for low frequency | tripped for low frequency | off in the case | none | off in the case | off in the case | none | Old wt4g and wt4e models. Protection trips for freq 59.5 Hz in 0.16 seconds. Need to discuss protection settings and the plant model parameters with the generation owner. |
| | | 3Ph fault on Midway 230 kV, Midway - Kern PP# 2 and 3 230 kV | P7 | L-2 | tripped for low frequency | tripped for low frequency | | none | | | none | |
| PGE BIK-TS-16 | 70 kV and 115 kV buses around Midway | 3Ph fault on Midway 230 kV, Gates-Midway 230 kV | P1 | L-1 | vlt dips up to 47% if pumps not tripped right away | none | vlt dips up to 29% | none | Vlt dip up to 37% | none | none | This is possible numerical issue because of slow convergence due to large amount of inverter-based generation in the area and composite load models. Large voltage dips observed around 0.1 sec after fault clearing. Also slow frequency recovery after the fault in Midway area |
| PGE BIK-TS-17 | Buena Vista pumps | 3Ph fault on Midway 230 kV, Gates-Midway 230 kV | P1 | L-1 | tripped by undervoltage relays | vlt dip up to 26% | vlt dip up to 31% | none | tripped by undervoltage relays | none | none | |
| PGE BIK-TS-18 | Wheeler Ridge pumps | 3Ph fault on Midway 230 kV, Gates-Midway 230 kV | P1 | L-1 | tripped by undervoltage relays | vlt dip up to 34% | vlt dip up to 42% | vlt dip up to 33%, may be tripped by under-voltage relays | tripped by undervoltage relays | none | none | |
| PGE BIK-TS-19 | Wind Gap pumps | 3Ph fault on Midway 230 kV, Gates-Midway 230 kV | P1 | L-1 | tripped by undervoltage relays | vlt dip up to 33% | tripped by undervoltage relays | vlt dip up to 32%, may be tripped by under-voltage relays | tripped by undervoltage relays | none | vlt dip 31.4% | |
| PGE BIK-TS-17 | Buena Vista pumps | 3Ph fault on Midway 230 kV, Midway - Kern PP# 2 and 3 230 kV | P7 | L-2 | tripped by undervoltage relays | vlt dip up to 28% | vlt dip up to 34% | none | tripped by undervoltage relays | none | none | |
| PGE BIK-TS-18 | Wheeler Ridge pumps | 3Ph fault on Midway 230 kV, Midway - Kern PP# 2 and 3 230 kV | P7 | L-2 | tripped by undervoltage relays | vlt dip up to 38% | vlt dip up to 37% | tripped by under-voltage relays | tripped by undervoltage relays | none | Vlt dip 33.5% on # 2 | |
| PGE BIK-TS-19 | Wind Gap pumps | 3Ph fault on Midway 230 kV, Midway - Kern PP# 2 and 3 230 kV | P7 | L-2 | tripped by undervoltage relays | vlt dip up to 36% | tripped by undervoltage relays | tripped by under-voltage relays | tripped by undervoltage relays | none | vlt dip 25%-32.3% | |
| PGE BIK-TS-16 | 70 kV and 115 kV around Midway | 3Ph fault on Midway 230 kV, Midway - Kern PP# 2 and 3 230 kV | P7 | L-2 | vlt dips up to 49% if pumps not tripped right away | vlt dips <30% | vlt dips up to 33% | none | vlt dip up to 38% | none | none | |
| PGE BIK-TS-20 | SMYRNA 115 kV | 3Ph fault on Midway 230 kV, Midway - Kern PP# 2 and 3 230 kV | P7 | L-2 | UFLS | UFLS | none | none | none | none | none | |
| PGE BIK-TS-21 | FAMOSO 115 kV | 3Ph fault on Midway 230 kV, Midway - Kern PP# 2 and 3 230 kV | P7 | L-2 | UFLS | UFLS | none | none | none | none | none | |
| PGE BIK-TS-22 | CHARKA 115 kV | 3Ph fault on Midway 230 kV, Midway - Kern PP# 2 and 3 230 kV | P7 | L-2 | UFLS | UFLS | none | none | none | none | none | |

Study Area: **PG&E Bulk**

Single Contingency Load Drop



| ID | Worst Contingency | Category | Category Description | Amount of Load Drop (MW) | | | | | | Potential Mitigation Solutions |
|---------|-------------------|----------|----------------------|--------------------------|----------|----------|----------|----------|----------|--------------------------------|
| | | | | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. | |
| X-SLD-1 | NONE | | | | | | | | | |

No single contingency resulted in total load drop of more than 250 MW.

Single Source Substation with more than 100 MW Load

| ID | Substation | Load Served (MW) | | | | | | | | Potential Mitigation Solutions |
|--------|------------|------------------|----------|----------|----------|----------|----------|----------|----------|--------------------------------|
| | | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. | |
| X-SS-1 | NONE | | | | | | | | | |

No single source substation with more than 100 MW Load